



RIPHAH INTERNATIONAL COLLEGE
ADP Computing/Computer Systems/Computer Graphics

Course Title:	Calculus & Analytical Geometry	Semester:	I
Course code:		Credit Hours:	3
Prerequisites	MAT-1003	Lecture type	Class room Lectures/Lab Sessions/Project Presentation
Instructor Name:			
Consulting Hours:			
	Email:		
	Contact info		

I. Course Description:

This course introduces students to the fundamental concepts of calculus and analytical geometry, with a focus on their applications in computer science. It covers topics such as limits, continuity, derivatives, integrals, and their applications in problem-solving, along with an introduction to vectors and the geometry of curves. Analytical geometry concepts such as lines, conics, and planes in 2D and 3D space are also explored. These mathematical tools are essential for understanding algorithms, optimization, and modeling in computer science. The course aims to develop students' analytical and computational skills, preparing them to solve complex problems encountered in fields like graphics, data science, and software development.

II. Course Objectives:

- Understand the fundamental concepts of limits, continuity, and their importance in the analysis of functions of one variable.
- Master the principles of differential and integral calculus, including the calculation of derivatives and integrals for various functions.
- Apply calculus techniques to solve problems related to the area under a curve and explore their practical implications in real-world scenarios.
- Learn the concepts related to the equation of planes and their geometric interpretation in both two-dimensional and three-dimensional spaces.
- Build a strong foundation in calculus and geometry that will enable students to analyze and solve mathematical problems relevant to their academic and professional growth.

III. Course Learning Outcomes:

- Students will be able to understand and explain the fundamental concepts of limits and continuity and their role in analyzing functions of one variable.
- Students will demonstrate proficiency in calculating derivatives and integrals of various functions and applying differential and integral calculus principles effectively.

- Students will apply calculus techniques to solve problems involving the area under a curve and interpret their practical implications in real-world scenarios.
- Students will understand and solve equations of planes, and analyze their geometric properties in both two-dimensional and three-dimensional spaces.
- Students will develop a strong mathematical foundation in calculus and geometry, enabling them to approach and solve complex problems in academic and professional context.

IV. Course Grading Policy:

- The instructor is responsible for grading all student performance through examinations, class participation in discussions, individual and/or team presentations, short or major papers requiring research or analysis, and other appropriate means. Individual discussions of the reading material may be held at the instructor's discretion. If any projects or assignments are identical or partially identical, a zero will be awarded. The repetition of such instances may result in an "F" grade in the course.

• Grade Distribution:

Evaluation Type	Percentage (%)	Activities
Quizzes	10	Minimum 4
Assignments	10	Minimum 4
Presentation	10	Minimum 1
Mid Term	30	
Final Term	40	
Total Points	100	

ABSOLUTE GRADING

V. General Classroom Norms (Attendance required: Minimum 75%)

Class attendance is mandatory. You may miss up to **25%** (8 out of 32 sessions) class sessions but save it for emergency only. In case you exceed this level, you will be withdrawn from the course. As a courtesy to the instructor and other students, be prepared to arrive at class and be in your seat on time. In addition, please note that each class lasts for **120 minutes** (1.5 Hours).

Also keep in mind some general rules in the class as given below:

- Cell phones should be powered off.
- Eatables are not allowed in the class.
- The teacher will not tolerate any disruptive behavior in the class.

The University Dress Code has to be observed, no warnings will be given, and violators will be asked politely to leave the class and consequently will be marked absent.

VI. Course Content & Schedule:

Week	Lecture No.	Topic	Lecture Contents	Lecture Material	Activity
Week 1	Lecture 1	Limits	<ul style="list-style-type: none"> • Concept of Limits • Limit of a function 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
	Lecture 2	Limits	<ul style="list-style-type: none"> • Graphical approach • Properties of limits 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 2	Lecture 3	Limits	<ul style="list-style-type: none"> • Theorems of limits • Limits of polynomials, rational and transcendental functions 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	Assignment 1
	Lecture 4	Limits	<ul style="list-style-type: none"> • Limits of polynomials, rational and transcendental functions 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 3	Lecture 5	Limits and continuity:	<ul style="list-style-type: none"> • Limits at infinity 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
	Lecture 6	Limits and continuity:	<ul style="list-style-type: none"> • one-sided limits 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by 	

				Thomas and Finney. 12 th edition <ul style="list-style-type: none"> Calculus by Steward, James 	
Week 4	Lecture 7	Limits and continuity:	<ul style="list-style-type: none"> Continuity 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	Quiz 1
	Lecture 8	Functions	<ul style="list-style-type: none"> Concept of function Types of Functions 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
Week 5	Lecture 12	Functions	<ul style="list-style-type: none"> Domain and range of a function Examples: polynomial, rational, piecewise defined functions, absolute value functions 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
	Lecture 10	Functions	<ul style="list-style-type: none"> Evaluation of functions Operations with functions: sum, product, quotient and composition 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
Week 6	Lecture 11	Graphs	<ul style="list-style-type: none"> Graphs of functions: linear, quadratic, piecewise defined functions 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	Assignment 2

	Lecture 12	Graphs	<ul style="list-style-type: none"> • Shifting graphs • Graph of quadratic Functions 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 7	Lecture 13	Graphs	<ul style="list-style-type: none"> • Logarithmic functions and its Graph • Exponential function and its Graph 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	Quiz 2
	Lecture 14	Graphs	<ul style="list-style-type: none"> • Graphical approach and its symmetry 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 8	Lecture 15	Derivatives	<ul style="list-style-type: none"> • Definition and techniques of differentiation 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
	Lecture 16	Derivatives	<ul style="list-style-type: none"> • Derivatives of polynomials and rational, exponential, logarithmic and trigonometric functions 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 12	Mid Term				
Week 10	Lecture 17	Derivatives	<ul style="list-style-type: none"> • The chain rule • Implicit differentiation 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and 	Assignment 3

				Finney. 12 th edition <ul style="list-style-type: none"> Calculus by Steward, James 	
	Lecture 18	Derivatives	<ul style="list-style-type: none"> Rates of change in natural and social sciences Related rates 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
Week 11	Lecture 112	Derivatives	<ul style="list-style-type: none"> Linear approximations and differentials Higher derivatives 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
	Lecture 20	Applications of derivatives	<ul style="list-style-type: none"> Increasing and decreasing functions value theorems 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
Week 12	Lecture 21	Applications of derivatives	<ul style="list-style-type: none"> Relative extrema and optimization First derivative test for relative extrema 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
	Lecture 22	Applications of derivatives	<ul style="list-style-type: none"> Convexity and point of inflection The second derivative test for extrema 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	Quiz 3

Week 13	Lecture 23	Applications of derivatives	<ul style="list-style-type: none"> • Curve sketching 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	Presentation
	Lecture 24	Applications of derivatives	<ul style="list-style-type: none"> • Rolls theorem and Mean Value Theorem 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 14	Lecture 25	Applications of derivatives	<ul style="list-style-type: none"> • Indeterminate forms and L'Hopitals rule 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
	Lecture 26	Applications of derivatives	<ul style="list-style-type: none"> • Inverse functions and their derivatives 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	
Week 15	Lecture 27	Integration	<ul style="list-style-type: none"> • Anti-derivatives and integrals 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition • Calculus by Steward, James 	Assignment 4
	Lecture 28	Integration	<ul style="list-style-type: none"> • Riemann sums and the definite integral 	<ul style="list-style-type: none"> • Calculus and Analytical Geometry by Thomas and Finney. 12th edition 	

				<ul style="list-style-type: none"> Calculus by Steward, James 	
Week 16	Lecture 212	Integration	<ul style="list-style-type: none"> Proper and improper integral 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	Quiz 4
	Lecture 30	Integration	<ul style="list-style-type: none"> Properties of Integral The fundamental theorem of calculus 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
Week 17	Lecture 31	Integration	<ul style="list-style-type: none"> The substitution rule Area under the curve Straight line in R³ 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
	Lecture 32	Integration	<ul style="list-style-type: none"> Concept of plane Equation of plane curve 	<ul style="list-style-type: none"> Calculus and Analytical Geometry by Thomas and Finney. 12th edition Calculus by Steward, James 	
Week 18		Final Term			

VII. Course Material:

a. Recommended Text book :

1. Calculus and Analytical Geometry by Kenneth W. Thomas
2. Calculus by Steward, James
3. Calculus by Earl William Swokkowski, Michael Olinick, Dennis Pence , Jeffery A. Cole