



Department of Mathematics

College of Education

University of Salahaddin

Subject: Calculus

Course Book – 1st Semester (Year 2)

Lecturer's name: Mudhafar hamed Hamadamen

Academic Year: 2022/2023

Course Book

1. Course name	Ordinary differential equations
2. Lecturer in charge	Mudhafar hamed Hamadamen
3. Department/ College	Chemistry /Education
4. Contact	e-mail: mudhafar.hamadamen@su.edu.krd Tel:
5. Time (in hours) per week	Theory: 3 Practical:(conclusion):0
6. Office hours	
7. Course code	
8. Teacher's academic profile	<p>Biography</p> <p>Mudhafar H.H - MH mathematics teacher</p> <p>mathematics teacher work in college of education</p> <p>Kurdistan region-Iraq, Erbil</p> <p>Current: Salahaddin University college of education mathematics department.</p> <p>Education: M.Sc. in mathematics (Differential Equation).</p> <p>Summary : I am a native Kurdish speaker and graduate from Salahaddin who is working towards to rise Scientific title</p>
9. Keywords	
10. Course overview:	<p>Mathematics is often a student's first exposure to the world of mathematics. While this course has many applications, Mathematics is mainly study of mathematical structure such as Real numbers, limit, continuity... etc. This semester is dedicated to study some important objects such as: Inequality, function, limit, differentiation and integration... etc. also theorems which depend on foundations of calculus and set theory.</p>
11. Course objective:	<p>This course is a natural continuation of a previous course (Mathematics) taught in first class, which is based in every field of applied sciences as instrument for the solution of problems of varies fields. The basic goal is to study the following: • Inequality of real numbers. • Functions of several variables which include: limits, continuity, derivatives, and integrals.</p>
12. Student's obligation	<p>1- Attendance.</p> <p>2- Quiz.</p>

<p>3- Test about some questions in the conclusion .</p> <p>4-There examinations' will be given,each %40.</p> <p>5- Final examination,%60 .</p>	
<p>13. Forms of teaching</p> <p>The essence of the teaching program is prepared on papers. Elaborations and explanations of the details are done on black and white board. For the student to a achieve a level of excellence in this subject, the following points should be given most consideration:</p> <ul style="list-style-type: none"> • Class attendance on regular basis for the purpose of learning and doing class work. • Active participation in class discussions. • Reviewing the lecture notes and topics on weekly basis, noting the ambiguous points, if any and requesting clarification during instructoroffice hours. • Giving adequate and sufficient priority of papers, pencils, erase for writing lecture and daily tests. 	
<p>14. Assessment scheme</p> <p>Quizzes and written home assignments 10%</p> <p>Midterm exams 30%</p> <p>Final exam 60%</p>	
<p>15. Student learning outcome:</p> <p>Upon completing this course you should be able to:</p> <ul style="list-style-type: none"> • explain the basic properties of the real number system. • apply theorems of analysis to real functions of one variable. • prove basic analysis results. • write correct and coherent mathematical proofs. 	
<p>16. Course Reading List and References:</p> <p>1. Calculus with analytic geometry, George F. Simmons, 1985, by McGrawhill, Inc.</p> <p>2. Calculus, Howard Anton, 1995, by Anton text books, Inc.</p> <p>3. THOMAS' CALCULUS, Weir Hass, 2005, Pearson Education, Inc. 11th edition. 17. The Topi.</p>	
17. The Topics:	Lecturer's name
<p>First semester</p> <p>Week 1-3: Inequality.</p> <p>Week 4: Functions.</p> <p>Week 5-6: Type of Functions.</p> <p>Week 7-10: limits and continuity,</p> <p>Week 11-12 derivatives</p> <p>Weak 13-14 final exam</p>	

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

19. Examinations:

Q1/ Is the differential equation $\bar{Y} + p(x)y = Q(x)$ *exact*? If

- 1) $P(x) = 0$. 2) $Q(x) = 0$. 3) $P(x) = Q(x)$.
(9Marks)

Q2/Eliminate the arbitrary constants c_1, c_2 from $Y = e^{c_1 + c_2 x}$.

(7Marks)

Q3/Write an Integrating Factor when I is a function only of (y) , and give an example.

(7Marks)

Q4/Solve the following differential equations:

1. $\frac{dx}{dt} + x = e^t$; $\frac{dy}{dt} = x$.
 2. $(y^2 + y^2x)dy + (x + y^2x)dx = 0$.
 3. $(3x^2y^2 + x + e^x)dy + (2y^3x + y + ye^x)dx = 0$.
 4. $dx = \frac{dy}{(12e^{2x}y^2 - y)}$ with the Initial condition (0,1).
- (12Marks)

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Q1/ Eliminate the arbitrary constants a, b from $y = ae^{3x} + be^x$ (8Marks)

Q2/prove or disprove:

- 1) Every homogenous differential equation is to be separable differential equation by using the relation $\frac{y}{x} = \vartheta$.

- 2) Every Separable differential equation is to be homogenous differential equation . (8Marks)

Q3/A / Match each of the following differential equations with their solution.

A. $y' = -2y$

a. $y = \sin(x) + C$

B. $y' = (3/x)y$

b. $y = Ce^{-2x}$

$$C. y' = \cos(x)$$

c. $y = Cx^3$

B/ Choose the correct answered:

Which of the following second order differential equation is linear and homogenous?

- a) $x^2 y'' + xy' + \sin(x)y = 0$
- b) $(1 + y^2)y'' + xy' + \sin(x)y = 0$
- c) $x^2 y'' + xy' + \sin(x)y = \ln x$
- d) None of the above.

((3+4)Marks)

Q4/Solvonly **THREE** branches:

- i) $(y + x + 5)y' = (y - x + 1)$
- ii) $\frac{dy}{dx} = (x^2 - 8xy + 16y^2)$
- iii) $(2y^7 + y^4)dx + (6xy^6 - 3)dy = 0$
- iv) $xy' - y = \sqrt{x^2 - y^2}$ (12Marks)

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 پیداچوونہوہی ھاوہل

This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.

(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).

ئەم کۆرسبووکە دەبێت لەلایەن ھاوئێکی ئەکادیمیە سەیر بکەیت و ناوێکی بابەتەکانی کۆرسەکە پەسەند بکات و جەند وشەیهک بنووسێت لەسەر شیاوی ناوێکی کۆرسەکە و واژووی لەسەر بکات.
ھاوئێ ئەو کەسە کە زانیاری هەبێت لەسەر کۆرسەکە و دەبێت پلە زانستی لە مامۆستا کەمتر نەبێت.