

<p align="center"><b>B.E.(Common to all Programmes)</b>  <b>Outcome Based Education (OBE) and Choice Based Credit System (CBCS)</b>  <b>SEMESTER - III</b></p>			
<p align="center"><b>TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES</b>            (Common to all Programmes)</p>			
Course Code	18MAT31	CIE Marks	40
Teaching Hours/Week (L: T:P)	(2:2:0)	SEE Marks	60
Credits	03	Exam Hours	03
<b>Course Learning Objectives:</b> <ul style="list-style-type: none"> <li>To have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z-transforms.</li> <li>To develop the proficiency in variational calculus and solving ODE's arising in engineering applications, using numerical methods.</li> </ul>			
<b>Module-1</b>			
<b>Laplace Transform:</b> Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems. <b>Inverse Laplace Transform:</b> Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Solution of linear differential equations using Laplace transforms.			
<b>Module-2</b>			
<b>Fourier Series:</b> Periodic functions, Dirichlet's condition. Fourier series of periodic functions period $2\pi$ and arbitrary period. Half range Fourier series. Practical harmonic analysis.			
<b>Module-3</b>			
<b>Fourier Transforms:</b> Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems. <b>Difference Equations and Z-Transforms:</b> Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.			
<b>Module-4</b>			
<b>Numerical Solutions of Ordinary Differential Equations(ODE's):</b> Numerical solution of ODE's of first order and first degree- Taylor's series method, Modified Euler's method. Runge - Kutta method of fourth order, Milne's and Adam-Bash forth predictor and corrector method (No derivations of formulae)-Problems.			
<b>Module-5</b>			
<b>Numerical Solution of Second Order ODE's:</b> Runge-Kutta method and Milne's predictor and corrector method. (No derivations of formulae). <b>Calculus of Variations:</b> Variation of function and functional, variational problems, Euler's equation, Geodesics, hanging chain, problems.			
<b>Course outcomes:</b> At the end of the course the student will be able to: <ul style="list-style-type: none"> <li>CO1: Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.</li> <li>CO2: Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.</li> <li>CO3: Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.</li> <li>CO4: Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.</li> <li>CO5:Determine the externals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.</li> </ul>			

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
<b>Textbooks</b>				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10 <sup>th</sup> Edition, 2016
2	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	44 <sup>th</sup> Edition, 2017
3	Engineering Mathematics	Srimanta Pal et al	Oxford University Press	3 <sup>rd</sup> Edition, 2016
<b>Reference Books</b>				
1	Advanced Engineering Mathematics	C. Ray Wylie, Louis C. Barrett	McGraw-Hill Book Co	6 <sup>th</sup> Edition, 1995
2	Introductory Methods of Numerical Analysis	S. S. Sastry	Prentice Hall of India	4 <sup>th</sup> Edition 2010
3	Higher Engineering Mathematics	B.V. Ramana	McGraw-Hill	11 <sup>th</sup> Edition, 2010
4	A Textbook of Engineering Mathematics	N. P. Bali and Manish Goyal	Laxmi Publications	6 <sup>th</sup> Edition, 2014
5	Advanced Engineering Mathematics	Chandrika Prasad and Reena Garg	Khanna Publishing,	2018
<b>Web links and Video Lectures:</b>				
1. <a href="http://nptel.ac.in/courses.php?disciplineID=111">http://nptel.ac.in/courses.php?disciplineID=111</a>				
2. <a href="http://www.class-central.com/subject/math(MOOCs)">http://www.class-central.com/subject/math(MOOCs)</a>				
3. <a href="http://academicearth.org/">http://academicearth.org/</a>				
4. VTU EDUSAT PROGRAMME - 20				

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