Department of Mathematics

College of Science

University of Salahaddin

Subject: Ordinary Differential Equations

Course Book –Year 2- First Semester

Lecturer's name: MSc. *Chiman Mohammed Qadir*

Academic Year: 2023/2024

Course Book

1. Course name	**Ordinary Differential Equations**
2. Lecturer in charge	**Chiman Mohammed Qadir**
3. Department/ College	**College of Science- Department of Mathematics**
4. Contact	**e-mail: chiman.qadir@su.edu.krd** **Tel: (optional)**
5. Time (in hours) per week	**Theory: 3 discussion: 1** **Practical: 0**
6. Office hours	
7. Course code	
8. Teacher's academic profile	Name: Chiman M. qadir Work Address: Mathematics Department, College of Science, Salahaddin University-Erbil. **Employment** 2010 – up to now: Mathematics Department, College of Science, Salahaddin University-Erbil **Qualifications & background** B. Sc., Salahaddin University-Erbil, College of Science, Mathematics Department, Iraq. M. Sc., Salahaddin University-Erbil, College of Science, Mathematics Department, Iraq. **General specialization:** Mathematics-Differential Equations. **Specific specialization**: Qualitative Theory Differential Equations. **Assignments** 2010-2023 Assistant Lecturer, Department of Mathematics, College of Science, Salahaddin University -Erbil, **Teaching Interest** Ordinary Differential Equations, Theory of Ordinary Differential Equations, , Calculus, Finite Mathematics, Linear Algebra.
9. Keywords	Differential equations, order, degree, homogeneous, exact, linear, Bernoulli equations, Riccati equations, constant coefficients, variable coefficients, Laplace transforms, series solutions

10. Course overview:

General Description of the module The subject of differential equations is a very important branch of applied mathematics. Many phenomena from physics, biology and engineering may be described using ordinary differential equations. They are also used to model the behaviour of systems in the natural world, and predict how these systems will behave in the further. For instance, exponential growth (the rate of change of a population is proportional to the size of the population) is expressed by the differential equation. Newton's Law of Gravitation (acceleration is inversely

proportional to the square of distance) translates to the equation. Many examples are found in the fields of physics, engineering, biology, chemistry and economics. The traditional course in differential equations focused on the small number of differential equations for which exact solutions exist. However, the methods used by scientists today have changed dramatically due to computer . Here we will cover almost all methods for solving every kind of ordinary differential equations.

This should not be less than 200 words

11. Course objective:

The objective of this module is to acquaint students with the fundamental principles and techniques of ordinary differential equations. The goal is to develop their proficiency in resolving ordinary differential equations through the utilization of diverse solution methods. Furthermore, students will attain the capability to effectively address a range of differential equations, encompassing those of first order and first degree, systems of initial order equations, higher degree equations, higher order equations, as well as both linear and nonlinear equations.

12. Student's obligation

- **a.** Students rein a commitment to come on time and remain in the classroom for the duration of scheduled classes and Labs.
- **b.** Nothingness speak students with each other during lecture.
- **c.** All devices must be turned off.
- **d.** When teacher ask question, Students will be to rise your hand before answer his question.

Students own an obligation to write tests and final examinations at the times scheduled by the teacher or the College.

13. Forms of teaching

Different ways of teaching will be used to reach the objectives. In general, a magic board is used for learning and discussing the objectives.

14. Assessment scheme

The academic year contain two obligatory exams with average 30% degree and 10% Quizzes. The other will be reserved for final exam .

15. Student learning outcome:

1. The student will learn to formulate ordinary differential equations (ODEs) and seek understanding of their solutions.
2. Students should understand the concept of a solution to an initial value problem.
3. The student will recognize basic types of differential equations which are solvable, and will understand the features of linear equations in particular.

4. Students will learn to use different approaches to investigate equations which are not easily solvable.

16. Course Reading List and References:

1. Nagle, R.K., Saff, E.B. and Snider, A.D., 2014. *Fundamentals of differential equations*. Pearson.
2. Conrad, B.P., 2010. Ordinary Differential Equations: A Systems Approach.
3. Boyce, W.E., DiPrima, R.C. and Meade, D.B., 2017. *Elementary differential equations*. John Wiley & Sons..
4. Rukmangadachari, E., 2012. *Differential equations*. Pearson Education India.
5. Bronson, R. and Costa, G.B., 2022. *Schaum's outline of differential equations*. McGraw-Hill Education.
6. Bronson, R., 1989. 2500 solved problems in differential equations. .
7. Ross, S., 2021. Introduction to ordinary differential equations.
8. Waleed,H.Aziz.2023, lecture notes Ordinary differential equations

17. The Topics:	Lecturer's name
1 Basic definitions and elimination of essential constants 1.1 Introduction: How to read a differential equation 1.2 Solutions of differential equations 1.3 The elimination of essential arbitrary constants 1.4 Geometrical interpretation of differential equations **2 Equations of first order and first degree** 2.1 Equations of first order and first degree 2.2 Separation of variables (Separable differential equations) 2.3 Homogeneous differential equations 2.4 Coefficients linear in the two variables 2.5 Exact differential equations 2.6 Non-exact differential equations (Integrating factors) 2.7 Linear differential equations of first order 2.7.1 First order linear differential equation 2.8 Equations reducible to linear differential equations of first order 2.8.1 Bernoulli equations 2.8.2 Riccati equations 2.9 Substitution suggested by the equation 2.10 Simultaneous first order differential equations 2.11 Applications of First Order Equations **3 The equation is of first order and of second or higher degree** 3.1 Equations solvable for p	NA (4-5)weeks

3.2 Equations solvable for y 3.3 Equations soluble for x Notes: • The course program does not include the examination days, which need at least a couple of weeks during the year; thus the total number of weeks in a course year will be: (21 + 2). • This course is for second year students, who start the course at least 4 weeks later than the other grades.	(4)weeks
18. Practical Topics (If there is any)	
In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture	Lecturer's name ex: (3-4 hrs) ex: 7/10/2018

19. Examinations:

1. Compositional: In this type of exam the questions usually starts with Explain how, What are the reasons for…?, Why…?, How….?
With their typical answers
Examples should be provided

2. True or false type of exams:

In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided

3. Multiple choices:

In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.

20. Extra notes:

Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks.

21. Peer review پێداچوونەوەی هاوەڵ

ئەم کۆرسبووکە دەبێت لەلایەن هاوەڵێکی ئەکادیمیەوە سەیر بکرێت و ناوەرۆکی بابەتەکانی کۆرسەکە پەسەند بکات و جەند ووشەیەک بنووسێت لەسەر شیاوی ناوەرۆکی کۆرسەکە و واژووی لەسەر بکات.
هاوەڵ ئەو کەسەیە کە زانیاری هەبێت لەسەر کۆرسەکە و دەبیت پلەی زانستی لە مامۆستا کەمتر نەبێت.