**Ministry Of Higher Education and Scientific Research**





**Mustansiriyah University/College of Science/Department of Mathematic**

(الخطة الدراسية للمساق)

Course Plan

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| **Course No.1: 54453124** |  |
| **Course Name:** Theory of Differential EquationsI | **Time Division:**  4hr Theoretical and 1hr Practical |
| **Course Website:ان وجد** | **Semester & Year:**   First , 2022/2023 |

**Course Description**

( 5 credit hours, Prerequisite [ Calculus2, Advance Calculus, Methods for solving ordinary differential equations]

**Course Intended Outcomes:**

At the end of the Course, students are expected to learn

1) Existence of a unique solution of an ordinary diff. equations of 1st ,2nd and nth order

2) Existence of a unique solution of a system of ordinary diff. equations of 1st order and finding the solutions for a

linear homogeneous and nonhomogeneous systems.

3) Laplace transform for solving a system of diff. eqs. with constants coefficients.

**Course Outline:**

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| **Week** | **Topics Covered** |  |  |
| 1 | System of diff. eqs, Reducing the diff. eq. of nth to a system of 1st order eqs. |  |  |
| 2 | Linear homogeneous systems, Nonlinear system of 1st order eqs. |  |  |
| 3 | The existence and uniqueness theorem |  |  |
| 4 | solution matrix and Fundamental matrix solution |  |  |
| 5 | Calculation of a fundamental matrix, The exponential matrix method |  |  |
| 6 | Eigenvalues and eigenvectors method |  |  |
| 7 | First Exanimation |  |  |
| 8 | Linear nonhomogeneous systems and their solutions, Liouville theorem |  |  |
| 9 | Existence theory of standard form of a 1st order diff. eq., Lipschitz condition |  |  |
| 10 | existence of the solutions |  |  |
| 11 | Uniqueness of the solutions, dependence on initial condition |  |  |
| 12 | Existence solution on largest interval, Continuation of solutions. |  |  |
| 13 | Existence theory for systems of 1st order eqs. and higher-order eqs. |  |  |
| 14 | Gronwall inequality , linear systems and linear homogeneous systems |  |  |
| 15 | Laplace transform and its inverse, applications to the linear equations with constants coefficients. |  |  |
| 16 | Second examination |  |  |

**Textbooks:**

**[1] A First course of Ordinary Differential Equations by F. Brauer and J. A. Nohel**

**Suggested references:**

**[1] Any Reference titling by “The Theory of Differential Equations”**

**Marking:**

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| **First Semester** | | | | **Second Semester** | | | | **Final Exam** |
| **1st exam** | **2 nd exam** | **Practical** | **Activity** | **1st exam** | **2 nd exam** | **Practical** | **Activity** |  |
| **10** | **10** | **5** | **5** |  |  |  |  | **70** |
|  |  |  |  |  |  |  |  |  |

**Assignments and/ or Projects:**

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| --- | --- | --- | --- |
| **Assignment/ Project** | **Description** | **Due Date** | **Marking** |
| **Home work** | **Some important exercises** | **14-11-2017** | **5** |
| **Home work** | **Some important exercises** | **15-12-2017** | **5** |

**Instructor(s) information[معلومات الأستاذ]**

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| **Section:** 01 | | **Lecture Room: [ A203, A402 ]** | **Office No.: (07 )** | |
| **Instructor's Name:** *Nabaa Najdi Hasan* **E-Mail**: alzaer1972@uomustansiriyah.edu.iq | | | |  |
| **Office Hours:** | **Sun. : ( 11:40 -1:30 ), thu. .: (10:10-11)**  **NOTES:**  **-Office Hour: Other office hours are available by appointment.**  **-The content of this syllabus not be changed during the current semester.**  **Lecturer Signature Chairman Signature** | | | |