



- **Department of Physics(General)**

**College of Science**

**University of Salahaddin**

**Subject: Ordinary Differential Equations**

**Course Book: Second Year Physics**

**Lecturer's name: MSc. Muzhda Amjad Abdulrahem**

**Academic Year: 2023/2024**

# Course Book

<b>1. Course name</b>	<b>Ordinary Differential equations</b>
<b>2. Lecturer in charge</b>	Muzhda Amjad Abdullaheem
<b>3. Department/ College</b>	<b>College of Science- Department of Mathematics</b>
<b>4. Contact</b>	<b>e-mail: muzhda.abddulraheem@su.edu.krd</b> <b>Tel: (optional)</b>
<b>5. Time (in hours) per week</b>	<b>Theory: 3                      discussion: 1</b> <b>Practical: 0</b>
<b>6. Office hours</b>	
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	My name is Muzhda Amjad Abdullaheem, I born in Erbil, Iraq in 1981.I graduated from mathematical Department / college of science in Salahaddin University-Erbil in 2003-2004, in Erbil,Iraq.I got Master of science in differential equation in 2010.I am working as a lecturer in mathematical department/college of science/Salahaddin University-Erbil.
<b>9. Keywords</b>	<b>Ordinary Differential equation , Laplace transform, power series</b>
<b>10. Course overview:</b>	
<p>Provides an introduction to ordinary differential equations and their applications. Upon completion of this course the student will:</p> <p>To be able to identify and classify an ordinary differential equation, derive an ordinary differential equation as the mathematical model. To understand what it means for a function to be a solution of an ordinary differential equation and develop the skills to identify appropriate solution techniques for various classes of differential equations Emphasis is placed on first and second order equations with constant coefficients. The equations studied are often derived directly from physical considerations in applied problems.</p> <p>This should not be less than 200 words</p>	
<b>11. Course objective:</b>	
introduce the students to the basic theory of ordinary differential equations and give a competence in solving ordinary differential equations, classify differential equations by order, linearity, and homogeneity, solve first order linear differential equations, solve linear equations with constant coefficients, use separation of variables to solve differential equations, solve exact differential equations, use variation of parameters to solve differential equations, use the method of D operator coefficients to solve differential equations, determine whether a set of functions is linearly independent using the Wronksian,use power series to solve differential equations and use Laplace transforms and their inverses to solve differential 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. "differential equations", 2004 by Shepley L. Ross, 3rd Edition.
2. "A first course in differential equations with applications", by A.H.Siddiqi and P. Manchanda, Macmillan India Ltd., 2006.
3. "Applied differential equations" , by Murray R.Spiegel,2nd edition ,1958.
4. "differential equations", by Richard Bronson and Gabriel B.Costa, 2006 (Schaum's outline Series), The McGraw Companies.

17. The Topics:	Lecturer's name
<p><b>1.</b></p> <p><b>1.1 Basic definitions and eliminations of essential constants</b></p> <p>1.1.1 Introduction: How to read a differential equation</p> <p>1.1.2 Notation, order, degree</p> <p>1.1.3 Solutions of differential equations</p> <p>1.1.4 The elimination of essential arbitrary constants</p>	(2-3)weeks
<p><b>1.2 Equation of first order and first degree</b></p> <p>1.2.1 Equations of first order and first degree</p> <p>1.2.2 Separation of variables</p> <p>1.2.3 Homogenous differential equations</p> <p>1.2.4 Exact differential equations</p> <p>1.2.5 Linear Differential equations of first order</p> <p>1.2.6 Bernoulli equations</p>	(3)weeks
<p><b>2. Solving first order higher degree Differential equation.</b></p> <p>2.1 Equations solvable for <b>P</b></p> <p>2.2 Equations solvable for <b>y</b></p> <p>2.3 Equations solvable for <b>x</b></p>	
<p><b>3. Linear equation equations with constant coefficients</b></p> <p>3.1 Linear differential equations</p> <p>3.2 Differential operators</p> <p>3.3 General solution of a non-homogenous differential equations</p> <p>3.4 Variation of parameters</p> <p>3.5 Linear differential equations with constant coefficients</p> <p>3.5.1 The Cauchy and Legendre with variable coefficients</p> <p>3.5.2 Solving the Legendre linear equation</p> <p>3.6 Second order linear differential equations with variables coefficients</p>	(6-7)weeks
<p><b>4. The Laplace transformation (Laplace's transform and its application to differential equations)</b></p> <p>4.1 Laplace transform</p> <p>4.2 Laplace transform of some elementary functions</p> <p>4.3 Laplace transform of derivatives</p> <p>4.4 Inverse Laplace transform</p> <p>4.5 Initial Value Problem</p> <p>4.6 Transformation of initial value problem</p> <p>4.7 Derivatives of Laplace transforms</p>	(4-5)weeks

<p>Notes:</p> <p>☐ 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).</p> <p>☐ This course is for second year students, who start the course at least 4 weeks later than the other grades.</p>	
<p><b>18. Practical Topics (If there is any)</b></p>	
<p>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</p>	<p>Lecturer's name ex: (3-4 hrs)</p>
<p><b>19. Examinations:</b></p> <p><b>1. <i>Compositional:</i></b> 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</p> <p><b>2. <i>True or false type of exams:</i></b></p> <p>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</p> <p><b>3. <i>Multiple choices:</i></b> 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.</p>	
<p><b>20. Extra notes:</b> 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.</p>	

## 21. Peer review

## پیداچونہوی ھاوہل

ئەم کۆرسبووکە دەبیت لەلایەن ھاوہلیکی ئەکادیمیەرە سەیر بکریت و ناوەرۆکی بابەتەکانی کۆرسەکە پەسەند بکات و جەند وشەیک بنووسیت لەسەر شیاوی ناوەرۆکی کۆرسەکە و واژووی لەسەر بکات. ھاوہل ئەو کەسەیکە زانیاری ھەبیت لەسەر کۆرسەکە و دەبیت پلەیی زانستی لە مامۆستا کەمتر نەبیت.