Far Western University
Four Years B.Sc. CSIT
Syllabus for Computer Science

Course Title: Calculus and Analytical Geometry **Credit: 3**
Course No: CSIT.113 **Number of period per week: 3**
Nature of the Course: Theory **Total hours: 45**
Year: First, Semester: First
Level: B.Sc.CSIT

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 the multiple integrals.

2. Objectives

The general objectives of the course are as follows:

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

3. Contents in detail with Specific objectives

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.

Unit 1: Sequence of Real numbers - 5 hours

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

- Give the concept of series of real number with 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 $\sum \frac{1}{n^p}$.
- Give the meaning of n^{th} derivative.
- Derive Leibnitz theorem and state its application.
- Discuss the term partial differentiation and its application.

Unit 2: Series of Real Numbers - 10 hours

2.1 Sequence of partial sum.
2.2 Convergence of series. If $\sum u_n$ is convergent then $u_n \to 0$ as $n \to \infty$ (with proof)
2.3 Convergence of geometric series (with proof)
2.4 Series of positive terms, comparison test and its limit form (without proof)
2.5 Convergences of $\sum \frac{1}{n^p}$, $P \in R$ (with proof)

Unit 3: Differential Calculus - 4 hours

3.1 n^{th} derivative
3.2 Leibnitz theorem (with proof) and its application
3.3 Partial differentiation

- Give the concept of integration
- State and prove the properties of definite integral.
- Define the improper integral of different types.
- Discuss the meaning of Beta and Gamma function and its important properties.
- Derive reduction formula for $\sin^n x$, $\cos^n x$ etc.

Unit 4: Integral Calculus - 6 hours

4.1 Method of integration.
4.2 Properties of definite, integral.
4.3 Improper integral
4.4 Beta Gamma function and their properties.
4.5 Reduction formula

5.1 Classifying conic section by eccentricity,
5.2 Plane curves, parametric and polar equations.
5.3 Integration in polar coordinates.

polar forms.

- Discuss the integration in polar coordinates.

- Explain the meaning of vector in space, lines and planes in space.
- Discuss the term cylindrical and quadric space with their equations.
- Define vector valued function and space curves.
- Define the term tangent, curvature and torsion & derive TNB system completely.
- Give the concept of calculus & multivariate calculus.
- Discuss the concept of functions, limits & continuity of two or more variable.
- Derive the directional derivative and define gradient vectors.
- Define extreme values.
- Give the concept of multiple integral.
- Define double integrals in the rectangular polar coordinate.
- Using multiple integral techniques obtain the areas, moments and centre of mass.
- Discuss triple integrals.

Unit 6: Vectors and Vector valued function - 6 hours

6.1 Vectors in the space.

6.2 Lines and planes in space

6.3 Cylindrical and quadric spaces.

Unit 7: Vectors and Vector valued function - 4 hours

7.1 Double integrals in rectangular polar coordinates.

7.2 Finding areas, moments and centre of mass.

7.3 Triple integrals in rectangular coordinates and application.

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coefficient.

8.3 Directional derivative and gradient vectors.

8.4 Extreme values.

8.5 Lagranges multiplier.

Note: The figures in the parenthesis indicates the approximate periods for the respective units.

Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	40
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

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.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	11 questions	8	8×5 = 40	40%	24
Group C: Long answer type question/case studies	6 questions	4	4×10 =40	40%	24
			100	100%	60

*Scoring scheme will not follow negative marking.

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 QUILIFIED (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.

Text Books and References

Text Books

i. Real Analysis: R.G. Bartle, D. Sherbert, 3rd Edition, John wiley & sons India Edition.
ii. Thomas and Fenns: Calculus and Analytical Geometry, 9th Edition, 2004 (Thomas, Jr G.D and Finney Ross L, Publisher Pearson Ed. Pvt. Ltd.

Reference Books

i. (i) Advanced Engineering mathematics: Kreyszing Erwin John Wiley & sons (1991) 5th Ed.
ii) Calculus with analytical Geometry: E.W Swokowski & second Alter Edition.