FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

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
Lecturer	Ahmed Mahsoup Mohamed ElHadidi	3
Assistant Lecturer	TAREK ALI ABDALLAH TEAMA	

Area Of Study :

The overall aims of the course are
Demonstrate a conscious understanding of the concepts of special functions and complex analysis.
Develop studentsô mathematical skills for the methods of solution of partial differential equations.
Acquire skills for the application of special functions and complex analysis to solve electrical engineering problems

Description :

Power Series solutions of ordinary Differential equations. Solutions about Ordinary Points, Solutions about Singular Points. Frobineous theorem. Special functions, Partial differential equations, heat and wave equations. Laplace equation in Rectangular and Polar coordinates, Dôlambert solution, Numerical solutions of Partial differential equations. Functions of complex variables, Cauchy-Riemann Equations, Complex integrals, Laurent series, Evaluation of real integrals by residues. Conformal mappings.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Explain the Power Series solutions of ordinary Differential Solutions using Frobineus theorem.
2 -	Identifying Partial differential equations, their types and methods of solutions.
3 -	Define Gamma, Beta, and Bessel functions, and Legendre Polynomials as solutions of partial differential equations.
4 -	Demonstrate Elementary complex functions, Cauchy-Riemann Equations, Complex integrals, Laurent series, and the evaluation of real integrals by residues.
5 -	Describe conformal mappings for Mechanical engineering applications.
b.Intellectual Skills: :	
1 -	Apply Special functions, power series solutions to solve Mechanical engineering problems.
2 -	Apply numerical solutions of P.D.E to solve problems related to heat, wave, and Laplace equations
3 -	Solving improper integrals converted to Gamma and Beta functions
4 -	Applying Cauchy-Riemann Equations, Laurent series, and residues theorem for the solution of complex engineering problems.

5 -	Creating conformal mapping procedures for the solution of complex functions problems.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Power Series solutions of ordinary Differential equations.	5	3	2
Frobineous Theorem	5	3	2
Special functions , Gamma , Beta , Bessel functions	5	3	2
Legendre Polynomial	5	3	2
Partial differential equations, Definitions and Classification of equations,	5	3	2
Separable Partial differential equations, heat equation, Wave equation	5	3	2
D'lambert solution of wave equation	5	3	2
Laplace equation in Rectangular and Polar coordinates	5	3	2
Numerical solutions of Partial differential equations, Finite difference method	10	6	4
Functions of complex variables, Elementary complex functions	5	3	2
Cauchy-Riemann Equations	5	3	2
Complex integrals, Laurent series	5	3	2
Evaluation of real integrals by residues	5	3	2
Conformal mappings	5	3	2

Teaching And Learning Methodologies :

Interactive Lecturing
Problem solving
Discussion

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments	5.00		
Final exam	40.00	16	
First Mid Term Exam	20.00	5	To assess the levels of math skills needed for successful completion of the course, and to improve teaching and learning for all students
Participation	10.00		To assess overall understandings, concepts, Knowledge, Problem solving, and mathematical skills delivered by the course
Quiz Exam	5.00		
Second Mid Term Exam	20.00	10	To assess comprehension, Knowledge, Problem solving, and mathematical skills delivered by the course after 6 weeks of studying

Recommended books :

Erwin Kreyszig. "Advanced Engineering Mathematics", 10th edition, John Wiley& Sons, INC, 2010.

Robert T. Smith, Roland B Minton. Calculus: Early Transcendental Functions. 4th. edition. McGraw ï HILL International Edition, 2012