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| **Jerash University**  **Faculty of Science**  **Department of Science/Mathematics**  **First Semester 2019-2020** | **C:\Users\HP\Dropbox\Jarash University\Jarash Logo.jpg** |

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| **Course Information** | |
| **Course Title** | Differential Equations |
| **Course Number** | 303204 |
| **Prerequisites** | 303102 |
| **Instructor** | Jafar Al Al-Ahmad |
| **Office Location** | 502, Al-Khwarizmi |
| **Office Hours** | (9:30- 11:00) Everyday |
| **E-mail** |  |
| **Course Description** | |
| Basic definitions and construction of an ordinary differential equation. Methods of solving ordinary differential equations of first order. Orthogonal trajectories. Ordinary differential equations of higher orders with constant coefficients and with variable coefficients. Types of solutions. Series solutions of a linear ordinary differential equation of second order with polynomial coefficient. Laplace transform | |

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| **Text Book** | |
| **Title** | Elementary Differential Equations |
| **Author(s)** | BOYCE and DIPRIMA |
| **Publisher** | John Wiley & Sons |
| **Year** | 2013 |
| **Edition** | 10th 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** |
| 1. To demonstrate the usefulness of ordinary differential equations for modeling physical phenomena. 2. To introduce different classifications of ordinary differential equations. 3. To introduce different forms of differential equations and show how to solve them using analytical methods. 4. To discuss some applications on differential equations. |

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| **Weekly Course Outlines** | |
| **Topics** | **Week** |
| Introduction: Solutions and initial value problems.  Direction fields | 1 |
| First Order Differential Equations: Separable equations.  Linear equations. Exact equations | 2 |
| Special integrating factors.  Substitutions and transformations | 3 |
| Linear Second Order Equations: Linear differential operators.  Fundamental solutions of homogeneous equations. | 4 |
| Reduction of order  Homogeneous linear equations with constant coefficients. | 5 |
| Auxiliary equations with real roots. | 6 |
| Auxiliary equations with complex roots  Method of undetermined coefficients . . | 7 |
| Method of variation of parameters | 8 |
| Theory of Higher Order Linear Differential Equations: Basic theory of linear differential equations | 9 |
| Homogeneous linear equations with constant coefficients  Method of variation of parameters. | 10 |
| The Laplace Transform: Definition of the Laplace transform | 11 |
| Properties of the Laplace transform. Inverse Laplace transforms. | 12 |
| Solving initial value problems | 13 |
| Series Solutions of Differential Equations: | 14 |
| The Taylor polynomial approximation Power series and analytic functions. | 15 |