Department of Mathematics

College of Science

Salahaddin University-Erbil

Subject: Advanced Computer Skills

Course Book: MSc Degree

Lecturer's name: Imad A. Aziz

Academic Year: 2023-2024

Course Book

1. Course name	Computational Mathematics I
2. Lecturer in charge	Imad A. Aziz
3. Department/ College	Mathematics / Science
4. Contact	e-mail: imad.aziz@su.edu.krd Tel: +9647504639909
5. Time (in hours) per week	Theory: 2 Practical: 2
6. Office hours	
7. Course code	
8. Teacher's academic profile	**23/6/2020** lecturer at Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **16/6/2020** Awarded Ph.D. in Mathematics, Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **3/9/2006** Assistant lecturer at Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **31/7/2006** Awarded M.Sc. in Mathematics, Department of Mathematics, College of Science, University of Al-Mustansiriyah, Iraq. **10/1/2002** Awarded B.Sc. in Mathematics, Department of Mathematics, College of Science, University of Salahaddin-Erbil, Iraq. **1995-1996** Awarded Baccalaureate, Hamren Secondary
9. Keywords	Matrix, Sum, For, If, While, Script, Function.

10. Course overview:

The computer program MATLAB is a powerful tool which can help you solve a wide range of mathematical problems: it can differentiate, integrate, and otherwise manipulate mathematical formulas, perform arithmetic calculations, plot curves and surfaces in two and three dimensions, solve differential equations, and carry out a variety of other useful mathematical operations, At Rutgers, MATLAB is available on the student computer Eden. MATLAB is also available on the Windows PCs and Macintoshes in the public labs. Although the commands you use to do mathematics with MATLAB will be the same on all these machines, there are differences among computers, such as in the way that, les are opened, saved and printed.

With MATLAB, you can create powerful interactive documents. The MATLAB environment lets you start solving problems right away by entering expressions in 2-D Math and solving these expressions using point-and-click inter- faces. You can combine text and math in the same line, add tables to organize the content of your work, or insert images, sketch

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regions, and spreadsheets. You can visualize and animate problems in two and three dimensions, format text for academic papers or books, and insert hyperlinks to other MATLAB files, Web sites, or email addresses. You can embed and program graphical user interface components, as well as devise custom solutions using the MATLAB programming language.

11. Course objective:

- Familiarize students with the basic MATLAB interface, including the command window, workspace, and editor.
- Understand and navigate the basic menus, toolbars, and help documentation.
- Introduce fundamental programming concepts such as variables, data types, and basic operators.
- Learn to write simple MATLAB scripts and functions.
- Understand and implement basic control structures like loops and conditional statements.
- Teach students how to import, export, and manipulate simple datasets in MATLAB.
- Create basic plots and graphs to visualize data.
- Customize simple plots with labels, titles, and legends.
- Understand basic numerical operations and functions in MATLAB.
- Solve simple mathematical problems using MATLAB's built-in functions.
- Perform basic matrix and array operations.
- Understand the use of matrices in MATLAB and their applications in solving linear algebra problems.
- Conduct basic statistical analysis and descriptive statistics using MATLAB.
- Perform elementary data manipulation and summary techniques.
- Apply learned skills to small, practical projects.
- Develop problem-solving skills through hands-on practice and assignments.

12. Student's obligation

a. Students reign an commitment to come on time and remain in the classroom for the duration of scheduled classes and Labs.
b. Nothingness speak students with each other during lecture.
c. All devices must be turned off.
d. When teacher ask question, Students will be to raise your hand before answer his question.
e. Students own an obligation to write tests and final examinations at the times scheduled by the teacher or the College.

13. Forms of teaching

I give hard copy of My lecture notes to students before coming lecturer time. first I remember students about previous lecture, and then I start new lecture. At the end of the lecture give a homework for the next lecture. During this proses I am use presentation and whiteboard.

14. Assessment scheme
1. *Practical:* 35% Matlab assignments and quizzes in Lab.
2. *Theoretical:* 15% (Midterm exams and other activities).
3. *Final Exam: Practical:* 0% and *Theoretical:* 50% .

15. Student learning outcome:
Student learning in every facet of computational mathematics. Following are some commonly used mathematical calculations where it is used most commonly:

- Efficiently navigate and use the MATLAB interface, including the command window, workspace, and editor.
- Write, debug, and execute simple MATLAB scripts and functions.
- Use basic control structures like loops and conditional statements in MATLAB programs.
- Import and export data in MATLAB.
- Create and customize basic plots and graphs to visualize data effectively.
- Perform basic numerical calculations and use built-in MATLAB functions to solve simple problems.
- Conduct basic matrix operations and understand their applications in linear algebra.
- Perform simple data analysis tasks, including basic statistical analysis and data manipulation.
- Apply MATLAB skills to complete small projects, demonstrating problem-solving abilities and practical application of course concepts.

16. Course Reading List and References:
- A Guide to MATLAB for Beginners and Experienced Users Second Edition, Brian R. Hunt, Cambridge, 2006.
- An Introduction to MATLAB, Winfried Auzinger, Vienna, 2002.
- Applied Numerical Methods Using Matlab, Won Young Yang, New Jersey, 2005.
- Learning MATLAB 7, The MathWorks, 2005.
- Numerical Analysis Using MATLAB and Spreadsheets, Second Edition, Steven T. Karris, Orchard Publications, 2004.

17. The Topics:	Lecturer's name
Chapter One: Introduction to Matlab Starting MATLAB, Typing in the Command Window, MATLAB Help, MATLAB Windows, Entering and retrieving variables, Input and output, Saving and loading data, Basic mathematical operations, Useful MATLAB functions, Complex numbers. **Chapter Two: Vectors and Matrices** Entering matrices and Vectors, Subscripts, Operations with Arrays, Operations on Vectors and Matrices, Vector functions and Matrix functions, Polynomials in MATLAB.	This Column are not applicable because timetables of holidays will change that is I cannot Determine a week by week review of the topics.

Chapter Three: Programming in MATLAB
Relational and Logical Operators, M-files: Scripts, Loops
statement, If and switch statement, Input and output.

Chapter Four: MATLAB Function
Write a function, break, return, error, continue.

Chapter Five: Strings
Assignment, Input, Strings are arrays, Concatenation of strings,
ASCII codes, double and char, Comparing strings, String
functions.

Chapter Six: Graphics
2D Plotting, Polar Plots, 3D Plotting, Mesh and surface plots**.**

Chapter Seven: The Symbolic Math Toolbox
Variable precision arithmetic, Symbolic substitution, Symbolic
variables, Symbolic matrix operations.

Chapter Eight: Calculus
Differentiation, Limits, Integration, Symbolic Summation, Taylor
Series.

Chapter Nine: Linear Algebra
Eigenvalues, Solving Algebraic Equations, Solving Linear System
of Equation, Symbolic Linear Algebraic Functions, Solving
Algebraic Equations

Chapter Ten: Differential Equations
Differential Equation, Solving differential equations**,** solving
system of differential equations

18. Practical Topics (If there is any)

	This Column are not applicable because timetables of holidays will change that is I cannot Determine a week by week review of the topics.

19. Examinations:
   Questions in the examination will be arranged the matching mode by way of the
examples and exercises that I give delivered in the lecture notes.
Sometimes will be have extra mark in examination for worthy students.

20. Extra notes:

Answers of examination will be find in the board's declaration Mathematics department after every examination.

21. Peer review