

CS 315

Scientific Computations

Introduction; Error Analysis; Numerical Solution of Nonlinear Equations; Finite Differences & Interpolation; Curve Fitting: Least Squares Approximation; Numerical Differentiation; Numerical Integration; Solving Sets of Linear Algebraic Equations; Initial Value Problems.

Chief Examiner	<i>Dr. Kareem Elgindy</i>
Unit Coordinator	<i>Dr. Kareem Elgindy</i>
<i>Mode of delivery</i>	On campus
<i>Workload</i>	One 3-hour lecture and one 2-hour practice lab class per week
<i>Prerequisites</i>	Familiarity with the fundamentals of linear algebra and differential equations is useful, but there is sufficient introductory material on these topics so that courses in these subjects are not needed as prerequisites
<i>Campus</i>	Assiut University Campus
<i>Phone</i>	(2) 412284
<i>Email</i>	Kareem.elgindy@aun.edu.eg
<i>Consultation hours</i>	Between 10 a.m. -12 p.m. on Wednesdays. Outside these hours, use the discussion forum on easyclass website to post any questions of general interest. Use email for personal issues only.
<i>Tutors</i>	Contact details of all tutors appear on the unit website.

SEMESTER Semester 1

2015

Academic Overview

Welcome to CS 315 – Scientific Computations. This 100-point subject is suitable for students who wish to strengthen their mathematics skills to support their studies in other science or non-science areas.

Learning Objectives

On completion of this unit, students will:

- identify some types of problems which require numerical techniques for their solution;
- accurately approximate the solutions of problems, which cannot be solved exactly, or infeasible to obtain;
- learn typical techniques for estimating error bounds for the approximations;
- be a better scientific programmer.

Assessment Summary

Week starting	Activity
04 Oct	Lectures & practice lab classes begin this week
01 Nov	Assignment 1 handed out
22 Nov	Assignment 1 due and Assignment 2 handed out
Will be publicized later	Mid-Semester Exam
13 Dec	Assignment 2 due
20 Dec	Revision and exam preparation

Teaching Approach

There will be 5 contact hours per week as follows:

- One three-hour lecture
- One two-hour practice lab class

At all times you are encouraged to post on easyclass discussion site if you need help.

Lectures

The material in lectures will be presented by hand – I shall create real mathematics before your eyes – and through lecture slides. The material is based on lecture slides that also include all unit information.

Practice Lab Classes

In the practice lab classes you will work on some problem sets concerned with MATLAB software and numerical analysis under the guidance of a tutor. You are required to attend the practice lab classes, to work on the problem sets and participate in class.

Writing in Mathematics

In this unit, we will pay great attention to how you write mathematics. The degree to which you will have to put an effort into improving your mathematics writing will depend very much on the good or bad habits you developed so far. You will be given opportunities to improve your mathematics writing in lectures (by watching good practice) and in tutorials.

Feedback

Our Feedback to You

In CS 315, the following opportunities should help you get a sense on how you are doing:

Assignments. Always look through the marked assignments, and read the comments given by your lecturer either written on the assignment itself or in the lecture to the whole group. Always ask if there is something that it is not clear to you. All topics included in the assignments will be covered in the final exam; therefore, it is important that if you lost marks in a particular question that you find out what you did wrong to avoid making the same mistake again in the exam!

Practice lab tutorials. These are the best place to get feedback from both the tutor and your peers. Take the weekly problem sets seriously, and clarify anything that you are unsure about. Many questions included in the problem sets are from previous exams and they will give you an idea of what will be included in your exam.

Previous exams. Towards the end of the semester, I will put on easyclass website some previous exams.

Unit Resources

Required Resources

Brief lecture slides will be available on the unit web site. Students are expected to download and print these notes.

Recommended Resources

The textbook for CS 315 is Numerical Analysis by R.L. Burden & J.D. Faires. There are at least nine versions of this book. Any edition would suffice, preferably starting from the 6th edition. A copy of the 9th edition of the textbook can be downloaded from the unit web site.

Unit Website

Unit information, lecture slides, assignments, all handouts and notices will be available on the web through easyclass (available through <https://www.easyclas.com/>).

Lecture Schedule

CS 315 Scientific Computations		
Lecture(s)	Topic	Week(s)
1	Introduction	2
2	Error Analysis	3
3,4	Numerical Solution of Nonlinear Equations	4,5
5,6	Finite Differences & Interpolation	6,7
7	Curve Fitting: Least Squares Approximation	8
8	Numerical Differentiation	9
9,10	Numerical Integration	10,11
11,12	Solving Sets of Linear Algebraic Equations	12,13
13	Initial Value Problems	14
14	REVISION AND EXAM PREPARATION	15

Assessment Requirements

Assessment Tasks

The assessment for this unit will consist of:

- two assignments worth 15%.
- one mid-semester test worth 15%.
- one practice lab exam worth 20%.
- one final exam worth 50%.
- bonus marks worth up to 20% (for clever and active students).

Assessment Criteria

The assignments will consist of four or five exercises, which you will have to write up neatly, and using correct mathematics symbols and English grammar. The assignments must be prepared using some form of word processor. Hand written assignments will attract a significant penalty (to be advised at the time the assignments is handed out).

Your written work in all assessment tasks will be assessed using two basic criteria: the accuracy of the solution given for each exercise and the logic followed to arrive at each solution, and the presentation of the solution, including the correct use of mathematical symbols and sentences linking the different steps.

Examinations

No material other than your writing pens, calculators, and your brain will be allowed in the mid-semester test and in the final exam.

Assignment Submission

Hard Copy Submission

Assignments must include a cover sheet. This can be downloaded from the unit web site. You should print the cover sheet, fill it, and attach it at the top of your solution sheet. Please keep a copy of tasks completed for your records. You must submit your assignments with a signed cover sheet by the due date either directly to me at the end of a lecture or by handing it to me at my office in the Fifth Floor of the Mathematics Department at Faculty of Science.

Online Submission

Electronic submission, via e-mail, easyclass or any other form, is not allowed for this unit. All material submitted for assessment must be in paper form. This will allow for written feedback on each piece of submitted work.

Extensions and Penalties

I have a strict policy on late submission of work.

1. The penalty for assignments submitted late should be 10% of the maximum mark per day late or part thereof.
2. Weekends and holidays should attract the same penalty as weekdays.
3. No assignment can be accepted for assessment more than a week after the due date except in exceptional circumstances and in consultation with me.

Resubmission of Assignments

You will not be allowed to re-submit your work for assessment except in very special cases.

Referencing Requirements

Where you include significant pieces of work, other than your own, you must provide details of where that material was obtained. If you obtained the information from Wikipedia or Wolfram Alpha then you must provide the URL of the web page. You should follow standard scientific practice where the references are included as a final section of your submitted work.