Department of Mathematics

College of Basic education

University of Salahaddin University -Erbil

Subject: Advance Calculus

Course Book: Second Year

Lecturer's name: Aween S. Karim

Academic Year: 2022-2023

Course Book

1. Course name	Advance Calculus
2. Lecturer in charge	Awen S.abdollah Karim
3. Department/ College	Mathematics/ Basic Education
4. Contact	e-mail:awen.karim@su.edu.krd
5. Time (in hours) per week	Theory: 4
6. Office hours	
7. Course code	
8. Teacher's academic profile	B.Sc degree in mathematics from the University of Urmia in 2008 M.Sc degree in Numerical Analysis at the University of Urmia in 2012
9. Keywords	Advance Calculus (sequence and series, Polar Coordinates, Area in polar coordinate, Change Cartesian to polar coordinate,…

10. Course overview:

Calculus weaves together previous study of algebra, geometry, and functions. The course focuses on the mastery of critical skills and exposure to new skills necessary for success in subsequent math courses. Calculus is a foundational course; it plays an important role in the understanding of science, engineering, economics, and computer science, among other disciplines. Calculus also provides important tools in understanding functions and has led to the development of new areas of mathematics including real and complex analysis, topology, and non-euclidean geometry.

After completing this course, students should have developed a clear understanding of the fundamental concepts of single variable calculus and a range of skills allowing them to work effectively with the concepts.

The general objective of this course is to deeper understanding and working knowledge of mathematics. also we have other aims such as awareness of applications of calculus in mathematics and physics and to develop understanding of mathematics. moreover one of the goals of the course is learn to think creatively, be able to attack a problem you have not seen before, develop tools for that, develop a mathematical model for a given 'real life' situation.

11. Course objective:
1. Polar coordinate.
2. Area in polar coordinate.
3. Change Cartesian to polar coordinate.
4. Introducing different types of series and discussing their convergence

12. Student's obligation
• Attend and participate in lecture discussions
• Attend class prepared, ready to hand in homework and ready to work.
• Attend in exams

Directorate of Quality Assurance and Accreditation بەڕێوەبەرایەتی دڵنیایی جۆری و متمانەبەخشین

13. Forms of teaching

White board, Colorful markers, PowerPoint, data show.

14. Assessment scheme

2 Mid-Course Exams 40%

Final exam 60%

15. Student learning outcome:

At the end of the course, all students will be able to do the following:

1. Apply double integrals to represent the volume of a solid region and to find surface area
2. Write and evaluate double integrals in polar coordinates
3. Use a polar coordinate to find Area.
4. Change Cartesian to polar and apply this to find Area.
5. Identify different types of series and determine whether a particular series converges;

16. Course Reading List and References:

▪Key references:

1. Thomas A., Calculus with Diff. Equation.11ed, Addison Wesley Pub. Comp., 2010

 2. Adams R. & Christopher E. , Calculus Several Variables. 7ed , Pearson Edu. Canada, 2010

▪Useful references:

1. David B, Calculus Demystified, McGraw-Hill Comp., 2007

2. Stewart J, Essential Calculus early transcendentals, Bob Pirtle pub. Canada, 2007

3. Staley I. Grossman , Calculus .5ed , Saunders College Pub., 1997

 4. Kaplan W. , Advanced Calculus .5ed , Addison Wesley Pub. Comp., 2000

 5. Any other textbook in calculus or advance calculus

17. The Topics:	Lecturer's name
Double Integrals, reversing the order of integration	Week 1
Application of double integral (Area and volume) in the space	Week 2
Double Integral in polar coordinate	Week 3
Moment and centre of mass, centroid and moment of nertia	Week 4
Triple Integrals in Cartesian and polar Coordinates	Week 5
Change of Variables in Multiple Integrals	Week 6
The line Integral of continuous region containing smooth curve	Week 7
Green's Theorem , finding area using greens theorem	Week 8
The Curl and Divergence of the function	Week 9

Sequence and series, The sequence of real numbers, convergent and divergent sequence	Week 10
Series, convergent and divergent, geometrical series	Week 11
The Integral Test, Comparison Tests	Week 12
The Ratio and Root Tests.	Week 13
Alternating Series, Absolute and Conditional Convergence, Power Series.	Week 14

19. Examinations:

Q1// Find the **area** of the region that lies **inside** the circle r=1 and **outside** the cardioids $r = 1 - cos\theta$.

Q6// Determine **absolutely** and **conditionally** convergent of the following:

$$\sum_{n=0}^{\infty}(-1)^n \frac{1}{2^n} \qquad \sum_{n=1}^{\infty}(-1)^n \frac{1}{n}$$

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

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