

**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	Ahmed Mahsoub Mohamed ElHadidi	2
Lecturer	Mohamed Reda Ali Mohamed	
Lecturer	Hany Abd El Ghaffar Abd El Aty El Deeb	1
Assistant Lecturer	Basma Magdy Ahmed Mohamed	
Assistant Lecturer	TAREK ALI ABDALLAH TEAMA	5
Teaching Assistant	Mariam Mohamed Kamal Abdelaziz	

**Area Of Study :**

Demonstrate a conscious understanding of the concepts of integral transforms, Laplace and Fourier transforms.  
 Develop students' mathematical skills for the methods of solution of initial and boundary values problems by using Laplace and Fourier Transforms, Fourier series, and Fourier integrals.  
 Acquire 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- Define the main terms of Laplace Transforms & its applications
2 -	a2- Explain the principals of inverse Laplace Transforms
3 -	a3- Describe the main concept of integral equations by Laplace transform
4 -	a4- List the main items of Series of odd & even functions

**b. Intellectual Skills: :**

1 -	b1- Calculate the values of Laplace Transforms & its applications
2 -	b2- Analyze the system of inverse Laplace Transforms

3 -	b3- Solve problems regarding integral equations by Laplace transform
4 -	b4- Assess issues of Series of odd & even functions
5 -	b5- Solve problems regarding Fourier Integrals & Transforms
6 -	b6- Calculate the values of numerical solution
<b>c. Professional and Practical Skills: :</b>	
1 -	c1- Prepare technical reports for numerical solution
<b>d. General and Transferable Skills: :</b>	
1 -	d1- Cooperate and communicate effectively

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Laplace Transforms. Definition. Properties and theorems. Inverse Laplace transforms.	20	12	8
inverse Laplace Transforms	10	6	4
integral equations by Laplace transform	10	6	4
Series of odd & even functions	10	6	4
Fourier Integrals & Transforms	10	6	4
numerical solution	10	6	4
Revision	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	15.00		
Attendance and Participation	15.00		
Final-term Exam	40.00		
First Mid Exam	15.00		
Second Mid Exam	15.00		

**Course Notes :**

Handouts
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**Recommended books :**

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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 :**

- o [www.wolframalpha.com](http://www.wolframalpha.com)
- o [www.sosmath.com](http://www.sosmath.com), [www.math.hmc.edu](http://www.math.hmc.edu),
- o [www.tutorial.math.lamar.edu](http://www.tutorial.math.lamar.edu),
- o [www.web.mit.edu](http://www.web.mit.edu)