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| **Jerash University**  **Faculty of Science**  **Department of Science/Mathematics**  **First Semester 2020-2021** | **C:\Users\HP\Dropbox\Jarash University\Jarash Logo.jpg** |

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| **Course Information** | |
| **Course Title** | Mathematics Software Packages |
| **Course Number** | 303322 |
| **Prerequisites** | 1001104, 303204, 303241, 303345 |
| **Instructor** |  |
| **Office Location** |  |
| **Office Hours** |  |
| **E-mail** |  |
| **Course Description** | |
| This course aims to equip students will efficient skills of mathematical software. Topics in calculus, linear algebra, linear programming, differential equations, probability, statistics and number theory are covered after introducing a brief introduction about Mathematica package. | |

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| **Text Book** | |
| **Title** | Programming with Mathematica: An Introduction. |
| **Author(s)** | Paul R. Wellin. |
| **Publisher** | Cambridge University Press. |
| **Year** | 2013 |
| **Edition** | First edition |

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| **Assessment Policy** | | |
| **Assessment Type** | **Expected Due Date** | **Weight** |
| **First Exam** | To be announced by the department | 20% |
| **Second Exam** | To be announced by the department | 20% |
| **Final Exam** | To be announced by the department. | 40% |
| **Assignments** | Ten assignments will be considered | 20% |
| **Over all** |  | 100% |

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| **Course Objective** |
| This course is devoted to give as much as possible of applications to linear and nonlinear ordinary differential equations through Mathematical modeling approach. |

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| **Course Outcomes** |
| Upon completion of this course, students should be able to:  **Knowledge and Understanding**  **K1** To learn the basic principles of the Wolfram programming language using Mathematica.  **K2** To learn the basics commands and functions for solving and visualizing mathematical problems.  **Cognitive/Subjective Skills**  **S1** To be able to understand the programming environment of Mathematica, to make use of Wolfram language in the School.  **S2** To be able to solve different mathematical problems (symbolically and numerically) using Mathematica.  **S3** To be able to present data in an appropriate manner.  **S4** Practical problem solving.  **Creativity/Communication Skills**  **C1** Be involved in the process of illustrating concepts, building algorithms and exploring facts.  **C2** Make critical comments on obtained results.  **C3** Write reports, to be involved in general discussions with his classmates, and to do independent work.  **C4** Reading and studying the text; daily homework problems from the text; writing assignments on concepts covered in class. |

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| **Course Content** | | |
| **Week** | **Topics** | **Chapter in Text (handouts)** |
| 1-2 | **Introduction**  What is Mathematica? The Structure of Mathematica. Common Kinds of Interfaces to Mathematica. Notebook Interfaces. Editing Cells and Text. Palettes. | Chapter 1 |
| 3-4 | **Mathematica as a Calculator**  Commands for Basic Arithmetic. Precedence. Built-in Constants. Built-in Functions. Numerical and Scientific Notations. Prefix, Postfix, Infix Forms for Built-in Functions. Mathematica Help. | Chapter 2 |
| First Exam | | |
| 6 | **Variables and Functions**  Rules for Names. Immediate Assignment. Functions. Substitution Rule. Anonymous Functions. | Chapter 3 |
| 7 | **Lists**  What is a List? Functions Producing Lists. Working with Elements of a List. Listable Functions. Useful Functions. | Chapter 4 |
| 8 | **Logic and Set Theory**  Being Logical. Truth Tables. Element . Handling Sets. Quantifiers. | Chapter 5 |
| 9 | **Number Theory**  Primes. Integer Factorization. Number Theoretic Functions. Numerical Functions. Fibonacci Sequence. Digits in Numbers. Selecting from Lists. | Chapter 6 |
| 10 | **Computer Algebra**  Working with Polynomials and Powers. Working with Rational Functions. Working with Transcendental Functions. The FullSimplify Command. | Chapter 7 |
| Second Exam | | |
| 11 | **Solving Equations**  Equations and Their Solutions. Inequalities. | Chapter 8 |
| 12 | **Single Variable Calculus**  Function Domain and Range. Limits. Differentiation. Implicit Differentia- tion. Maximum and Minimum. Integration | Chapter 9 |
| 13 | **Sums and Products**  Sequences. The Sum Command. Taylor Polynomials. The Product Com- mand. | Chapter 10 |
| 14 | **Vectors and Matrices**  Vectors. Matrices. The Conditional Function If. Special Types of Matrices. Basic Matrix Operations. Solving Linear Systems. | Chapter 11 |
| 15 | **Graphics in Mathematica**  Making Graphs. Plotting Curves. Making Graphs in Space. | Chapter 13 |
| Final Exam | | |