Department of Physics

College of Education/ Erbil

University of Salaheddin

Subject: Calculus

Course Book: Year 1

Lecturer's name: Diyar A. Rasool

Academic Year: 2022

Course Book

1. Course name	Calculus
2. Lecturer in charge	Diyar Ali Rasool
3. Department/ College	Physics/ College of Education/ Erbil
4. Contact	**e-mail:** diyar.rasool@su.edu.krd diyarrasool@gmail.com
5. Time (in hours) per week	**Theoretical:** 2 Hours per week
6. Office hours	I will be in my room on Wednesday from 8:30 Am to 1:00 PM. Students can email to make an appointment.
7. Course code	
8. Teacher's academic profile	I did an undergraduate degree at the Department of Physics/ College of Education at Salahaddin University-Erbil between the years 2006-2010. In 2010 I got a position at Salahaddin University as a lab demonstrator. I stayed with the job for more than a year before moving to the United Kingdom in 2011 to study master's degree. In 2013, I obtained MSc in Advanced Science (Particle Physics) from the University of Liverpool, United Kingdom. Then, I returned to Salahaddin University and got a position as an assistant lecturer. I have participated in many conferences and published two articles. I was nominated as a Ph.D. candidate in the field of Biophysics at Salahaddin University in 2019.
9. Keywords	

10. Course overview:

The importance of general mathematics is to let students have information about mathematics. A course designed for all who want a course in calculus with an emphasis on **physical** science applications. Topics covered are plane analytic geometry, Limits, continuity, function and their graphs, differentiation, applications of the derivative, integration, and applications.

In addition to these topics, the course emphasizes problem-solving skills and practice setting up functions for typical optimization problems presented in calculus courses. We will illustrate the methods and ideas of calculus by applying them to solve several physical and geometric problems.

11. Course objective:

This module aims to provide students with

- Good understanding of General Mathematics.
- To give information about Integrations and derivations and how they are used in the physics field.
- Helping students to connect mathematics with physics.
- solving mathematical examples in their physics modules.
- better understanding of integration and derivations and their importance of them in physics.

12. Student's obligation

Students must come to the class on time. If a student has a legitimate reason for being excused early from class, then he or she should discuss this with me before class. Cell phones may not be used during class (no texting) and should be silent. Laptops may not be used for anything other than taking notes. It is important that you refrain from excessive talking during lectures as a courtesy to your fellow students.

Students will be divided into groups, and each group which includes 5 students, will have a leader. At the end of any lecture, homework will be given to them, and they should solve it in a group. Homework solutions will be collected one week before the monthly exams. That will take 2 marks.

13. Forms of teaching:

Different forms of teaching will be used to come across with objectives of the course. PowerPoint presentations for the head titles, definitions, graphs, and many useful illustrations with a summary at the end of each chapter will be presented and discussed.

The PowerPoint contains information about new topics and unsolved examples, and then the whiteboard will be used to solve them and to let students to see the solutions.

14. Assessment scheme

The maximum mark of this module is (100%). The grading system is based on the summation of two categories of evaluations:

There are three ways of assessing. Firstly, students must take one or two midterm exams; each exam will take 36 marks. Secondly, attendance and solving homework will take 4 marks. Finally, (60%) of the mark is based on a final examination that is comprehensive for the whole of the study material reviewed during the academic year, and it will be in June.

Monthly Exams 36%

Attendance and Homework 4%

Final Exam 60%

Total 100%

15. Student learning outcome:

After successful completion of the module, students should be able to:

- Work with **functions** represented in various ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations. The functions include **linear**, polynomial, **absolute** value, rational, **exponential**, logarithmic, **trigonometric**, inverse trigonometric, **hyperbolic**, inverse hyperbolic, and **piecewise**-defined functions.
- Define and apply the **concepts** of **limits** and **continuity** to the mentioned functions and study them graphically and analytically.
- Understand the meaning of the **derivative** in terms of a **rate** of **change** and local linear approximation, and should be able to use **derivatives** to solve a **variety** of problems.
- understand the meaning of the **definite integral** both as a **limit** of
- **Riemann** sums as the net accumulation of change and should be able to use **integrals** to solve a **variety** of problems.
- understand the relationship between the **derivative** and the definite **integral** as expressed in both parts of the Fundamental Theorem of Calculus.
- use **various integration techniques** to obtain anti-derivatives without an integral table or calculator.

16. Course Reading List and References:

1- Calculus with Analytical Geometry, Fourth Edition, By Robert Ellis and Denny Gulick, 1990.
2- Calculus, Fifth Edition, By Stanley I. Cross may1992.
3- Calculus, International Edition, By Thomas, 2005.
4- Calculus, 11th Edition, By Thomas, 2013.
5- Understanding Basic Calculus, by S.K. Chung, 2007

17. The Topics:	Lecturer's name
L1: lines and functions ▪ Equation of Line in a Plane ▪ Distance between two points ▪ Parallel and Perpendicular Lines **Functions and their Graphs** ▪ Domain and Range (one example) ▪ Graphs of Functions (including parabola)	Diyar Ali Rasool Weeks: 1. L1 needs 1 week. 2. L 2 needs 1 week.

▪ Absolute Value function **L 2: Limits** **2-2: Some rules Limits of Functions** ▪ Limits at Infinity of Rational Functions ▪ Horizontal Asymptotes ▪ Vertical Asymptotes **L3: Differentiation** **Tangents and Derivatives** Rates of Change and Derivative at a Point **3-1: Definition of the Derivative** **3-4: Rules for Differentiation** **3-5: Second and Higher Order Derivatives** **Applications of the derivatives (Extreme values, concavity)** **3-7: Chain Rule and Derivative of Composite Functions** ▪ Slopes of Parametrized Curves ▪ Power Chain Rule **3-8: Implicit Differentiation** ▪ Lenses, Tangents, and Normal Lines ▪ Derivatives of Higher Order ▪ Rational Powers of Differentiable Functions **L4: Some elementary functions with their applications: (Transcendental functions)** **1. Trigonometric Functions** ▪ Radian Measure ▪ The sine and cosine functions (Trigonometric Identities) ▪ Some other trigonometric functions depend on sine and cosine functions. ▪ Limits Involving Trigonometric Functions ▪ **Derivative of Trigonometric Functions** ▪ Inverse Trigonometric Functions **2. Hyperbolic Functions** It is similar to Trigonometric Functions. **(Including Graph, properties, and derivative)** **3. Exponential functions (including Graph,**	3. 1 or 2 weeks for L 3. 4. L4 needs 3 Total: 8 or 10 weeks

properties, and derivative) **4. Logarithmic functions (including Graph, properties, and derivative)** **5. Natural logarithmic functions (including Graph, properties and derivative)**	

19. Examinations:

1. Evaluation

Using the substitution $\boldsymbol{x = a\ sin\ \theta}$, evaluate $\int \frac{x^2\ dx}{\sqrt{9-x^2}}$

2. Calculations

For example: Find the integrations of $\int (\boldsymbol{e^{3x} + 5e^{-x}})\ \boldsymbol{dx}$

3. Prove the laws

For example: Prove that $\frac{d}{dx}\boldsymbol{tanh^{-1}x} = \frac{1}{1-x^2}$

4. Verifications

For example Verify that $\frac{\boldsymbol{d}}{\boldsymbol{dx}}$

21. Peer review

پێداچوونەوەی هاوەڵ