SINDH MADRESSATUL ISLAM (SMI) UNIVERSITY
Department of Artificial Intelligence and Mathematical Sciences (AIMS)

1. COURSE INFORMATION

Course Title	Calculus with Analytical Geometry
Course Code	MAT-100
Credit Hours	3 hours
Pre-requisite	None
Type of Course	BSAI
Academic Year	Fall-2022
Coordinator Name	Dr. Muhammad Ali
Contact Details	Cell phone: 03462104187

2. INTRODUCTION

This calculus and analytical geometry course provides basics of calculus with Limits, Differentiation and Integration of single variable functions. These mathematical tools and methods are used extensively in the physical sciences, engineering, economics and computer graphics. The goal is to encourage and motivate students for implementing calculus in their computer sciences career by polishing their skills in the concepts of derivatives and integration along with the relative topic

3. Course Learning Objectives

After completion of this course students will be able to

- Understand and calculate limit of a single variable function
- Understand differential calculus and integral calculus and their difference
- Understand derivative as slope at a specific point and rate of change of a function.
- Understand the application of derivatives and integration techniques
- Find the equation of tangent lines and normal lines
- Understand continues functions and discontinues functions
- Able to use basic mathematics in physics, mathematics and computer

4. Course outline

Functions and Graphs, Simple Cartesian Curves, Symmetrical Properties, Limits of function, Continuity of functions, Differentiation of Functions. Slope of Tangents line to a Curve, Equation of Tangent and Normal, Extreme Value functions, Rate of Change, Application of Differential Calculus; Increasing Decreasing function, Maxima /Minima, Point of Inflection, Taylor and Maclaurin series Expansions, Anti-derivative, Indefinite Integration of Simple Functions. Method of Integration, Definite Integral as Limit of a Sum, Lines and systems of equations, Application of Integral Calculus; to find Area, Arc Length, Volume and Surface of Revolution. De Moiver's Theorem and its Applications.

5. Detailed lesson plans for each remaining lecture

Course Title: Calculus and Analytical Geometry Course Code: MAT-101

COURSE CONTENTS AND TOPICS

Week	Hour	Topics
01	1	Introduction of Rules and regulation of class, course outline, revision of Calculus
	1	Functions, Types of functions
	1	Injective, Surjective and bijective functions with Examples
02	1	Inverse Function, Composite function, Even function, Odd function
	1	Graph of functions
	1	Domain and Range function with example
03	1	Absolute Value functions, Properties of Absolute Value,
	1	Inequalities, properties of inequalities with examples
	1	limits, existence of limits, limit of polynomials as x tends to 'a',
04	1	Limits of rational functions as x tends to 'a' and limits involving radical sign. Definition of continuity. **Quiz I, Assignment I**
	1	**Techniques of differentiation**, Basic Rules of Derivatives **(Stewart Book)**
	1	Derivatives of Polynomial and exponential functions. Examples
05	1	Derivatives of trigonometric functions, Chain rule. Example
	1	The method of implicit differentiation. Examples
	1	Derivatives of Logarithmic Functions, Differentials, increment, differentials
06	1	Rates of Change in the Natural and Social Sciences, Examples
	1	Linear Approximations and Differentials.
	1	Applications of Derivatives, Absolute Maxima and Minima, Examples,
07	1	Relative maxima and minima and critical points
	1	Indeterminate Forms and l'Hospital's Rule, Examples
	1	Exercise **Quiz II Assignment II**
MID TERM EXAMINATION		
09	1	**Antiderivatives or Integration**
	1	Area Under the curve,Examples
	1	The Definite Integral, The Fundamental Theorem of Calculus
10	1	Indefinite Integrals and the Net Change Theorem,
	1	**Techniques of Integration**, Integration by substitution, Formulas,
	1	Integration by Part, Example,

11	1	Integration by Partial Fraction, Example
	1	**Application of Integration**, Area between the curves, Volumes Example
	1	Work done, The average value of a function. The mean value theorem for integrals and average value
12	1	Arc Length as application of integration, **Quiz III Assignment III**
	1	Area of a Surface of Revolution, Example
	1	Applications to Physics and Engineering, Probability
13	1	Volumes by cylindrical shells, volume of cylindrical shell, cylindrical shells centered on the y-axis and variation of the method of cylindrical shells
	1	Length of a plane curve
	1	Area of surface of revolution
14	1	Work, work done by constant force and work done by a variable force
	1	General equation of straight lines, Distance between two points in a plain.
	1	Equation of Tangents and Normal, Examples
15	1	Exercise **Quiz IV Assignment IV**
	1	Taylor series
	1	McLaurin series
16	1	Binomial series
	1	Other indeterminate forms
	1	Revision
FINAL EXAMINATION		

6. COURSE TEXTBOOK, RECOMMENDED READINGS AND RESOURCES

Textbooks/Reference Books

- James Stewart, Calculus Early Transcendental 7 Edition.
- Howard Anton, Calculus with Analytical Geometry, 10th edition,
- Thomas Finney, Calculus with analytical geometry.
- Calculus with Analytical Geometry by SM Yousuf 7th Edition

7. STUDENT EVALUATION (Grading)

Following is a distribution of 100 score across assessment tools:

Sessional Description	Frequency	Marks per Frequency	Total marks
Course Work Evaluation			
Individual Assignments	02	05	10
Quizzes	02	05	10
Final Group Project/Presentations	01	15	15
Class Participation	-	05	05
Subtotal			**40**

Mid Term Exam	01	20	20
Final Exam	01	40	40
Grand Total			**100**

8. ONLINE ATTENDANCE POLICY

Students are expected to attend their classes. Absence never exempts a student from the work required for satisfactory completion of the courses. Excessive absences of any course will result in:

1. First warning for absence of 10% of the class hours
2. Second warning for absence of 20% of the class hours
3. A failing grade in the course for an absence of 25% of the class hours (as per HEC guidelines)
4. Exception to (3) may be made in the case of serious illness or death to an immediate family member if approved by the dean of the college. In such case, the student will receive a W grade in the course

9. PLAGIARISM

It is use of someone else's idea, words, projects, artwork, phrasing, sentence structure, or other work without properly acknowledging the ownership (source) of the property. Plagiarism is dishonest because it misrepresents the work of someone else as one's own. Students who are suspected of plagiarism will answer to an investigation. Those found guilty will face a disciplinary action as per the university rules.