Syllabus
BSc CSM Part-II
Semester III (Session 2025 onwards)

Course Code	Type	Subject Title	Credits
BCSM301	Major I	Oracle	3
BCSM301(P)	Major Lab I	Practical based on oracle	1
BCSM302	Major II	Applied statistics	3
BCSM302(P)	Major Lab II	Practical based on applied statistics	1
BCSM303	Major III	Advanced Calculus	4
BCSM304	Minor-I	Home Science	4
BCSM307	AEC	English	2
BCSM309	IDC	Cyber Security	3
BCSM311	SEC	Data handling Using spreadsheet	3
BVAC3	VAC	Yoga and Meditation	2
BCSM306	Compulsory	Punjabi Compulsory	4

Total Credits: 30

BCsM303: ADVANCED CALCULUS

Subject: Mathematics

Total Marks: 100

Time Allowed: 3 Hours

External Exam: 70

Internal Assessment: 30

Course Objectives

The course is designed for undergraduate students to provide a concrete foundation of calculus by introducing first the basic set theory and then moving to the concept of Countability of sets. For the working knowledge to deal with the mathematical concepts of subsequent semesters the concepts of limit, continuity and differentiation in one variable with its various applications is also introduced. The behavior of sequence and series of real numbers is proposed in detail which helps in monitoring the output of functions.

Course Outcomes

After completing this course students will be able to

1. Knowledge of Principle of Countability.
2. Encounter with the set of real numbers as an uncountable set.
3. Idea about Bounded and unbounded sets, least upper and greatest lower bounds of a set.
4. Gain knowledge of Sequences and various concepts related to it like convergence, limit points, bounded and monotonic sequences, Cauchy sequence and completeness of R.
5. Applicability of various tests of convergence of Sequence and series.
6. Introduction and concrete foundation of various concepts like limit, continuity, differentiation of functions of one variable.
7. Various applications of differentiation to finding maxima and minima and Taylor series expansion.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections A, B and C. Sections A and B will have four questions each from the respective sections of the syllabus and Section C will consist of one compulsory question having eleven short answer type questions covering the entire syllabus uniformly. Each question in Sections A and B will be of 12 marks and Section C will be of 22 marks.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C.

Section-A

The language of sets and functions - countable and uncountable sets. Real numbers - least upper bounds and greatest lower bounds.
Sequences:- limit points of a sequence, convergent sequences; bounded and monotone sequences, the limit superior and limit inferior of a sequence. Cauchy sequences and the completeness of R.
Infinite Series of non-negative terms:-convergence and divergence of series, absolute and conditional convergence. Various tests for convergence of series. Connection between infinite series and decimal expansions, binary expansions of real numbers.(Theorem without proof only application)

Section-B

Alternating series:- Leibnitz's theorem, absolute and conditional convergence.
Series of arbitrary terms: convergence, divergence and oscillation. Abel's and Dirichlet's tests.
Calculus of a single variable: Continuity; attainment of supremum and infimum of a continuous function on a closed bounded interval, uniform continuity. Differentiability of functions. Rolle's theorem and mean value theorems. Higher derivatives, maxima and minima. Taylor's theorem - various forms of remainder, infinite Taylor expansions.

TEXT BOOKS

- Tom M Apostol. *Calculus*. Nasora Publishing House, New-Delhi, 1985.
- Tom M Apostol. *Mathematical analysis*. Nasora Publishing House, New-Delhi, 1985.
- Richard R Goldberg. *Methods of real analysis, 2nd ed.* Wiley, 1976.
- Subhash Chandra Malik and Savita Arora. *Mathematical analysis*. New Age International, 2009.

RECOMMENDED READINGS

- Halsey Lawrence Royden and Patrick Fitzpatrick. *Real analysis*. Vol. 2. Macmillan New York, 1968.
- Terence Tao. *Analysis I*. Vol. 185. Hindustan Book Agency, 2009.

BCSM402(P): STATISTICAL PRACTICAL

Subject: Statistics

Total Marks: 30
External Exam: 20
Internal Assesment :10

Course Objectives

This course is based on Theory paper BCSM402and will provide practical knowledge to the students on various concepts elaborated in these courses.

Course Outcomes

The learning outcomes will be similar to Theory paper BCSM402. They will be able to solve practical problems based on these theory papers.

INSTRUCTIONS FOR THE PAPER-SETTER AND THE CANDIDATES

The setting and evaluation will be done by a board of examiners consisting of Head, External examiner and the teacher(s) involved with the teaching of this paper.

The practical paper will consist of four exercises and the candidates will be required to attempt any three exercises.

Lab Course: The exercises will be based on the syllabus of the paper BCSM402

Section-A

Time Series: Definition, components of a time series, measurement of secular trend by graphical method, method of semi averages, method of moving averages, fitting of Mathematical curves using Legendre's least square method, measurement of seasonal fluctuations by using methods of ratio-to-moving average, ratio to trend and link relatives, measurement of cyclical fluctuations(excluding periodogram analysis).

Section-B

Index Numbers: Definitions, interpretation and applications of index numbers. Problems involved in the construction of index numbers, Laspeyre's, Paasche's, Marshal-Edgeworth, Fisher's, Drobish-Bowley , Kelly's formulae for index numbers. Criterion of good index numbers, Errors in index numbers, uses of index numbers. Cost of living index numbers and its uses.

Demand Analysis: Theory and analysis of consumer's demand: Law of demand, Price elasticity of demand, Estimation of demand curves; Forms of demand functions, Engel's curves, Income elasticity of demand.

TEXT BOOKS

- A. M. Gun, M.K. Gupta, and B. Dasgupta. *Fundamentals of Statistics. Vol-II.* Third Edition. World Press, Calcutta, 2016.
- S. C. Gupta and V. K. Kapoor. *Fundamentals of Applied Statistics*. S. Chand and Sons, 2014.

RECOMMENDED READINGS

- Frederick E. Croxton, Dudley J. Cowden, and Sidney Klein. *Applied General Statistics*. PHI Learning Pvt. Ltd., 1974.

BCSM302: APPLIED STATISTICS

Total Marks: 70
External Exam: 50
Internal Assessment: 20

Course Objectives

The objective of this paper is to give exposure to students about concepts of:

1. Time series with methods of measurement of its various components.
2. Index numbers with their construction, uses and applications.
3. Demand analysis.

Course Outcomes

After completing this course students will be able to

1. Explain the concept of Time Series and its components.
2. Measure secular trend by various methods like graphical, method of semi averages, method of moving averages, fitting of Mathematical curves using Legendre's least square method.
3. Determine seasonal fluctuations by using methods of ratio-to-moving average, ratio to trend and link relatives.
4. Compute cyclical fluctuations (excluding periodogram analysis).
5. Define, interpret and understand the various applications of index numbers.
6. Understand the Problems involved in the construction of index numbers.
7. Calculate price and quantity index numbers using Laspeyre's, Paasche's, Marshal-Edgeworth, Fisher's, Drobish-Bowley , Kelly's formulae.
8. Understand the criterion of good index numbers, errors in index numbers and uses of index numbers.
9. Understand the concept of Cost of living index numbers and its uses.
10. Know the concepts of Law of demand and Price elasticity of demand.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections, Sections A, B & C. Sections A & B will have four questions each from the respective sections of the syllabus. Each question will carry 8 marks, which may be segregated into sub-parts. Section C will be compulsory with 9 short answer type questions of 02 marks each, which will cover the entire syllabus.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions in all selecting two questions from each of the Section A and B and compulsory question of Section C.