Department of Mathematics

College of Basic Education

Salahaddin University-Erbil

Subject: Ordinary Differential equations

Course Book – *3*^{ed} Stage

Lecturer's name: BSc.Hemin Q. Rahman

Academic Year: 2022-2023 First semester

Course Book

1. Course name	**Differential equations**
2. Lecturer in charge	**Hemin Q. Rahman**
3. Department/ College	**Mathematics / Basic Education**
4. Contact	**e-mail: hemin.rahman@su.edu.krd** **Tel: 0750 479 1291**
5. Time (in hours) per week	**Theory: 3hours in week** **Practical: 0**
6. Office hours	**6 hours in the week**
7. Course code	
8. Teacher's academic profile	• **B. Sc. in Mathematics, Mathematics Department - College of Education – Salahaddin University - Erbil in 2003.** • **M. Sc. In in Mathematical Statistic. Mathematics Department - College of Science Salahaddin University - Erbil in 2009.** • **Main activities and responsibilities Teaching Experience: Probability & Statistics, Ordinary Differential Equation , Computer, Calculus , finite mathematic**
9. Keywords	Ordinary(partial) differential equations**.** **solution of** differential equations. **Find the general solution of** differential equations,(non)homogeneous linear differential equations

10. Course overview:

A study of the methods of solution and applications of differential equations. Topics include: higher and second order equations, Tayp of Linear differential equation, Homogeneous(non Homogeneous Linear differential equation with variable(constant)Coefficint , Linear depended(independed)function.

11. Course objective:

Upon completion of this course, you should be able to

classify and Tayp of Linear differential equation, TaypLinear depended function,homogeneous Linear differential equation, nonhomogeneous Linear differential equation,, homogeneous Linear differential equation with constant(Variable)coefficient .

12. Student's obligation

1) Schedule changes may occur during the semester any changes will be announced in class.

2) The student is responsible for all assignments, changes in assignments, or other verbal information given in the class, whether in attendance or not..

13. Forms of teaching

White board and Presentation slides in Power point , Lecture notes

14. Assessment scheme

The students are required to do two exams before the final exam. There will be final exam on 60 marks . So that the final grade will be based upon the following criteria:

Mid-semester Exam: (20+15+5)% and ,

Final exam 60%

Total: 100%

15. Student learning outcome:

- identify an linear differential equation and classify it by homogeneous (or not)
- determine solution to a higher-order initial-value problem exists
- understand differences between solutions of linear and non-linear first-order differential equations
- recognize and solve homogeneous higher-order differential equations with constant or vaeiable coefficint,
- solve homogeneous linear differential equations using variation of parameters or reduction orger to first oeder
- solve nonhomogeneous linear differential equations using operator (optional)

16. Course Reading List and References:

▪Key references: 1) Deferential Equations by Hari Kishan

2) طرق حل المعادلات التفاضلية د.خاليد أحمد السامرائي

▪Useful references:3) Ordinary Deferential Equation سلسلة شوم

4) Differential Equations Crash Course - R. Bronson

17. The Topics:

Subject	Week
Introduction to Ordinary Differential Equations	1
Homogeneous Linear Second Order Ode's	2
Properties of solutions, linear independence ,Wronskian	3
Homogeneous Linear Second Order Ode's with constant coefficients	4

Non-homogeneous Linear Second Order ode's with constant coefficients	5
Non-homogeneous Linear high Order Ode's	6
Definition of operator +properties +theorems	7
Nonhomogeneous Linear Second Order with constant coefficients :the method of reduction of order	8
Nonhomogeneous Linear Second Order with constant coefficients :the Using operator	9+10+11
Non-homogeneous Linear Second Order ode's using the variation of parameters method	12
Non-homogeneous Linear Second Order ode's with variable coefficients	13
Cauchy-Euler ODE's	14

18. Examinations:

Q1. Find the general solution of the equation

$$x^2y'' - xy' + 4y = 3 + \cos(lnx)$$

Q2. Solve the differential equation $(D^2 - 4)y = \cosh(2x)$

$Q6/$ Let $y_1 = e^{ax}\cos bx$ and $y_2 = e^{ax}\sin bx$, show that y_1 and y_2 are Linearly Independent Function($L.i.f$), and show that y_2 is solution of $y'' - 2a\,y' + (a^2 + b^2)\,y = 0$

$Q7/$ *find* $(D^5 - 2D^4)(\sin 2x + 3e^{\sqrt{3}x} + x^4)$

19. Extra notes:

Good Luck for Student

20. Peer review

Professor Dr.Azad Ibrahim Ameen