FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

Faculty of Engineering & Technology

Transformation and Numerical Analysis (Math 4)

Information :

Course Code :	MTH 212	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Department of Structural Engineering & Construction Management

Instructor Information :

Title	Name	Office hours
Lecturer	Mohamed Reda Ali Mohamed	2
Assistant Lecturer	Basma Magdy Ahmed Mohamed	

Area Of Study :

Demonstrate a conscious understanding of the concepts of integral transforms, Laplace and Fourier transforms.
Å Develop studentsômathematical skills for the methods of solution of initial and boundary values problems by using Laplace and Fourier Transforms, Fourier series, and Fourier integrals.
ÅAcquire skills for the application of Numerical methods to the solution of electrical engineering problems.

Description :

Laplace Transforms. Definitions. Properties and theorems. Inverse Laplace transforms. Calculating of Laplace transforms, Periodic functions, unit-step functions, and Dirac delta functions. Calculating of Inverse Laplace Transforms. Solution of Initial value problems and integral equations by Laplace transforms. Fourier series. Periodic and non-periodic Functions. Series of odd and even functions. Convergence Theorem.. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms and Applications. Numerical solution of nonlinear equations, Newton's method. Secant method. Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods. Least Squares methods. Interpolation

Course outcomes :

a.Knowledge and Understanding: :	
1 -	a1- Recognize the fundamental concepts of Laplace transforms, Inverse Laplace Transforms, and Laplace transform for derivatives.
2 -	a2- Define Shifted Laplace transform, unit ï step functions, unit impulses, Dirac delta-function, Fourier series, Fourier integrals, and Fourier Transforms.
3 -	a3- Explain Laplace transforms, Fourier series, Fourier integrals, and Fourier transforms, with convergence for the solution of initial values problems.
4 -	a4- State the difference between approximate solutions, interpolate solution, numerical solutions, and exact solutions.
5 -	a5- Outlines, Euler methods, and Rung -Kutta methods for the numerical solutions of Initial value problems, and Least squares method, and interpolation by Lagrange polynomials for tabulated and explicit functions.
b.Intellectual Skills: :	
1 -	b1- Recognizing methods of calculating Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.

2 -	b2- Use Laplace Transforms, Inverse Laplace Transforms, Fourier series, Fourier Integrals, and Fourier Transforms for the solution of initial values problems.
3 -	b3- Use Fourier series, Fourier integrals, an Fourier Transform to Approximate functions.
4 -	b4- Apply Laplace and Inverse Laplace transform, Fourier Transforms, and Rung -Kutta, Euler, and modified Euler, for the solution of initial value problems.
5 -	b5- Approximate and interpolate functions by using Least squares methods, and interpolation by Lagrange polynomials at the intellectual level required of this course.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Laplace Transforms. Definition. Properties and theorems. Inverse Laplace transforms.	10	6	4
Calculating of Laplace transforms of algebraic and transcendental functions, Periodic functions, derivatives, unit-step functions, unit impulses, and Dirac delta functions.	10	6	4
Calculating of Inverse Laplace Transforms. Solution of Initial value problems	10	6	4
Integral equations by Laplace transform, Fourier series. Periodic and non-periodic Functions.	10	6	4
Series of odd and even functions. Half intervals Fourrier Series Convergence Theorem	10	6	4
Fourier Integrals and Fourier Transforms. Definitions and properties of Fourier integrals and transforms. Finite Fourier transforms. Applications.	10	6	4
Numerical solution of Initial Value problems. Euler, Modified Euler, and Runge Kutta methods. Applications.	10	6	4
Least Squares methods. Interpolation.	5	3	2

Teaching And Learning Methodologies :

interactive Lecturing
Discussion
Problem solving

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments and Quizzes	10.00		
Attendance and Participation	10.00		
Final-term Exam	40.00		
First Mid Exam	20.00		
Second Mid Exam	20.00		

Course Notes :

Handouts

Recommended books :

Erwin Kreyszig. "Advanced Engineering Mathematics", 10 editions, John Wiley& Sons, INC, 2010.
Earl W. Swokowski, "Calculus with Analytic geometry, Prindle, Weber & Schmidt
Peter V. O'Neil, "Advanced Engineering Mathematics", Thomson.

Web Sites :

- www.wolframalpha.com
- www.sosmath.com, www.math.hmc.edu,
- www.tutorial.math.lamar.edu,
- www.web.mit.edu