



Complex Variables & Transforms

Course Code:	Math-232	Semester:	4 th
Credit Hours:	3+0	Prerequisite Codes:	
Instructor:	Mr. Saeed Afzal	Discipline:	BEE
Office:	304-A, Faculty Block	Telephone:	051-90852365
Lecture Days:	Wednesday, Thursday, Friday	E-mail:	Saeed.afzal@seecs.edu.pk
Class Room:	4,5,12,13 (SEECs)	Consulting Hours:	Monday, Tuesday (9:00-1:00)
Knowledge Group:	Applied Mathematics	Updates on LMS:	After every lecture

Course Description:

This course provides sound knowledge of calculus in the complex domain with a detailed discussion on complex algebra, complex functions, analyticity and contour integration. It also covers Fourier Series, Fourier Integrals and Fourier Transforms to provide students strong mathematical tools to solve Engineering/Technology problems.

Course Objectives:

The course objective is that its successful completion should develop understanding of complex functions, analyticity and contour integration. The applications will be covered from potential theory of harmonic functions. The other objective is to learn solution techniques of Fourier series and Fourier transform approach is dealt rigorously.

Course Learning Outcomes (CLOs):

After successful completion of this course, a student should be able to:	PLO	BT Level*
1. Describe Complex functions, derivatives, contour integrals.	2	C-2
2. Represent a given function in terms of Fourier series and Fourier integrals.	1	C-2
3. Evaluate Fourier and Z-transforms of a given function.	1	C-5
* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain		



Mapping of CLOs to Program Learning Outcomes

PLOs/CLOs	CLO1	CLO2	CLO3
PLO 1 (Engineering Knowledge)		√	√
PLO 2 (Problem Analysis)	√		
PLO 3 (Design/Development of Solutions)			
PLO 4 (Investigation)			
PLO 5 (Modern tool usage)			
PLO 6 (The Engineer and Society)			
PLO 7 (Environment and Sustainability)			
PLO 8 (Ethics)			
PLO 9 (Individual and Team Work)			
PLO 10 (Communication)			
PLO 11 (Project Management)			
PLO 12 (Lifelong Learning)			

Books:

- Text Books:**
- Advanced Engineering Mathematics (9th Edition) by Ervin Kreyszig.
 - A first course in complex analysis with applications by Dennis G. Zill.
- Reference Books:**
- Real and Complex Analysis by Walter Rudin.
 - Complex Variables & Applications by James Ward Brown, Ruel V. Churchill.
 - Advanced Modern Engineering Mathematics by Glyn James.

Topics to be covered:

These mainly fall into three main categories:

Complex Variables

Review of Complex algebra and Complex functions.

Concepts of limits, continuity and analyticity in the complex domain

Line integral in the complex plane, Cauchy Integral Theorem and formula

Laurent series, Singularities, Poles, Residues

Contour Integration

Fourier Series

Periodic functions, Fourier sine and cosine series

Fourier Integrals

Fourier Transform and Z -Transform

Introduction to Fourier and Z-Transforms



National University of Sciences & Technology (NUST)
School of Electrical Engineering and Computer Science (SEECs)
Department of Electrical Engineering

Sr. No.	Topics	Estimated Contact Hours
1	Review of Complex algebra, Complex functions, Real and imaginary components of a function of a complex variable function, Limit and continuity.	3
2	Derivative, Cauchy Riemann equations, Properties of UV-function, Analytic functions, Harmonic functions.	3
3	Complex logarithms	1
4	Line integral in complex plane	2
5	Cauchy integral theorem, Cauchy Integral formula	3
6	Derivatives of analytic functions	1
7	Sequence and Series, Power series, Taylor series.	2
	OHT-I	
8	Laurent series	2
9	Singularities and Zeros	2
10	Residue integration method, Evaluation of integrals.	4
11	Periodic functions, Trigonometric series, Fourier series.	2
12	Fourier series for functions of any period.	3
13	Even and Odd functions, Half range expansions.	2
	OHT-II	
14	Complex Fourier series.	1
15	Fourier integrals.	2
16	Fourier Transform.	3
17	Concept of mapping, Complex mapping functions, Conformal mappings and its applications.	3
18	Introduction, Definition, examples and properties of Z-transform.	3
19	Inverse of Z-transform.	1
20	Solution of Difference equation.	2
	ESE	
	Total	45



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Weightages:

Quizzes:	10%
Assignments:	10%
OHT-1:	15%
OHT-2:	15%
Final Exam:	50%

Grading Policy:

Quiz Policy:	The quizzes will be unannounced and normally last for ten minutes. The question framed is to test the concepts involved in last few lectures. Number of quizzes that will be used for evaluation is at the instructor's discretion. Grading for quizzes will be on a fixed scale of 0 to 10. A score of 10 indicates an exceptional attempt towards the answer and a score of 1 indicates your answer is entirely wrong but you made a reasonable effort towards the solution. Scores in between indicate very good (8-9), good (6-7), satisfactory (4-5), and poor (2-3) attempt. Failure to make a reasonable effort to answer a question scores a 0.
Assignment Policy:	In order to develop comprehensive understanding of the subject, assignments will be given. Late assignments will not be accepted / graded. All assignments will count towards the total (No 'best-of' policy). The students are advised to do the assignment themselves. Copying of assignments is highly discouraged and violations will be dealt with severely by referring any occurrences to the disciplinary committee. The questions in the assignment are meant to be challenging to give students confidence and extensive knowledge about the subject matter and enable them to prepare for the exams.
Plagiarism:	SEECS maintains a zero tolerance policy towards plagiarism. While collaboration in this course is highly encouraged, you must ensure that you do not claim other people's work/ ideas as your own. Plagiarism occurs when the words, ideas, assertions, theories, figures, images, programming codes of others are presented as your own work. You must cite and acknowledge all sources of information in your assignments. Failing to comply with the SEECS plagiarism policy will lead to strict penalties including zero marks in assignments and referral to the academic coordination office for disciplinary action.