جامعـة الزيتونــة الأردنيــة
Al–Zaytoonah University of Jordan
كلية العلوم وتكنولوجيا المعلومات
Faculty of Science and Information Technology

" عراقة وجودة"
"Tradition and Quality"

Detailed Course Description - Course Plan Development and Updating Procedures/ Mathematics Department	QF01/0408-3.0E

Faculty	Faculty of Science and Information Technology	**Department**	Mathematics
Course number	**0101273**	Course title	**Ordinary Differential Equations 1**
Number of credit hours	3	Pre-requisite/co-requisite	Calculus (2) 0101161

Brief course description
A first course in Ordinary Differential Equations. Topics include differential equations of the first-order, Linear Differential Equations of first-order, linear Differential Equations of Higher Order and Cauchy – Euler Equation.

Course goals and learning outcomes	
Goal 1	Learn to classify different types of Differential Equations
Learning outcomes	1.1 Classify by type as Ordinary and Partial Differential Equations 1.2 Classify by Order 1.3 Classify by Degree 1.4 Classify by Linearity
Goal 2	Learn to solve first-order differential equations.
Learning outcomes	2.1 Solve separable, homogeneous, exact, and linear first-order differential equations with and without initial conditions. 2.2 Determine regions of the plane over which a given first-order differential equation will have a unique solution. 2.3 Solve application problems modeled by separable, homogeneous, exact, linear first-order differential equations, and equations reducible to first-order differential equation
Goal 3	Learn to solve General Ordinary Linear Differential Equations of Higher Order
Learning outcomes	3.1. Determine if a set of functions is linearly dependent or independent by definition and by using the Wronskian. 3.2. Construct a second solution of a differential equation from a known solution. 3.3. Solve homogenous linear equations with constant coefficients. 3.4. Solve non-homogeneous linear equations with constant coefficients using the methods of undetermined coefficients and variation of parameters.

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Goal 4	Learn to solve Ordinary Differential equations with variable coefficients
Learning outcomes	4.1 Determine this type of Differential equations. 4.2 Solve Cauchy – Euler Differential Equation
Goal 5	Learn to use the Laplace Transform to solve initial-value problems.
Learning outcomes	5.1 Find the Laplace and the inverse Laplace transform of different functions 5.2 Use the Laplace Transform to solve initial-value problems

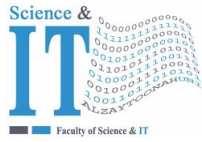| **Textbook**	Elementary Differential Equation and Boundary Value Problems, By William E.Boyce & Richard C. Diprima, 10th edition, 2013.
Supplementary references	1) A First Course in Differential Equations with Applications". By W.R. Derrick and S.I. Grossman, 3^{ed} Edition, 1987
	2) A First Course in Differential Equations with Modeling Applications, 7th Edition", By Dennis G. Zill. 2009.
	3) Introduction to theory of Ordinary Differential Equations, V. hamrmaiah, 2013, ISBN:978812034666
	4) Ordinary Differential Equation, Purna Chandra, 2012, ISBN:9788120346222

Course timeline			
Week	**Number of hours**	**Course topics**	**Pages (textbook)**
01	1 1 1	Basic definitions. Solution, general solution, examples. Particular solution and initial value problem..	**2 – 11**
02	1 1 1	Existence and Uniqueness Theorem. Directional fields Separable ODE	**17 – 36**
03	1 1 1	Differential eqns .of the form $y' = f(y + ax + b)$ Homogeneous functions and homogeneous differential. eqns of the first order.	**37 - 59**
04	1 1 1	Differential eqns. of the form $y' = f(\dfrac{a_1 x + b_1 y + c_1}{a_2 x + b_2 y + c_1})$ Definition of exact equations , Necessary and sufficient condition for exactness.	**37 - 59**
05	1 1 1	Non-exact differential equations and integrating factors.	**37 - 59**
06	1 1 1	Linear ODE of the first order. Discontinuous forcing terms. **First Exam 20%.**	**37 - 59**

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07	1 1 1	Bernoulli's eqn Riccati's eqn.		**37 - 59**
08	1 1 1	Higher order equations (some special cases). Reduction of order of higher order differential eqns.		**93 – 108**
09	1 1 1	The Basic Theory of Linear differential eqns. Of nth order. Linear dependence and independence of functions. The Wronskian.		**93 – 108**
10	1 1 1	Homogeneous Linear differential equations with constant coefficients. Distinct and repeated real roots of Characteristic equations.		**109 – 141**
11	1 1 1	Complex roots of the characteristic eqn of the homogenous differential. eqn. Method of undetermined coefficients. Finding the particular solution for higher order nonhomogeneous linear differential equations		**109 – 141**
12	1 1 1	Method of variation of parameters for finding the particular solution for higher order nonhomogeneous linear differential equations. **Second Exam 20%.**		**141 – 146**
13	1 1 1	Ordinary Differential Equations with variable coefficients Cauchy-Euler Differential Equations		**147 – 153**
14	1 1 1	Laplace Transform and inverse Laplace transform.		**239 - 300**
15	1 1 1	Using Laplace transform to solve initial-value problems.		**300 - 310**
16	1 1 1	**Final Exam 50%**		

Theoretical course evaluation methods and weight	Participation = 10% First exam 20% Second exam 20% Final exam 50%	**Practical (clinical) course evaluation methods**	Semester students' work = 50% (Reports, research, quizzes, etc.) Final exam = 50%

Approved by head of department		**Date of approval**	

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Extra information (to be updated every semester by corresponding faculty member)

Name of teacher	Amer Dababneh	Office Number	9356
Phone number (extension)		Email	amjad@zuj.edu.jo
Office hours			