TEACHING PLAN: MATHEMATICS-III

SCHOOL: Engineering & Technology		ACADEMIC SESSION: 2022 – 2023		FOR STUDENTS' BATCH: 2021-25 B. Tech. SEM-IV	
1	**Course code**	**BSC 201**			
2	**Course Title**	**Mathematics-III**			
3	**Credits**	**04**			
4	**Learning Hours**	**Lectures**	**03**		
		Assessment OR Tutorial	**01**		
		Guided Study			
		Total hours	**04**		
5	**Course Objective**	After Studying this lesson, you should be able to: (1) TO represent periodic functions using Fourier series (2) Get an idea of power series method to solve differential equations Familiar with Legendre equation and Legendre polynomial. (3) Write given function in terms of sine and cosine terms in Fourier series and also to get knowledge in Fourier transforms. (4) This course aims to provide detailed description Signals and System Analysis. Fourier series and Fourier transform, Laplace and Z Transform along with respect to SISO systems and State variable analysis for MIMO systems. (5) Solve partial differential equations of first order. (6) Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events. (7) Analyze statistical data graphically using frequency distributions and cumulative frequency distributions. Also identify the type of statistical situation to which different distributions can be applied.		
6	**Course Outcomes**	1. In-depth knowledge of Fourier analysis and its applications to solve problems in physics and electrical engineering. 2. An ability to construct and communicate reasoned arguments of an engineering mathematical nature in both written and oral form. 3. Understanding nature of complex analysis in engineering field and developing analytic skills in the field of complex function. 4. Study statistical techniques for data analysis, probabilistic risk assessment, and many other fields in the engineering world.			
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	Unit	**Section**	**Introduction**	**Reference Number**	**Teaching Methods**
	Unit-1	(a)	**Fourier transform:** Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val's identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.	RB1 927-952	White Board & PPT

	Unit - II	(a)	Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac's delta function, Differentiation and integration of transforms, Applications to differential equations.	TB2 885-932 RB1 889-908	White Board & PPT
	Unit-III	(a)	**Statistical Techniques:** Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions,	TB1 326-344 TB2 763-796	White Board & PPT
		(b)	Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear	TB1 351-364 TB2 796-847	White Board & PPT
	Unit-IV	(a)	**Functions of Complex Variable**: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.	TB2 506-513	White Board & PPT
	Unit-V	(a)	**Cauchy-Riemann equations**: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.	TB2 513-551	White Board & PPT

8	**Course Evaluation**	
8.1	**CA: 40%**	
8.1.1	**Attendance**	5%
8.1.2	**Assignment & presentation**	20%
8.1.3	**Class test**	15%
8.1.4	**Any other**	--
8.2	**MTE**	20%
8.3	**End-term examination: 40%**	
9	**Text Books & References**	
9.1	**Text book**	**TB1:** Bird, J. (2007). *Engineering Mathematics* **TB2:** H.K. Dass (1999). *Advanced Engineering Mathematics*, S Chand. **TB3:** Jeffrey, Advanced Engineering Mathematics, ELSEVIER **TB4:** Grewal B. S., *Higher engineering Mathematics*, Khanna Publication, New Delhi **TB5:** Keyszig E., *Advanced Engineering Mathematics*, Wiley Eastern Publication
9.2	**References**	**RB1:** shorturl.at/chnyK **RB2:** shorturl.at/tuN29 **RB3:** shorturl.at/hvV45 **RB4:** shorturl.at/ehCJ5 **RB5:** shorturl.at/mnqM0 **RB6:** shorturl.at/fuEKX

9.3	**Video References**	[1] https://www.youtube.com/watch?v=HoGNkZclxDU&list=PLs7oDAL8_ouJ5w8wCPtKnK2I09MlKC6kP [2] https://www.youtube.com/watch?v=vqJuFD0GdJA&list=RDCMUCY-ANi3wxkUSGhAel7T0TGw&start_radio=1&rv=vqJuFD0GdJA&t=3 [3] https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE [4] https://www.youtube.com/watch?v=VVYLpmKRfQ8&list=PL6C92B335BD4238AB [5] https://www.youtube.com/watch?v=Mwpz1zjPlzI&list=PLbMVogVj5nJS_i8vfVWJG16mPcoEKMuWT

CO-PO Mapping

Course Outcome	Program Outcome												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO 1	1	3	3	3	1	2	1	1	2	2	1	2	3	1	2	2
CO 2	2	3	3	3	2	2	2	1	2	1	2	2	3	2	2	2
CO 3	2	3	3	3	2	2	1	1	2	1	2	3	3	2	2	2
CO 4	2	3	3	3	2	3	2	2	2	2	1	2	3	3	2	2

Question Bank

1) Find the Fourier transform of the function $f(x) = \begin{cases} K, & 0 < x < a \\ 0 & , otherwise \end{cases}$
2) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$.
3) Find the sine and cosine Fourier transform of $2\,e^{-5x} + 5\,e^{-2x}$
4) Find the Fourier transform of F(x) $= e^{-a|x|}$ where $a > 0$ and $x \in (-\infty, \infty)$.
5) Find the Laplace transform of $e^{3t} + 5t^4 - 2cost + 3sint$.
6) Find the inverse Laplace transform of $\frac{1}{(s+1)(s^2+2s+2)}$.
7) Apply the Convolution theorem to evaluate $L^{-1}\frac{1}{(s-1)(s+3)}$.
8) Find the inverse Laplace transform of $\frac{2s^2-4}{(s+1)(s-2)(s-3)}$.
9) Solve the equation $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$ where y=1; $\frac{dy}{dx} = 2$; $\frac{d^2y}{dx^2} = 2$ at x=0
10) Compute Karl Pearson's coefficient of the correlation from the following data

x	17	19	23	35	40	48	42	54
y	2	13	11	24	13	18	50	37

11) A factory production line is manufacturing bolts using three machines, A, B and C. Of the total output, machine A is responsible for 25%, machine B for 35% and machine C for the

rest. It is known from previous experience with the machines that 5% of the output from machine A is defective, 4% from machine B and 2% from machine C. A bolt is chosen at random from the production line and found to be defective. What is the probability that it came from?

(a) Machine A

(b) Machine B

(c) Machine C

12) In an intelligence test conducted on 1000students, the average score was 42 and standard deviation 24 Find the

(i) Number of the student getting more than 50 marks

(ii) Number of the students getting marks between 30 to 54

13) Prove that Log (-5) = log 5 +i (2n+1)π.

14) Resolve log (1+i) into real and imaginary part

15) State and prove the C.R Equations in Polar form

16) If α and β be the imaginary cube roots of unity.

17) Prove that $\alpha \, .e^{\alpha x} + \beta \, .e^{\beta x} = -e^{\frac{-x}{2}} \left[\sqrt{3} \ \sin\frac{\sqrt{3}}{2}x + cos\frac{\sqrt{3}}{2}x\right]$

18) Split up the real and imaginary part $e^{(5+3i)^2}$ into the real and imaginary part.

19) State the Orthogonal system and prove it in Cauchy-Rieman equation.

20) The following data give the results of a sample survey. The letters Y,N, and D represents the three catagories.

D	N	N	Y	Y	Y	N	Y	D	Y
Y	Y	Y	Y	N	Y	Y	N	N	Y
N	Y	Y	N	D	N	Y	Y	Y	Y
Y	Y	N	N	Y	Y	N	N	D	Y

a. Prepare a frequency distribution table.

b. Calculate the relative frequencies and percentage for all categories.

c. What percentage of elements in this sample belong to category Y?

d. What percentage of elements in this sample belong to category N or D?

e. Draw the Bar graph for the percentage distribution.

21) The following table gives the frequency distribution of times(to the nearest hour) that 90 fans spent waiting in line to buy tickets to a rock concert.

Waiting Time (hours)	**Frequency**
0 to 6	5
7 to 13	27

14 to 20	30
21 to 27	20
28 to 34	8

Answer the following questions from the table:

(i) The classes in the table is

(a)6 (b) 30 (c)90

(ii) The class width is

(a)6 (b)7 (c)34

(iii) The mid point of third class is

(a) 16.5 (b)17 (c)17.5

(iv) Lower boundary of the second class is

(a)6.5 (b)7 (c)7.5

(v) Upper limit of the second class is

(a) 12.5 (b)13 (c)13.5

(vi) The sample size is

(a)5 (b)90 (c)11

(vii) Relative frequency of the second class is

(a) 0.22 (b)0.41 (c)0.30

(viii) Relative frequency of the fifth class is

(a)8.89 % (b)22.22% (c)33.33%

(ix) Highest frequency of given data is

(a) 0.33 (b)5.56 (c)0.30

(x) Relative frequency of the fifth class is

(a)8.89 % (b)22.22% (c)33.33%

22) The following data set belongs to a population:

$5 \quad -7 \quad 2 \quad 0 \quad -9 \quad 1 \quad 61 \quad 07$

Then fill in the blank (each of 2 marks)

(i) Range is _____

(ii) Variance is _____

(iii) Standard deviation is _____