



Birla Institute of Technology & Science, Pilani
Hyderabad Campus

Second Semester 2020-2021
Course Handout Part II

Date:

16/01/2021

In addition to part I (General Handout for all courses appended to the time table), this part II provides further details regarding the Complex Analysis MATH F354 course.

Course Title : Complex Analysis
Course Number : MATH F354
Instructor-In-charge : Nijjwal Karak

Scope and Objective

In an introductory Calculus course, we study real valued functions of a real variable and associated concepts/definitions such as: continuity, derivative, integration, relation between derivative and integral, intermediate value theorems, Taylor's series et cetera. Analogously, Complex Analysis is the study of Complex valued functions of a Complex variable. In Complex Analysis, we emulate the various definitions/concepts of Calculus by replacing real numbers by complex numbers. It turns out that analytic features of functions of a complex variable are very intriguing and often they incorporate concepts from geometry, number theory, topology etcetera. The methods and theorems of Complex Analysis are very powerful and elegant. Complex Analysis has many applications in Physics and also in other areas of Mathematics like number theory, functional analysis, geometry etc.

Text Books:

1. J. B. Conway, Functions of One Complex Variable, Springer, 1997

Reference Books:

1. L. V. Ahlfors, Complex Analysis
2. R. E. Rodriguez, I. Kra, J. P. Gilman; Complex Analysis - spirit of Lipman Bers, Graduate Texts in Mathematics No. 245, Second Edition, Springer-Verlag, 2012
3. M. Beck, G. Marchesi, D. Pixton, L. Sabalka, A First Course in Complex Analysis,

open textbook (print version published by Orthogonal Publishing), 2002-2018
Available online at <http://math.sfsu.edu/beck/complex.html>

4. Raghavan Narasimhan and Yves Nievergelt, Complex Analysis in One Variable,
Sec- ond Edition, Birkhauser, 2000

Course Plan:

Lectures	Learning Objectives	Topics	Chapter in the text book
1-2	To recall the basic theory of complex numbers	Review of complex numbers and basic definitions from calculus and real analysis	Chapter I
3-5	To learn several definitions of analytic functions	Analytic functions, power series and Cauchy-Riemann equations	Chapter III (Sections 1-2)
6-9	To understand conformal mappings	Topology, analytic functions as mappings, conformal mappings	Chapter II and Chapter III (Section 3)
10-12	To understand the concept of complex integration	Complex integration, power series representation of analytic functions	Chapter IV (Sections 1-2)
13-16	To learn about zeros of analytic functions	Cauchy's Estimate, zeros of an analytic function and applications	Chapter IV (Sections 3-4)
17-19	To prove Cauchy's theorem and Morera's theorem	Cauchy's theorem and integral formula, Morera's theorem	Chapter IV (Section 5)
20-22	To prove open mapping theorem and Goursat's theorem	Open mapping theorem, Goursat's theorem	Chapter IV (Sections 7-8)
23-28	To classify the singularities of functions	Singularities, Taylor and Laurent series, calculus of residues	Chapter V
29-31	To understand Maximum Modulus Theorem and Schwarz's lemma	Maximum Modulus Theorem, Schwarz's Lemma	Chapter VI (Sections 1-2)
32-35	To learn how to factorize an entire function	Riemann mapping theorem, Weierstrass factorization theorem, Mittag-Leffler's theorem	Chapter VII (Sections 1-6) and Chapter VIII
36-40	To understand the basic theory of Harmonic functions	Analytic continuation, Harmonic functions, Jensen's formula	Chapter IX (Sections 1-2) , Chapter X (Sections 1-2) and Chapter XI (Section 1)

Evaluation Scheme:

No	Evaluation Component	Duration	Weightage	Date and Time	Nature of Component
1	Quiz-I	To be announced in the class	10%	To be announced in the class	Open Book
2	Mid-semester Test	90 min	30%	03/03 3.30 - 5.00PM	Open Book
3	Assignment-I	To be announced in the class	10%	To be announced in the class	Open Book
4	Quiz-II	To be announced in the class	10%	To be announced in the class	Open Book
5	Compre. Exam.	120 min	40%	08/05 FN	Open Book

Total Marks: 100

Chamber Consultation Hour: To be announced in the class.

Notices: General class related announcements will be made in the Google Classroom Page.

Make-up Policy: Make-up for mid-semester/comprehensive examination shall be granted in genuine cases.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor In-charge

MATH F354