



### 1. Instructors Information

<b>Instructors Name / Email:</b>	<b>Prof. Laith Azar</b> (@gmail.com) <b>Prof. Husein Jaradat</b> (@gmail.com) <b>Prof. Mohammad Al-Zuriqat</b> (@gmail.com) <b>Dr. Safwan Al-Shara'</b> (drsafwanshara973@gmail.com)
----------------------------------	---

### 2. Course Description

Introductions, classification, first order differential equations, applications. Differential equations of higher order and their solutions. Applications, solutions by series near ordinary points, Solving IVPs using Laplace transform.

### 3. Course Information

<b>Course Code:</b> 401203	<b>Course Title:</b> Ordinary Differential Equations (1)	<b>Level:</b> Second year								
<b>Delivery Mode:</b> Lecture (Online)	<b>Pre-requisite:</b> 401102	<b>Day(s) and Time:</b>								
		<table border="1"> <thead> <tr> <th>Section / Instructor</th> <th>Days / time</th> </tr> </thead> <tbody> <tr> <td>1 / Dr. Safwan</td> <td>Mon. Wed. (11:00 – 12:30)</td> </tr> <tr> <td>2 / Prof. Husein</td> <td>Sun. Tus. Thur. (11:00-12:00)</td> </tr> <tr> <td>3 / Prof. Mohammad</td> <td>Sun. Tus. Thur. (8:00-9:00)</td> </tr> <tr> <td>4 / Prof. Laith</td> <td>Sun. Tus. Thur. (10:00-11:00)</td> </tr> </tbody> </table>	Section / Instructor	Days / time	1 / Dr. Safwan	Mon. Wed. (11:00 – 12:30)	2 / Prof. Husein	Sun. Tus. Thur. (11:00-12:00)	3 / Prof. Mohammad	Sun. Tus. Thur. (8:00-9:00)
Section / Instructor	Days / time									
1 / Dr. Safwan	Mon. Wed. (11:00 – 12:30)									
2 / Prof. Husein	Sun. Tus. Thur. (11:00-12:00)									
3 / Prof. Mohammad	Sun. Tus. Thur. (8:00-9:00)									
4 / Prof. Laith	Sun. Tus. Thur. (10:00-11:00)									
<b>Academic year:</b> 2020-2021	<b>Semester:</b> First semester	<b>Credit Hours:</b> 3								

### 4. Course Objectives:

The main purpose of this course is to introduce fundamental concepts of the theory of ordinary differential equations (ODEs). By the end of the semester the students should be able to

1. Apply some standard methods to solve first order ODE.
2. Construct mathematical models of simple physical systems.
3. solve homogeneous higher order linear ODE's.
4. solve nonhomogeneous higher order linear ODE's.
5. Find the solution of Euler differential equations.
6. Master the Laplace transform techniques to solve ODE.
7. Master the power series techniques to solve ODE.

### 5. Intended Student Learning Outcomes

Successful completion of the course should lead to the following outcomes:

#### 1) Knowledge:

- \* Master the theory of classification of differential equations.
- \* Find analytical solutions for some first order differential equations.
- \* Understand the general theory of higher order differential equations.
- \* Solve higher order differential equations with constant coefficients.
- \* Solve nonhomogeneous differential equations.
- \* Find the solution of Euler differential equations.
- \* Master the Laplace transform techniques to solve ODE
- \* Master the Power series techniques to solve ODE

#### 2) Cognitive Skills

- \* Use differential equations to solve some problems in applied sciences.
- \* Use mathematics to analyze data and translate data into visual representations.

#### 3) General Competences

- \* Develop cooperative work habits and communication skills.
- \* Develop and practice disciplined habits of successful learning such as
  - \* Attending class regularly, making sure to arrive on time, and ready to focus and staying to the end of each class
  - \* Preparing for each class by prior textbook reading, practice with problems, and making a list of questions, etc.
  - \* Taking responsibility for one's own learning—staying up to date in everything that concerns the course.
- \* Encourage the development of Estimation skills and Logical thinking.

## 6. Course Content

Teaching Week	Topics/Activities to be Covered
1	Introduction to differential equations(DE): Definitions of Ordinary differential equation (ODE) and Partial differential equation (PDE), Order of ODE, Linear ODE, Nonlinear ODE, Implicit and explicit solution of ODE.
2	Initial-Value Problems (IVP), Existence theorem. Separable variables.
3	Separable Equations and Linear Equations Integrating Factors
4	Exact Equations, Integrating Factors
5	Solutions by Substitutions: Homogeneous, Bernoulli's.
6	Applications of First Order Differential Equations.
7	Linear Differential equations : Basic theory, Initial Value Problems and Boundary Value Problems.
8	Linear Dependence and Independence, Wronskian and Reduction of Order method.
9	Homogeneous Linear Equations with constant coefficients, Homogeneous Cauchy Euler Equation.
10	Mid – term Exam
11	Nonhomogeneous Equations: The methods of undetermined coefficients and the Variation of Parameters.
12	Definition of Laplace Transform, Properties of Laplace Transform,
13	Inverse Laplace Transform, Solving Initial Value problems by using Laplace Transform.
14	Power Series Solutions to Linear ODE.
15	Review
16	Final Exam

## 7. Teaching and learning Strategies and Evaluation Methods

Learning Outcomes	Teaching Strategies	learning Strategies	Evaluation Methods
- Master the theory of classification of differential equations. - Find analytical solutions for some first order differential equations.	- Pdf files and video record - Ask students questions and discuss them - Solve various issues	Give homework assignments	- Classroom presentations - Discussion
-Understand the general theory of higher order differential equations. -Solve higher order differential equations with constant coefficients. -Solve nonhomogeneous differential equations. -Find the solution of Euler differential equations.			- Classroom presentations - Discussion - Mid-term exam
- Master the Laplace transform techniques to solve ODE - Master the Power series techniques to solve ODE			- Classroom presentations - Discussion - Final exam

## 8. Assessment

Assessment	Grade Proportion	Week/Dates
<b>Class Work (Quizzes, Homework and Attendance of the lecture)</b>	<b>10 %</b>	
<b>Mid-term exam</b>	<b>40 %</b>	<b>10th Week</b>
<b>Final exam</b>	<b>50%</b>	<b>End of Semester</b>
<b>Total</b>	<b>100%</b>	

## 9. Text Book

<b>The main reference</b>	A First course in Differential Equations with Applications
<b>Authors</b>	Dennis G. Zill
<b>Publisher</b>	Jorge Avila Suarez
<b>Year</b>	2009
<b>The edition</b>	9th. edition
<b>The reference website</b>	<a href="https://www.academia.edu/25845901/Dennis.G.Zill_A.First.Course.in.Differential.Equations.9th.Ed">https://www.academia.edu/25845901/ Dennis.G.Zill A.First.Course.in.Differential.Equations.9th.Ed</a>

## 10. References and additional resources

1-	Elementary Differential Equations, William E. Boyce & Richard C. DiPrima, John Wiley & Sons, 9th edition, 2009, ISBN-13: 978-0470039403.
2-	Fundamentals of Differential Equations, R. K. Nagle, E.B. Saff and A.D. Snider, Addison-Wesley, 6th edition, 2004.
3-	Differential Equations and Linear Algebra, Edwards and Penney, Pearson, 3rd Edition, 2010, ISBN-13: 978-0136054252.

## 11. Useful Websites

<http://tutorial.math.lamar.edu/Classes/DE/DE.aspx>

<http://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010/lecture-notes/>