" عراقة وجودة"
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QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Department of Mathematics

Study plan No.	2021/2022	University Specialization		Bachelor of Mathematics	
Course No.	0101273	Course name		Ordinary Differential Equations 1	
Credit Hours	3	Prerequisite/ Co-requisite		Calculus (2)	
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT ☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	✓ Mandatory requirements	☐ Elective requirements
Teaching style	☐ Full online learning		☐ Blended learning	✓ Traditional learning	
Teaching model	☐ 1 Synchronous: 1 asynchronous		☐ 1 face to face : 1 asynchronous	✓ 2 Traditional	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	

Division number	Time	Place	Number of students	Teaching style	Approved model
				Traditional	

Brief description

Differential equations of first-order, Methods for solving linear differential equations of higher order, Methods for solving Cauchy – Euler equations, Laplace transformations.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	A First Course in Differential Equations with Modeling Applications, Zill, Dennis G. 10th edition, 2013
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Elementary Differential Equation and Boundary Value Problems, William Boyce & Richard C. Diprima, 10th edition, 2013. 2. Introduction to theory of Ordinary Differential Equations, V. hamrmaiah, 2013. 3. Ordinary Differential Equation, Purna Chandra, 2012. 4- A First Course in Differential Equations with Applications". By W.R. Derrick and S.I. Grossman, 3ed Edition, 1987
Supporting websites	1. http://eqworld.ipmnet.ru/en/solutions/ode.htm 2. http://www.sosmath.com/diffeq/diffeq.html
The physical environment for teaching	✓ Class room ☐ labs ☐ Virtual educational platform ☐ Others
Necessary equipment and software	

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Supporting people with special needs	
For technical support	

Course learning outcomes (**S**= *Skills, C= Competences K= Knowledge,*)

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Define the basic concepts of the ordinary differential equations	**MK 2**
K2	Classify the types of first order ordinary differential equations	**MK 1**
K3	Recognize the higher order linear differential equations with constant coefficients.	**MK 1**
K4	Recognize the nonhomogeneous linear ordinary differential equations.	**MK 1**
	Skills	
S1	Use different techniques to solve first order ordinary differential equations.	**MS 4**
S2	Apply method for solving higher-order homogeneous linear ordinary differential equations with constant coefficients.	**MS 4**
S3	Apply methods for solving nonhomogeneous linear ordinary differential equations.	**MS 5**
	Competences	
C1	Work professionally with different types of ordinary differential equations	**MC 2**
C2	Develop the individual's ability to communicate and interact with other mathematical courses.	**MC 1**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
First/Second exam	30%	30%	**30%**	30%
Participation / practical applications	.	.	**20%**	30%
Asynchronous interactive activities	30%	30%	**0%**	.
Final exam	40%	40%	**50%**	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Basic definitions. Solution, general solution, examples. Particular solution and initial value problem.	Lecture	2 – 11
2	Existence and Uniqueness Theorem. Directional fields. Separable ODE	Lecture	17 – 36
3	Differential eqns .of the form $y' = f(y + ax + b)$	Lecture	37 - 59

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	Homogeneous functions and homogeneous differential eqns of the first order.		
4	Differential equations 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.	Lecture	37 - 59
5	Non-exact differential equations and integrating factors.	Lecture	37 - 59
6	Linear ODE of the first order. Discontinuous forcing terms.	Lecture	37 - 59
7	Bernoulli's equation. Riccati's equation.	Lecture	37 - 59
8	Higher order equations (some special cases). Reduction of order of higher order differential equations. **Midterm Exam 30%**	Lecture	93 – 108
9	The Basic Theory of Linear differential equations of n-th order. Linear dependence and independence of functions. The Wronskian.	Lecture	93 – 108
10	Homogeneous Linear differential equations with constant coefficients. Distinct and repeated real roots of Characteristic equations.	Lecture	109 – 141
11	Complex roots of the characteristic equation of the homogenous differential equations. Method of undetermined coefficients. Finding the particular solution for higher order nonhomogeneous linear differential equations	Lecture	109 – 141
12	Method of variation of parameters for finding the particular solution for higher order nonhomogeneous linear differential equations.	Lecture	141 – 146
13	Ordinary Differential Equations with variable coefficients Cauchy-Euler Differential Equations	Lecture	147 – 153
14	Laplace Transform and inverse Laplace transform.	Lecture	239 - 300
15	Using Laplace transform to solve initial-value problems.	Lecture	300 - 310
16	**Final Exam 50%**		