

COMPLEX ANALYSIS – II

Semester	Subject Code	Category	Lecture		Theory		Practical	Credit
IV		Core – Paper XIII	Hrs/week	Hrs/Sem	Hrs/week	Hrs/Sem	0	4
			6	90	6	90		

COURSE OBJECTIVES:

The students will be able to

- Study Riemann theta function and normal families.
- Understand Riemann mapping theorem, Conformal mapping of polygons, Harmonic functions, Elliptic functions and Weierstrass theory of analytic continuation.

COURSE OUTCOMES:

On the successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Investigate the important features of equicontinuity, extension of zeta function.	K2
CO2	Understand the concept of conformal mappings of polygons	K2
CO3	Derive simply and double periodic functions	K2
CO4	Discuss the Weierstrass theory	K3
CO5	Analyze the results on analytic continuation	K4

Knowledge Level: K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze.

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	M	S	S	M
CO2	M	S	S	M	M	S
CO3	S	M	M	S	M	S
CO4	M	M	S	M	M	S
CO5	S	M	M	M	S	M

S- Strong; M- Medium; L- Low

UNIT I: RIEMANN ZETA FUNCTION AND NORMAL FAMILIES

18 Hours

The Product development – Extension of $\zeta[s]$ to the whole plane – The zeros of zeta function – Equicontinuity – Normality and Compactness – Arzela's theorem – Families of analytic functions – The Classical definition

Chapter 5: Sections 4.1 to 4.4

Chapter 5: Sections 5.1 to 5.5

UNIT II: RIEMANN MAPPING THEOREM

18 Hours

Statement and proof – Boundary behavior – Use of the Reflection Principle.

Conformal Mappings Of Polygons: The behavior at an angle Schwartz – Christoffel formula - Mapping on a rectangle.

Harmonic Functions: Functions with mean value property – Harnack's principle.

Chapter 6: Sections 1.1 to 1.3

Chapter 6: Sections 2.1 to 2.3

Chapter 6: Sections 3.1 and 3.2

UNIT III: ELLIPTIC FUNCTION

18 Hours

Simply periodic functions – Doubly periodic functions.

Chapter 7: Sections 1.1 to 1.3

Chapter 7: Sections 2.1 to 2.4

UNIT IV: THE WEIRSTRASS THEORY

18 Hours

The Weirstrass p -function – The functions $\zeta(Z)$ and $\sigma(Z)$ – The differential equation – the modular function $\lambda(\tau)$ – the conformal mapping by $\lambda(\tau)$.

Chapter 7: Sections 3.1 to 3.5

UNIT V: ANALYTIC CONTINUATION

18 Hours

The Weirstrass theory – Germs and sheaves - Sections and Riemann surfaces. Analytic continuation along Arcs – Homotopic curves – The Monodromy theorem – Branch points.

Chapter 8: Section 1.1 to 1.7

DISTRIBUTION OF MARKS: THEORY 100%

TEXT BOOK

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Lars F. Ahlfors	Complex Analysis, [3rd edition]	McGraw Hill Book Company, New York	1979

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	H. A. Prestly	Introduction to complex analysis	Clarendon Press, Oxford	1990
2.	E. Hille	Analytic Function theory (2 vols)	Gonm& co	1959
3.	M. Heins	Complex function theory	Academic press, New York	1968

WEB RESOURCES

1. <https://www.hindawi.com/journals/jmath/2013/181724/>
2. <https://www.maths.usyd.edu.au/u/tillmann/2007-complex/ComAna-Lectures.pdf>
3. <https://core.ac.uk/reader/30605948>

TEACHING METHODOLOGY

1. Class room teaching
2. Giving Assignments for all units
3. Discussions
4. Home test
5. PPT presentation