Faculty of Engineering & Technology

Complex Variable and Special Functions (Math 5)

Information :

Course Code :	MTH 311	**Level** :	Undergraduate	**Course Hours :**	3.00- Hours

Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Associate Professor	Hany Ahmed Attia El Gohary	
Lecturer	Soliman Abdulkarim Alkhatib	3
Teaching Assistant	Osama Mohamed Abdelrahman Ahmed Zaid	
Teaching Assistant	Ahmed Elsayed Abdellatif Ibrahim Bedeir	

Area Of Study :

To familiarize students with the basic concepts of Complex Variable and Special Functions and to make them able to develop an understanding of mathematical concepts that provide a foundation for the mathematics encountered in Engineering. The course allows students to work at their own level there by developing confidence in mathematics and general problem solving. On successful completion of this course the student will be able to:
1. demonstrate a sound understanding of a number of mathematical topics that are essential for studies in Engineering;
2. interpret and solve a range of problems involving mathematical concepts relevant to MTH 311;
3. Effectively communicate the mathematical concepts and arguments contained in this course.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Provide a through understanding and working knowledge of mathematics relevant to this course
2 -	Develop techniques for solving problems that may arise in every day life

b.Intellectual Skills: :	
1 -	Demonstrate knowledge of the theory, concepts, methods,and techniques of Complex variables and Special Functions, and ordinarily equations
2 -	Think logically
3 -	Rules and solve problems
4 -	Organize tasks into a structured form
5 -	Evaluate the evolving state of knowledge in a rapidly developing area
6 -	Transfer appropriate knowledge and methods from one topic within the subject to another

c.Professional and Practical Skills: :	
1 -	Understand Function of a complex variable and elementary functions

2 -	Understand the analytically, Cauchy Riemann equations and Complex integrals	
3 -	Know the Taylor and Laurent series and be able to evaluation real integrals by residues	
4 -	The relationship between Gamma and Beta functions and be able to calculate integrals	
5 -	Understand conformal Mapping and be able to calculate integrals	
6 -	Know Bessel's functions and be able to calculate the solution of differential equation	
7 -	Understand the definitions and types of partial differential equations	
8 -	Understand D'fflambert solution of Wave Equation and Separation of variables for Heat Equation and be able to determine a unique solution. But first we will relate the canonical forms to equations describing physical phenomena.	
9 -	know Finite difference method for partial solutions of differential equations	

d. General and Transferable Skills: :

1 -	Gain the principle of quality control
2 -	Develop skills related to creative thinking, problem solving

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Functions of a complex variable: Elementary functions, analytically, Cauchy-Riemann equations.	10	6	4
Complex Integrals: Cauchy Integral formula, Taylor and Laurent series	10	6	4
Cauchy Residues Theorem (Evaluation of real integrals by residues), Conformal Mapping	2	2	0
First Exam	5	3	2
Special functions: Gamma and Beta functions, Bessel functions and Legendre polynomials, power series solution of ordinary differential equations	16	12	4
Partial differential equation: Definitions and types, solution of Wave Problem	16	12	4
Second Exam	3	1	2
Heat Equation, Laplace's equations in different systems of coordinates, and Finite difference method for partial solutions of differential equations	16	12	4
Final Exam	2	2	0

Teaching And Learning Methodologies :

Lectures
Tutorial
Class discussions and activities
Homework and self-study

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments and quizzes	20.00	1	
Attendance and Participation	10.00	1	
Final-term Exam	40.00	16	To assess overall understandings, concepts, Knowledge, Problem solving, and mathematical skills delivered by the course
First Exam	15.00	7	To assess the levels of math skills needed for successful completion of the course, and to improve teaching and learning for all students
Second Exam	15.00	12	To assess comprehension, Knowledge, Problem solving, and mathematical skills delivered by the course after 6 weeks of studying

Course Notes :

Course notes & handouts

Recommended books :

Advanced Engineering Mathematics, Dennis G. Zill, warrens. Wright, Michael R, Cullen, Fourth Edition, 2011