جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

# Course Syllabus

***According to JORDAN National Qualification Framework (JNQF)***

# Course Name: Mathematical Modeling (1)

# Course Number: 0101372

## General Course Information:

| | |
|---|---|
| Course Title | Mathematical Modeling 1 |
| Course Number | 0101372 |
| Credit Hours | 3 credit hours |
| Education Type | Blended learning |
| Prerequisites/Co-requisites | Principles of Programming |
| Academic Program | Bachelor Program |
| Program Code | 101 |
| Faculty | Faculty of Science and IT |
| Department | Mathematics |
| Level of Course | 3 |
| Academic Year /Semester | 2023/2024 1st Semester |
| Awarded Qualification | Bachelor |
| Other Department(s) Involved in Teaching the Course | - |
| Language of Instruction | English |
| Date of Production | 2021-2022 |
| Date of Revision | 16-10-2023 |

## Course Coordinator:

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|---|---|
| Coordinator's Name | Waseem Alshanti |
| Office No. | 9117 |
| Office Phone Extension Number | |
| Office Hours | 10-12 Sun T, 11-1 Mon W |
| E-mail | Waseemalshanti@yahoo.com |

## Other Instructors:

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|---|---|
| Instructor Name | |
| Office No. | |
| Office Phone Extension Number | |
| Office Hours | |
| Email | |

## Course Description *(English/Arabic)*:

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|---|---|
| **English** | This course is an Matlab applications of some mathematical concepts such as: Programing and coding for solving mathematics problems. Introductions to Matlab and its use for matrices, Plotting, Integration and differentiation, Curves and If conditions, Optimizing and solving system of polynomials. |
| **Arabic** | هذا المساق عبارة عن تطبيقات الماتلاب لتعض المفاهيم الرياضية مثل: البرمجة والترميز لحل مسائل الرياضيات. مقدمات لماتلاب واستخدامها للمصفوفات والتخطيط والتكامل والتمايز والمنحنيات والجمل الشرطيه، تحسين وحل نظام كثيرات الحدود.طريقة جاكوبي وطريقة جاوس سادل. |

## Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

-“ Mastering MATLAB” by Duane C. Hanselman and Bruce R. Littlefield, (2014), Pearson Education.

## References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1-“Essential MATLAB for Engineers and Scientists”, by B. H. Hahn and D. T. Valentine, 5th Ed., (2013), Elsevier Ltd.
2-“Learning MATLAB”, Tobin A. Driscoll, (2009), Society for Industrial and Applied Mathematics, SIAM.
3- “Numerical Computing with MATLAB, Cleve B. Moler, (2004), the Society for Industrial and Applied Mathematics.
4- “Programming in MATLAB”, by Marc E. Herniter, (2001), Brooks/Cole, Thompson Learning.

## Course Educational Objectives (CEOs):

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| **CEO1** | Develop a strong understanding of the fundamental concepts and principles of mathematical modeling, including the modeling process and its applications. |
| **CEO2** | Learn to identify real-world problems that can be addressed through mathematical modeling and formulate them into mathematical equations or systems. |
| **CEO3** | Develop the skills to build mathematical models for a wide range of applications, including biological, environmental, financial, and engineering problems. |

## Intended Learning Outcomes (ILO’s):

| Intended learning outcomes (ILOs) | | Relationship to CEOs | Contribution to PLOs | Bloom Taxonomy Levels* | JNQF Descriptors** |
|---|---|---|---|---|---|
| **k** | Knowledge and Understanding | | | | |
| **ILO1-k** | Having access to MATLAB. | CEO1 | PLO1-k | Understanding | K |
| **ILO2-k** | Understand the difference between numeric and symbolic computation. | CEO2 | PLO2-k | Understanding | K |
| **ILO3-k** | Know how to graph in 2D and 3D. | CEO3 | PLO3-k | Applying | K |
| **ILO4-k** | Know how to use control structures like conditional statements and loops. | CEO2 | PLO4-k | Applying | K |
| **S** | | | | | |
| **ILO5-s** | Perform and analyze a series of mathematical computations. | CEO3 | PLO5-s | Analyzing | S |
| **ILO6-s** | Write and use function script files. | CEO2 | PLO6-s | Applying | S |
| **ILO7-s** | Do computations on vectors and arrays | CEO1 | PLO7-s | Evaluating | S |
| **ILO8-s** | Use MATLAB to explore a mathematical theorem, example, or concept. | CEO3 | PLO8-s | Applying | S |
| **ILO9-s** | Develop a computational spirit that will allow the students to use MATLAB on a regular basis to | CEO2 | PLO8-s | Applying | S |

| | | | | | |
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| | investigate mathematical and scientific ideas. | | | | |
| **C** | | | | | |
| **ILO10-c** | Work with the MATLAB interface. | CEO2 | PLO11-c | Applying | C |
| **D** | Transferable skills: | | | | |
| **ILO11-d** | | | | | |

| ***Bloom Taxonomy Levels:** | | | | | | |
|---|---|---|---|---|---|---|
| **Level #** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Level Name** | Remembering | Understanding | Applying | Analyzing | Evaluating | Creating |

**** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.**

## Program Learning Outcome (PLOs):

| **(PLOs)** | **JNQF Descriptors**** | | |
|---|---|---|---|
| | **K** | **S** | **C** |

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|---|---|---|---|---|
| 1. | Knowledge of the main concepts in pure mathematics. | √ | | |
| 2. | Knowledge of the main concepts in applied mathematics. | √ | | |
| 3. | Explain concepts, principles and theories in the fields of probability and statistics. | √ | | |
| 4. | Possession of technological culture related to the fields of mathematics and its applications. | √ | | |
| 5. | Making use of mathematical logic in practical life. | √ | | |
| 6. | Engaging scientific methodology as a way of thinking and as a tool in facing problems. | | √ | |
| 7. | Applying mathematical software packages in problem solving. | | √ | |
| 8. | Being capable of data analysis. | | √ | |
| 9. | Capability of teaching according to modern educational techniques. | | √ | |
| 10. | Develop creative and innovative methods of teaching mathematics. | | | √ |
| 11. | Showing the ability to work under ethical and professional standards within teams. | | | √ |
| 12. | Gaining critical thinking and scientific research skills. | | | √ |

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

**Weekly Schedule** *(please choose the type of teaching)*

- □ **Face to Face (F2F)**
  - ✓ **Hybrid** *(One – To - One)*
- □ **Online**

## Schedule of Simultaneous and their Topics:

| Week | First Lecture (F2F) | Activity | ILOs | PLOs | JNQF Descriptors* |
|---|---|---|---|---|---|
| **1** | Introduction: Accessing MATLAB; The MATLAB. Windows; Managing the MATLAB Workspace; Memory Management; Number Display Formats; The MATLAB. Search Path in MATLAB. | Activity: Background | 1 | 1 | K |
| **2** | Variables and Expressions Entering Commands; Integer. Data Types; Floating-Point Data Types; Character Data Types; Creating Variables. | Activity :Video 1 Solving exercises | 2 | 4 | K |
| **3** | Accessing and Modifying Data. Files M- Files; Creating Script Files; | Activity : Home work1: On the basics | 6 | 8 | S |

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|---|---|---|---|---|---|
| | Running Scripts; Dividing Code into Sections. | | | | |
| **4** | Getting Help and Using Some Useful Matlab Functions. | Activity: Quiz 1 | 8 | 7 | S |
| **5** | Arrays Creating and Manipulating Arrays; Array Size; Performing Calculations with Arrays; Scalar-Array Mathematics. | Activity: Assignment 1: On Matlab Operations | 7 | 7 | S |
| **6** | Array-Array Mathematics; Visualizing Array Data. | Activity: Video 2 | 7 | 8 | S |
| **7** | Polynomials: Evaluation; Roots; Multiplication ; Addition; Derivatives and Integrals; Calling MATLAB Functions involving Polynomials. | Activity: Home work 2 On the subjects studied in weeks 4,5 and 6 | 9 | 11 | C |
| Midterm Exam (30%) | | | | | |
| **9** | Control Structurs : Logical Operators; For Loops; While Loops; If-Else-End Constructions | Activity: Assignment 2: On Plotting of functions | 9 | 12 | C |
| **10** | Writing Functions: M-File Function Construction Rules; Input and Output Arguments | Activity: Video3 Solving exercises | 6 | 8 | S |
| **11** | Function Workspaces; Functions and the MATLAB Search Path; Nested Functions. Calling in built MATLAB Functions for Differentiation, Integration and root finding such as the Bisection Method and Newton's method. | Activity: Self-reading | 8 | 7 | S |
| **12** | Graphing: Two-Dimensional Graphics; The plot Function; Line styles; Markers and Colors; Axes and their Labels; Plot Grids; Plotting Polynomials | Activity: Quiz 2 | 8 | 7 | S |
| **13** | Curve Fitting; Interpolation; Plotting Some Basic Mathematical Functions. | Activity: Presentation of the subject: Matlab for differential equations | 9 | 10 | C |

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|---|---|---|---|---|---|
| **14** | Some Advanced Programming Assignments. | Activity: Video 4 Revision of all the course | 9 | 10 | C |
| **15** | **Projects Discussion** | | | | |
| **16** | **Final Exam** | | | | |

* **K: Knowledge, S: Skills, C: Competency**

## Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- learning through projects.
- learning through problem solving.
- participatory learning

## Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

## Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at https://exams.zuj.edu.jo/
- E-learning plan
- Software for e-learning

## Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Practice Labs
- Periodic reports for learning assessment

## Responsible Persons and their Signatures:

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| **Course Coordinator** | Waseem Almashaaleh | **Completed Date** | **10 / 2023** |
| | | **Signature** | |

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|---|---|---|---|
| **Received by (Department Head)** | | **Received Date** | **/ /** |
| | | **Signature** | |