SHORT SYLLABUS

BMAT102L Differential Equations and Transforms
4 Credits (3-1-0)
Prerequisites: Calculus Second order non-homogenous differential equations with constant coefficients-Method of undetermined coefficients-Method of Variation of parameters-Solving Damped forced oscillations and LCR circuit theory problems. Formation of partial differential equations –Solutions of standard types of first order partial differential equations – Lagrange's linear equation-Method of separation of variables. Properties of Laplace transform-Laplace transform of standard functions and periodic functions. Inverse Laplace transform- Applications. Solution of ODE's - Solution to First order. Fourier series - Dirichlet's conditions - Half range series –Parseval's identity- Simple applications to solve PDE. Z-transform of standard functions - Inverse Z-transform- Difference equation - First and second order difference equations with constant coefficients - Solution of simple difference equations using Z-transform.

BMAT102L	Differential Equations and Transforms	L	T	P	C
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Pre-requisite	**BMAT101L, BMAT101P**	**Syllabus version**			
		1.0			

Course Objectives

1. To impart the knowledge of Laplace transform, an important transform techniques for Engineers which requires knowledge of integration.
2. Presenting the elementary notions of Fourier series, this is vital in practical harmonic analysis.
3. Enriching the skills in solving initial and boundary value problems.
4. Impart the knowledge and application of difference equations and the Z-transform in discrete systems that are inherent in natural and physical processes.

Course Outcomes

At the end of the course the student should be able to:

1. Find solution for second and higher order differential equations, formation and solving partial differential equations.
2. Understand basic concepts of Laplace Transforms and solve problems with periodic functions, step functions, impulse functions and convolution.
3. Employ the tools of Fourier series and Fourier transforms.
4. Know the techniques of solving differential equations and partial differential equations.
5. Know the Z-transform and its application in population dynamics and digital signal processing.

Module:1	**Ordinary Differential Equations (ODE)**	**6 hours**

Second order non- homogenous differential equations with constant coefficients- Differential equations with variable coefficients- method of undetermined coefficients-method of Variation of parameters-Solving Damped forced oscillations and LCR circuit theory problems.

Module:2	**Partial Differential Equations (PDE)**	**5 hours**

Formation of partial differential equations – Singular integrals — Solutions of standard types of first order partial differential equations – Lagrange's linear equation-Method of separation of variables

Module:3	**Laplace Transform**	**7 hours**

Definition- Properties of Laplace transform-Laplace transform of standard functions - Laplace transform of periodic functions-Unit step function-Impulse function. Inverse Laplace transform-Partial fractions method and by Convolution theorem..

Module:4	**Solution to ODE and PDE by Laplace transform**	**7 hours**

Solution of ODE's – Non-homogeneous terms involving Heaviside function, Impulse function - Solving Non-homogeneous system using Laplace transform - solution to First order PDE by Laplace transform.

Module:5	**Fourier Series**	**6 hours**

Fourier series - Euler's formulae- Dirichlet's conditions - Change of interval - Half range series – RMS value – Parseval's identity.

Module:6	**Fourier Transform**	**6 hours**

Complex Fourier transform - properties - Relation between Fourier and Laplace Transforms- Fourier sine and cosine transforms – Parseval's identity- Convolution Theorem and simple applications to solve PDE.

Module:7	**Z-Transform**	**6 hours**

Definition of Z-transform and Inverse Z-transform - Standard functions - Partial fractions and

convolution method. Difference equation - first and second order difference equations with constant coefficients - solution of simple difference equations using Z-transform.		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours: **Total Tutorial hours :**	**45 hours** **15 hours**

Text Book(s)

1. Erwin Kreyszig, Advanced Engineering Mathematics, 2015, 10th Edition, John Wiley India.
2. B.S. Grewal, Higher Engineering Mathematics, 2020, 44th Edition, Khanna Publishers.

Reference Books

1. Michael D. Greenberg, Advanced Engineering Mathematics, 2006, 2nd Edition, Pearson Education, Indian edition.
2. A First Course in Differential Equations with Modelling Applications, Dennis Zill, 2018, 11th Edition, Cengage Publishers.

Mode of Evaluation: CAT, written assignment, Quiz, FAT

Recommended by Board of Studies	24-06-2021		
Approved by Academic Council	No. 64	Date	16-12-2021