Government PG College, Ambala Cantt

Course File(Session 2023-24)

Name of Assistant Professor: Ms. Neha Rani

Class: B.A./B.Sc. II Year/6th semester

Section: Non Medical & Computer Science

Subject Code and Name: BM-241/Real and Complex Analysis

SYALLBUS

B.Sc.	B.A.
External: 40 Internal: 10	External: 27 Internal: 06

Time: 3 Hours

Note: Examiner will be required to set nine questions in all. First question will be compulsory, consisting of objective type/short-answer type questions covering the entire syllabus. In addition to that eight more questions will be set, two questions from each Unit. A candidate will be required to answer five questions in all, selecting one question from each unit in addition to compulsory Question No. 1. All questions will carry equal marks.

UNIT – I

Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals.

UNIT – II

Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions, Parseval's identity for Fourier series, Fourier series for even and odd functions, Half range series, Change of Intervals.

UNIT – III

Extended Complex Plane, Stereographic projection of complex numbers, continuity and differentiability of complex functions, Analytic functions, Cauchy-Riemann equations. Harmonic functions.

UNIT – IV

Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings, Mobius transformations. Fixed pints, Cross ratio, Inverse Points and critical mappings.

Books Recommended:

1. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
2. R.R. Goldberg : Real analysis, Oxford & IBH publishing Co., New Delhi, 1970
3. D. Somasundaram and B. Choudhary : A First Course in Mathematical, Analysis, Narosa Publishing House, New Delhi, 1997
4. Shanti Narayan : A Course of Mathematical Analysis, S. Chand & Co., New Delhi
5. R.V. Churchill & J.W. Brown: Complex Variables and Applications, 5th Edition, McGraw-Hill, New York, 1990
6. Shanti Narayan : Theory of Functions of a Complex Variable, S. Chand & Co., New Delhi.

COURSE OBJECTIVES

The course objectives outlined are as follows:

1. Understand how complex numbers provide a satisfying extension of the real numbers.
2. Learn techniques of complex analysis that make practical problems easy (e.g. graphical rotation and scaling as an example of complex multiplication).
3. Appreciate how mathematics is used in design (e.g. conformal mapping).
4. Unlearn (if ever learned) the notion that mathematics is all about getting "the right answer".
5. To understand signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
6. Development of the mathematical skills to solve problems involving convolution, filtering, modulation and sampling.

COURSE OUTCOMES

After the successful completion of the course, students will be able to:

1. Students will be able to understand the concept of limit for real functions and be able to calculate limits of standard functions and construct simple proofs involving this concept
2. Student will be introduced to the concept of continuity and be familiar with the statements and proofs of the standard results about continuous real functions
3. Student will understand the concept of the differentiability of a real valued function and be familiar with the statements and proofs of the standard results about differentiable real functions.
4. Student will have a working knowledge of differentiability for complex functions and be familiar with the Cauchy-Riemann equations
5. Student will evaluate integrals along a path in the complex plane and understand the statement of Cauchy's Theorem.

Lesson Plan

From January 2024 to April 2024

Week No	Scheduled Dates	Topics to be covered
1.	**1-6 January**	Jacobians, Beta Function
2.	**8-13 January**	Gamma function
3.	**15-20 January**	Double and Triple integrals
4.	**22-27 January**	Dirichlets integrals, change of order of integration in double integrals.
5.	**29-3 February**	Fourier expansion of piecewise monotonic functions
6.	**5-10 February**	Properties of Fourier Co-efficients, Dirichlet's conditions
7.	**12-17 February**	Parseval's identity for Fourier series, Fourier series for even and odd functions
8.	**19-24 February**	Half range series, Change of Intervals
9.	**26-2 March**	Mappings by elementary functions: Translation, rotation, Magnification and Inversion. Conformal Mappings
10.	**4-9 March**	Mobius transformations. Fixed pints, Cross ratio, Inverse Points
11.	**11-16 March**	Critical mappings
12.	**18-22 March**	Extended Complex Plane, Stereographic projection of complex numbers
13.	**23-31 March**	**Holi Vacations**
14.	**1-6 April**	Continuity and differentiability of complex functions
15.	**8-13 April**	Analytic functions
16.	**15-20 April**	Cauchy-Riemann equations. Harmonic functions.
17.	**22-27 April**	Final Test, Assignments and REVISION of Contents
Exams Starts		