Ministry of Higher Education and Scientific research



- **Department of Chemistry**
- **College of Education**
- **University of Salahaddin**
- Subject:Mathematics (ODE)
- Course Book-(Year 2)(First Course )
- Lecturer's name: Ferman Ali Ahmed
- Academic Year: 2022/2023

1. Course name	Mathematics (ODE)
2. Lecturer in charge	Ferman Ali Ahmed
3. Department/ College	Mathematics / Education
4. Contact	e-mail:ferman.ahmed@su.edu.krd
	Tel: 07504753287
5. Time (in hours) per week	Theory: 2 hours
6. Office hours	Monday 10-12 am
	Tuesday 10-12 am
7. Course code	
8. Teacher's academic	2003-2007 BSc. of the mathematics
profile	Department of Mathematics
	College of Education
	University of Salahaddin-Hawler
	Erbil
	Kurdistan Region
	Iraq
	2012-2013 MRes of the mathematics
	Department of Mathematics
	University of Leicester
	UK
9 Keywords	Faultion exact senerable

# **Course Book**

10. Course overview:

The laws of nature are expressed as differential equations. Scientists and engineers must know how to model the world in terms of differential equations, and how to solve those equations and interpret the solutions. This course focuses on linear differential equations and their applications in science and engineering.

#### 11. Course objective:

Most dynamical systems physical. Social, biological, engineering are often conveniently expressed in the form of differential equations. Such equation can provide an insight in to thebehaviourof a system if they represent the various important factors governing the system. For instance, when a system is known to perform efficiently over a certain range of input, the existence of the solution of the differential equation. Governing the system over the interval concerned is an important consideration in the understanding of its behaviour. A scientist or an engineer can use differential equation in this work more confidently if he is conversant with the theory of existence, uniqueness, and continuation of solutions. Similarly, a mathematician who is a familiar with these properties of solutions is better equipped to develop further mathematical methods for examining the behaviour of solutions of differential equations. Understand and solve first and second order linear homogeneous and non-homogeneous differential equations. Solve separable boundary value problems.

#### 12. Student's obligation

In this year we take some quiz ,the student must prepare report and take two assignments, determine the active students.

## **13.** Forms of teaching

Different forms of teaching will be used to reach the objectives of these courses: power point presentation for the course outline, head titles, definition, discussion and conclusions. Also, we shall use the blackboard for solving and explaining the examples.

## 14. Assessment scheme

The students are required to do two main theoretical closed book exams and approximately

twoquizzes during the first course academic year. From the two theoretical exams, the

degree can be calculated of 15 marks and two quizzes are calculated of 5 marks. So that the

final grade will be based upon the following criteria:

The average of these two exams and quizzes = 20 %

Final exam: 30 % .

In the second course of academic year by the same way but in the other object

?

## **15. Student learning outcome:**

1- be a familiar in about basic definition of course subject .

2- to know the kinds of differential equations

3- To learn solve the ODE by using methods such as (separable , Homogenous, Nonhomogenous, Exact,...etc.)

# **16.** Course Reading List and References:

- 1. TynMyint-U, Ordinary Differential Equations.
- 2. Otto Platt, Ordinary Differential Equations.
- 3. C.RayWylie,. Differential Equations.
- 4. Hass, Heil & Weir, Thomas' Calculus, 14th Edition.

17. The Topics:	Lecturer's name
Week 1: Integration	Lecturer's name
	ex:(2 hrs)
	ex: 1/11/2021
Week 2: Technique of Integrals	
Week 3: Differential Equation, Ordinary Differential Equations.	
Partial Differential, Examples, order of O. D. E., Degree of O. D. E.	
Linear O.D.E., Examples.	
Week 4: The solutions of O. D. E., Examples. The general solution,	
particular solution and the singular solution, with their Examples.	

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Elimination the arbitrary constants (finding the O. D. E. if the		
general solution is exist).		
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Week 5: Methods for Solving the O. D. E. in the first order and		
first degree Separation variable (separable), examples.		
Week 6: Substitution method, examples.		
Week 7: Homogenous D. E. ,examples.		
Week 8: Non-homogenous D. E. of linear coefficient, examples.		
Week 9: Exact D. E., examples.		
Week 10: Exam.		
Week 11: Linear first order ordinary D E examples		
Week 12:Bernoullis Equation, examples.		
Week 13: Simulatonous Ordinary Differential Equation,		
Reduction of Higher Order Ordinary D.E., examples.		
Week 14: Higher Degree of ordinary D.E., examples.		
Week 15: Exam		
18. Practical Topics (If there is any)		
19. Examinations:		
Q1/ Solve the following differential equations		
1.y' = -2y 6 marks		
2. $(x - y)dx - xdy = 0$ 7 marks		
3. $(2x - yx)y' + (y + xy) = 0$ 7 marks		
4. $x^{2}(y+1)dx + y(x-1)dy = 0$ 7 marks		
Q2/ A:- Find ordinary differential equation if the general solution is		
$y = \Delta \rho^{x} + B y^{2} + C y$ 7 marks		
y - ne + bx + ex / marks		
B:- Which of the following is third order and non-linear ordinary	/ differential	

3 marks  

$$\frac{dy}{dx} = 2y + 1 2. y''' + y'' + xy = 2$$
3.  $y''' + y''y + x^2y = 1 4. y'' + x^3y'y = 0$   
C:- What is the order and the degree of the following differential equation  

$$\left(\frac{d^2y}{dx^2}\right)^3 + x^2 \left(\frac{d^3y}{dx^3}\right)^2 + x \frac{dy}{dx} + y = 2 3 \text{ marks}$$
20. Extra notes:  
21. Peer review  
21. Peer review  
Hemin A. Ahmad  
Assistant Lecturer.