GAINS
GANDAKI ACADEMY
OF INTERDISCIPLINARY STUDIES
EMPOWERING FUTURES

BSc-CSIT
FAR WESTERN UNIVERSITY

Course Title:	**Calculus and Analytical Geometry**	**Credit:**	**3**
Course Code:	**CSIT 113**	**Number of periods per week:**	**3**
Nature of Course:	**Theory**	**Total Hours:**	**48**
Year:	**First**	**Semester:**	**First**

1. **Course Introduction**

   The course aims to acquaint the students with the basic concepts of sequence and series of real numbers differential and integral calculus, multivariate calculus and multiple integrals.

2. **Objectives**

   The general objectives of the course are as follows:

   - To acquaint the students with basic analysis concepts on sequence and series of real numbers.
   - To enable the students, to understand differential and integral calculus and its further application.
   - To know the brief idea of vector-valued function, multiple integrals and multivariate calculus

3. **Specific Objectives and Contents**

Unit 1: Sequence and Real Numbers- 5 LH	
Specific Objectives • Define the sequence of real numbers with examples • Discuss the meaning of convergent, divergent & oscillatory sequences with examples. • Define the meaning of bounded set, bounded sequence with examples	**Contents** 1.1. Definition notation and examples 1.2. Convergent, divergent and oscillatory sequence, definition and examples 1.3. Bounded set, Bounded sequence definition and examples 1.4. Monotonic sequence
Unit 2: Series and Real Numbers- 10 LH	
Specific Objectives • Give the concept of a series of real numbers with an r sequence of partial sum. • Derive the necessary and sufficient condition for the convergence of series. • Explain the concept of convergence of geometric series with proof. • Explain the concept of comparison test • Give the proof of convergences of $\sum \frac{1}{n^p}$	**Contents** 1.1. Sequence of partial sum 1.2. Convergence of series. If $\sum U_n$ is convergent then $un \rightarrow 0\ as\ n \rightarrow \infty$ (with proof) 1.3. Convergence of geometric series (with proof) 1.4. Series of positive terms, comparison test and its limit form (without proof) 1.5. Convergences of $\sum \frac{1}{n^p}\ P \in R$ (with proof)
Unit 3: Differential Calculus- 4 LH	
Specific Objectives • Give the meaning of the n^{th} derivative. • Derive the Leibnitz theorem and state its application. • Discuss the term partial differentiation and its application	**Contents** 3.1. n^{th} derivative 3.2. Leibnitz theorem (with proof) and its application 3.3. Partial differentiation
Unit 4: Integral Calculus- 6 LH	
Specific Objectives • State and prove the properties of definitive integral • Define improper integral of different types • Discuss the meaning of Beta and Gamma function • Derive reduction formula of $\sin^n x$ and $\cos^n x$ etc.	**Contents** 4.1. Method of integration 4.2. Properties of definite integral 4.3. Improper integral 4.4. Beta Gamma functions and their properties 4.5. Reduction formula

Unit 5: Conic Sections and Polar Coordinates- 5 LH	
Specific Objectives • Conic sections and quar • Polar forms • Discuss integration in polar coordinates •	**Contents** 5.1. Classifying conic section by eccentricity 5.2. Place, curves, parametric and polar equations 5.3. Integration in polar coordinates
Unit 6: Vectors and Analytic Geometry in Space- 6 LH	
Specific Objectives • Explain the meaning of vector in space, lines and planes in space • Discuss the term cylindrical and quadric space with their equations • Define the terms tangent, curvature and torsion & derive the TNB system completely	**Content** 6.1. Vectors in the space 6.2. Lines and planes in space 6.3. Cylindrical and quadric spaces
Unit 7: Multiple Integrals- 4 LH	
Specific Objectives • Differentiate unregulated and regulated power supplies • Develop the concept of regulators and current boosters	**Content** 7.1. Double integrals in rectangular polar coordinates 7.2. Finding areas, moments and center of mass 7.3. Triple integrals in rectangular coordinates and application
Unit 8: Multivariable Functions and Partial Derivatives- 5 LH	
Specific Objectives • Conceptualize limits and continuity • Define extreme value • Conceptualization of Lagrange multipliers	**Contents** 8.1. Functions of several variables 8.2. Limits and Continuity 8.3. Partial derivatives 8.4. Differentiability 8.5. The chain rule 8.6. Extreme values and saddle points 8.7. Patial derivatives with constrained variables 8.8. Extreme values and saddle points 8.9. Language multipliers 8.10. Taylor's formula

4. Evaluation System

Undergraduate Program				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
Semester End Examination	60	Assignments	10%	40
		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term Papers	10%	
		Mid-Term Examination	40%	
		Group Work	10%	
Total External	60	Total Internal	100%	40
Full Mark: 60 + 40				100

5. External Evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Nature of Question	Total Questions to be asked	Total Questions to be Answered	Total Marks	Weight
Group A: Very short answer questions	8	8	8 X 3 = 24	24%
Group B: Short answer type questions	6	5	5 X 8 = 40	40%
Group C: Long answer type questions/case studies	4	3	3 X 12 = 36	36%
			100	**100%**

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUALIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Internal evaluation:

Assignment:
Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes:
Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class:
Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation:
Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper:
Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination:
It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation:

Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques:
All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self-study
- Assignments
- Presentation by Students
- Term Paper writing

Quizzes

Guest Lecture
Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Basic Books

Bartle, R. G., & Sherbert, D. . Real analysis (3rd ed.). John Wiley & Sons India.

Thomas, G. D., Jr., & Finney, R. L. (2004). Calculus and analytical geometry (9th ed.). Pearson Education Pvt. Ltd.

Reference

- Kreyszig, E. (1991). *Advanced engineering mathematics* (5th ed.). John Wiley & Sons.
- Swokowski, E. W. . *Calculus with analytical geometry* (2nd alter ed.).