Department of Mathematics

College of Education

Salahaddin University-Erbil

Subject: Programming Application

Course Book – 2nd Year – (1st & 2nd) Semester

Lecturer's name: Maher Ali Nawkhass

Academic Year: 2023- 2024

Course Book

1. Course name	**Programming Application**
2. Lecturer in charge	**Maher Ali Nawkhass**
3. Department/ College	**Mathematics /Education**
4. Contact	**e-mail:maher.nawkhass@su.edu.krd** **Tel: (optional)**
5. Time (in hours) per week	**Theory: 1** **Practical: 2**
6. Office hours	
7. Course code	**EdM0206**
8. Teacher's academic profile	Maher Nawkhass - MN mathematics teacher mathematics teacher work in college of education Kurdistan region-Iraq, Erbil _Current_: Salahaddin University college of education mathematics department. _Education_: M.Sc. in mathematics (optimization). _Summary_ : I am a native Kurdish speaker and graduate from Salahaddin who is working towards to rise Scientific title
9. Keywords	**Mat-lab**

10. Course overview:

This course teaches computer programming to those with little to no previous experience. It uses the programming system and language called MATLAB to do so because it is easy to learn, versatile and very useful for engineers and other professionals.

MATLAB is a special-purpose language that is an excellent choice for writing moderate-size programs that solve problems involving the manipulation of numbers. The design of the language makes it possible to write a powerful program in a few lines. The problems may be relatively complex, while the MATLAB programs that solve them are relatively simple: relative, that is, to the equivalent program written in a general-purpose language, such as C++ or Java. As a result, MATLAB is being used in a wide variety of domains from the natural sciences through all disciplines of engineering to finance and beyond, and it is heavily used in industry. Hence, a solid background in MATLAB is an indispensable skill in today's job market.

Nevertheless, this course is not a MATLAB tutorial. It is an introductory programming course that happens to use MATLAB to illustrate general concepts in computer science and programming.

Students who successfully complete this course will:

- ➢ become familiar with general concepts in computer science
- ➢ gain an understanding of the general concepts of programming
- ➢ obtain a solid foundation in the use of MATLAB:

11. Course objective:

- The goal of this course is to introduce students to the fundamental concepts of Scientific Programming using Matlab /Octave and similar programming languages (e.g. sagemath) and we will introduce the necessary mathematical concepts as we go (including linear algebra, differential equations, probability and statistics).

12. Student's obligation

- Student should attend lectures (theory part) and practicing in computer laboratories.
- Student should attend exams during the course.
- Home works
- Quizzes
- Team work projects

13. Forms of teaching

To achieve the objectives of the course, the following methods and techniques will be followed during teaching process:

1. Lecture notes will be handled to the students at the beginning of each part to facilitate easier understanding of books and also to read references.
2. Power point presentation for parts of the course as required.
3. White board will be used to explain program commands, draw sketches and solve problems in the lab.
4. Computer labs for practicing the theoretical parts.

14. Assessment scheme

The student must provide the following quizzes and exams during the course:

Annual Effort(40 %)		Final Exam(60 %)		Total
Lab Practices*	Midterm Exam (Theoretical)	Practical	Theoretical	
30%	20%	0%	50%	100%

* Quizzes and homework's are performed at the lab practices during the course.

15. Student learning outcome:

Students should have learned how to construct computer program flow diagrams, implement programs using MATLAB and apply those skills towards the numerical solution of engineering problems. Specifically:

o Understand basic foundations of computer programming

o Have a basic understanding of how to test and debug computer programs

o Have the ability and an appreciation for good documentation of computer programs

o Understand basic algorithms for (1) numerical integration, (2) numerical differentiation, (2) curve fitting, (3) solution of simultaneous linear equations and (4) numerical solution of Ordinary differential equations

o Have a reasonably good knowledge of the MATLAB programming environment

16. Course Reading List and References:

1- D. J. HIGHAM & N. J. HIGHAM " MATLAB Guide". Society for industrial

Applied Mathematics . United states of America. (2005)

2- S. Attaway "MATLAB- practical introduction to programming
and problem solving ".Elsevier INC. (2013)

3- A. Glat "An Introduction with Applications". John Wiley & Sons,
INC. (2004) .

4- S. J. Chapman "Essential of MATLAB Programming". Cengage Learning.   (2006)

17. The Topics: Lecturer's name

First semester from 4/9---12/1 20 weeks :(16 lectures + 4 Exam & revision)			
W	Sunday—Thursday	17 week (Classes + Exam)	
1	4/9----8/9	Introduction to MATLAB programming some basic knowledge about commands.	
2	11/9----15/9	Special variable and constant , some math function in MATLAB 1-function Trigonometric 2- function Trigonometric inverse 3-function Hyperbolic 4-function Hyperbolic	

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		inverse		
3	18/9----22/9	Mat-lab with vectors, vector operations in Mat-lab (transpose, addition and subtraction,		
4	25/9---29/9	Multiplication, term-by-term multiplication, creating vectors, manipulating matrix elements) and other operations.		
5	2----6/10	Mat-lab with matrix, creating matrix, Make a matrix y (,eye, zeros, ones,...)		
6	9-----13/10	Creating Larger Vectors from Existing Variables, Creating Vectors with Uniformly Spaced Elements, Characterizing a Vector		
7	16/10---20/10	Vector Dot and Cross Products, Referencing Vector Components, Basic Operations with Matrices		

8	23----27/10	Matrix Multiplication, More Basic Operations, Special Matrix Types, Referencing Matrix Elements	
9	30/10----3/11	Using Script Files, INPUT TO A SCRIPT FILE, OUTPUT COMMANDS, Relational operation , logical operation	
10	6/11----10/11	The if- end Structure, The if- else - end Structure, The if- elseif -else - end Structure	
11	13------17/11	THE switch-case STATEMENT, LOOPS, - for-end loops	
12	20-----24/11	Midterm exam	One weeks (optional)
13	27/11-----1/12	Quiz+ solve problems	
14	4/12---8/12	Nested loops and Nested Conditional statement	
15	11/1-----15/12	While –end loop	
16	18-----22/12	Quiz+ solve problems	
17	19-----23/12	Function m-file, Function definition line	
18	25-----29/12	Quiz+ solve	

		problems	
19	1------5/1	Final exam	
20	8------12/1	Final exam	

Second semester from 22/1---30/6 20 weeks			
W	Sunday—Thursday	17 week (Classes+ exam)	
1	22/1----26/1	Solving Basic Algebraic Equations, Solving Quadratic Equations, Plotting Symbolic Equations	Seven weeks
2	29/1----2/2	Solving Higher Order Equations, Systems of Equations, Expanding and Collecting Equations	
3	5/2----9/2	Solving with Exponential and Log Functions, Calculating Limits, LEFT- AND RIGHT-SIDED LIMITS, FINDING ASYMPTOTES	
4	12---16/2	Computing Derivatives, The dsolve Command, Solving ODE's	
5	19/2----23/2	Systems of Equations and Phase Plane Plots,	
6	26/2-----2/3	The Int Command, Definite Integration, Numerical Integration	

7	5/3---9/3	Quadrature Integration ,	
8	13----16/3	Newroz	Holiday
9	20/3---24/3	Newroz	Holiday
10	26/3----30/3	Midterm exam	One week **(optional)**
10	2/4----6/4	Basic 2D Plotting, More 2D Plotting Options,	
11	9----13/4	The Axis Commands, Showing Multiple Functions on One Plot	
12	16------20/4	Quiz+ solve problems	
13	23-----37/4	Adding Legends,	
14	30/4------4/5	Setting Axis Scales,	
15	10---14/5	Overlaying Plots and linspace,	
16	7-----11/5	Polar and Logarithmic Plots	One week
17	14 -----18/5	Final exam	One week
18	21-----25/5	Final exam	Two weeks (Exam & Results+ Objection).
19	7-----11/6	Off	
20	14----18/6	Final exam - Second trial	One week
21	21----25/6	Final exam - Second trial	One week
22	28----30/7	Final exam - Second trial	Three days

18. Practical Topics (If there is any)

The same Subjects above will be applied in the laboratory on computers.	Lecturer's name ------ 2 hrs per week Date -----

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19. Examinations:

Q1/ Write a MATLAB if statement to calculate y where y = 1 if x > pi/2, y = sin(x) if x is in [0, pi/2] and y = 0 otherwise?

Q2/Write a script file using Conditional If-Elseif-Else statements to shows the grade of the score as following: -

Grade	Score
A+	100
A	Score ≥ 90
B	Score ≥80
C	Score ≥70
D	Score ≥60
F	otherwise

Q3/ write a program that calculates the tip based on amount of bills, using the following rules and the variable 'bill':

- bill is less than $10
  - Tip is $1.80
- bill is between $10 and $60
  - Tip is %18
- bill is above $60
  - Tip is %20

Q4/Write a script file using Conditional If-Elseif-Else statements to evaluate the following function, assuming that x = -2, 0, and 6. The function is:

$$y = \begin{cases} e^{x+1} for\ x < -1 \\ 2 + \cos(\pi x)\ for -1 \le x \le 5 \\ 10(x-5) + 1\ for\ x > 5 \end{cases}$$

Q5/ Write a Program to check whether an integer entered by the user is odd or even?

Q6/ write a program to find the average of the student exams and write the grade

Of it as the following:-

No.	Exams
1	40
2	60
3	30
4	50
5	70

Avr.	grade
$100 \leq Avr \leq 90$	A
$90 < Avr \leq 80$	B
$80 < Avr \leq 70$	C
$70 < Avr \leq 60$	D
$60 < Avr \leq 50$	E
otherwise	F

20. Extra notes:

21. Peer review