ST. FRANCIS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
UNIVERSITY SYLLABUS

SUBJECT: ENGINEERING MATHEMATICS III
SEM-III/2023-24

Course Code	Course Name	Teaching Scheme (contact hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
ITC301	Engineering Mathematics-III	03	…..	01*	03	…..	01	04

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term work	Pract/Oral	Total
		Internal Assessment			End Sem.			
		Test-1	Test-2	Avg.				
ITC301	Engineering Mathematics-III	20	20	20	80	25	…..	125

*-Should be conducted batch wise.

Course Objectives-

1. To learn the Laplace Transform, Inverse Laplace Transform of various functions, its applications.
2. To understand the concept of Fourier Series, its complex form and enhance the problem solving skills
3. To understand the concept of complex variables, C-R equations with applications.
4. To understand the basic techniques of statistics like correlation, regression and curve fitting for data analysis, Machine learning and AI.
5. To understand some advanced topics of probability, random variables with their distributions and expectations.

Course Outcomes-

Course Outcomes	
C301.1	To **Understand** the concept of Laplace transform and its application to **solve** the real integrals in engineering problems. (PSO1) (PO1 & PO2)
C301.2	To **Understand** the concept of inverse Laplace transform of various functions and its applications in engineering problems. (PSO1) (PO1 & PO2)
C301.3	To **Expand** the periodic function by using Fourier series for real life problems and complex engineering problems. (PSO1) (PO1 & PO2)
C301.4	To **Understand** complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic function. (PSO1) (PO1 & PO2)
C301.5	To **Apply** the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI. (PSO1) (PO1 & PO2)
C301.6	To **Understand** the concepts of probability and expectation for getting the spread of the data and distribution of probabilities. (PSO1) (PO1 & PO2)

Syllabus Detailing

Sr. No	Module	Detailed Content	Hours	CO Mapping
I	Laplace Transform	1.1 Definition of Laplace transform Condition of Existence of Laplace transform (1hr) 1.2 Laplace Transform (L) of Standard Functions like, sin(at), cos(at), sinh(at), cosh(at) (2hrs) 1.3 Properties of Laplace Transform: Linearity, First Shifting theorem, Second Shifting Theorem, change of scale Property, multiplication by t, Division by t, Laplace Transform of derivatives and integrals (Properties without proof) (3hrs) 1.4 Evaluation of integrals by using Laplace Transformation (1hr)	07	CO1
II	Inverse Laplace Transform	2.1 Inverse Laplace Transform, Linearity property, use of standard formulae to find inverse Laplace Transform, finding Inverse Laplace transform using derivatives. (2hrs) 2.2 Partial fractions method to find inverse Laplace transform. (2hrs) 2.3 Inverse Laplace transform using Convoluti0on theorem (without proof). (2hrs) **Self Learning Topics:** Heaviside unit step function, Dirac-delta function, Laplace transform of Periodic function. 2. Applications to solve initial and boundary value problems involving ordinary differential equations.	06	CO2
III	Fourier Series	3.1 Dirichlet's conditions, Definition of Fourier series and Parseval's Identity (without proof) (1hr) 3.2 Fourier series of periodic function with period 2p and 2l. (2hrs) 3.3 Fourier series of even and odd functions. (2hrs) 3.4 Half range Sine and Cosine Series. (2hrs) **Self Learning Topics:** 1. Complex form of Fourier Series. 2. Orthogonal and Orthonormal set of functions. 3. Fourier Transform	07	CO3
IV	Complex Variables	4.1 Function f(z)of complex variable, limit, continuity and differentiability of f(z) analytic function, necessary and sufficient conditions for f(z) to be analytic (without proof). (2hrs) 4.2 Cauchy-Riemann equations in Cartesian coordinates (without proof). (1hr) 4.3 Milne-Thomson method to determine analytic function f(z)when real part (u) or Imaginary part (v) or its combination (u + v or u-v) is given. (2hrs) 4.4 Harmonic function, Harmonic conjugate and orthogonal trajectories (2hrs) **Self Learning Topics:** Conformal mapping, linear, bilinear mapping, cross ratio, fixed points and standard transformations.	07	CO4
V	Statistical Techniques	5.1Karl Pearson's Coefficient of correlation (r) (1hr)	06	CO5

		5.2 Spearman's Rank correlation coefficient (R) (with repeated and non-repeated ranks) (1hr) 5.3 Lines of regression (2hrs) 5.4 Fitting of first and second degree curves (2hrs). **Self Learning Topics:** Covariance, fitting of exponential curve		
VI	Probability	6.1 Definition and basics of probability, conditional probability (1hr) 6.2 Total Probability Theorem and Baye's theorem (1hr) 6.3 Discrete and continuous random variable with probability distribution and probability density function. (2hrs) 6.4 Expectation of random variables with mean, variance and standard deviation, moment generating function up to four moments. (2hrs) **Self Learning Topics:** Skewness and Kurtosis of distribution (data)	06	CO6

Text Books:

1. Engineering Mathematics III Information Technology, G.V Kumbhojkar, Jamnadas Publications.
2. Engineering Mathematics- III (Mumbai University) - Prof Satishkumar Barot

Reference Books:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication
4. Complex Variables and Applications, Brown and Churchill, McGraw-Hill education.
5. Probability, Statistics and Random Processes, T. Veerarajan, McGraw-Hill education.
6. Theory and Problems of Fourier Analysis with applications to BVP, Murray Spiegel, Schaum's Outline Series.

Internal Assessment Test for 20 marks:

Internal Assessment (IAT) for 20 marks:

 IAT will consist of Two Compulsory Internal Assessment Tests.
Approximately 40% to 50% of syllabus content must be covered in First IA Test and remaining 40% to 50% of syllabus content must be covered in Second IA Test

End Semester Examination:

- Question paper will comprise of 10 MCQ for 20 marks 02 marks each and 03 subjective questions, each carrying 20 marks.
- Each subjective question have 06 sub questions out of which any 04 have to be solved.
- All questions need to be solved.
- Weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Module-1	**Laplace Transform**
Topics	Definition of Laplace transform Condition of Existence of Laplace transform. , Laplace Transform (L) of Standard Functions like , sin(at), cos(at), sinh(at), cosh(at), , Properties of Laplace Transform: Linearity, First Shifting theorem, Second Shifting Theorem, change of scale Property, multiplication by t, Division by t, Laplace Transform of derivatives and integrals (Properties without proof). , Evaluation of integrals by using Laplace Transformation
References	Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited.
Teaching Methodology	PPT & Chalk Board
Course outcomes addressed	**C301.1**: To **Understand** the concept of Laplace transform and its application to **solve** the real integrals in engineering problems. (PSO1) (PO1 & PO2)
Assessment tools used	Tutorial Test,DT 1, IAT 1, University Exam

Module-2	**Inverse Laplace Transform**
Topics	Inverse Laplace Transform, Linearity property, use of standard formulae to find inverse Laplace Transform, finding Inverse Laplace transform using derivatives. , Partial fractions method to find inverse Laplace transform. . , Inverse Laplace transform using Convolution theorem (without proof).
References	Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited.
Teaching Methodology	PPT & Chalk board
Course outcomes addressed	**C301.2:** To **Understand** the concept of inverse Laplace transform of various functions and its applications in engineering problems. (PSO1) (PO1 & PO2)
Assessment tools used	Tutorial Test, IAT 1, University Exam

Module-3	**Fourier Series**
Topics	Dirichlet's conditions, Definition of Fourier series and Parseval's Identity (without proof) , Fourier series of periodic function with period 2p and 2l. , Fourier series of even and odd functions. , Half range Sine and Cosine Series.
References	Theory and Problems of Fourier Analysis with applications to BVP, Murray Spiegel, Schaum's Outline Series.
Teaching Methodology	PPT & Chalk board
Course outcomes addressed	**C301.3:** To **Expand** the periodic function by using Fourier series for real life problems and complex engineering problems. (PSO1) (PO1 & PO2)
Assessment tools used	Tutorial Test, Descriptive Test 2, University Exam

Module-4	**Complex Variables**
Topics	Function f(z)of complex variable, limit, continuity and differentiability of f(z) analytic function, necessary and sufficient conditions for f(z) to be analytic (without proof). , Cauchy-Riemann equations in Cartesian coordinates (without proof). ,Milne-Thomson method to determine analytic function f(z)when real part (u) or Imaginary part (v) or its combination (u + v or u-v) is given. , Harmonic function, Harmonic conjugate and orthogonal trajectories
References	Complex Variables and Applications, Brown and Churchill, McGraw-Hill education.
Teaching Methodology	PPT & Chalk board
Course outcomes addressed	**C301.4:** To **Understand** complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic function. (PSO1) (PO1 & PO2)
Assessment tools used	Tutorial Test, IAT 2, University Exam

Module-5	**Statistical Techniques**
Topics	Karl Pearson's Coefficient of correlation (r) , Spearman's Rank correlation coefficient (R) (with repeated and non-repeated ranks) , Lines of regression , Fitting of first and second degree curves
References	Probability, Statistics and Random Processes, T. Veerarajan, McGraw-Hill education.
Teaching Methodology	PPT & Chalk board
Course outcomes addressed	**C301.5:** To **Apply** the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI. (PSO1) (PO1 & PO2)
Assessment tools used	Tutorial Test, IAT 2, University Exam

Module-6	**Probability**
Topics	Definition and basics of probability, conditional probability, Total Probability Theorem and Baye's theorem, Discrete and continuous random variable with probability distribution and probability density function. Expectation of random variables with mean, variance and standard deviation, moment generating function up to four moments.
References	Probability, Statistics and Random Processes, T. Veerarajan, McGraw-Hill education.
Teaching Methodology	PPT & Chalk board
Course outcomes addressed	**C301.6:** To **Understand** the concepts of probability and expectation for getting the spread of the data and distribution of probabilities. (PSO1) (PO1 & PO2)
Assessment tools used	Tutorial Test, University Exam

Gaps Identified

Nil

Ms. Grishalda Dsouza — Dr. Prachi Raut

(Faculty in Charge) — (HOD-INFT)