



Department of Applied Mathematics		I.P: MA22358
B.E/B.Tech : ECE	Regulation: 2022	Rev. No : 00
Academic Year: 2023-2024		Date: 01.08.2023
Sub. Code / Sub. Name : MA22358 – Transforms and Random Process		
Unit I : Fourier Series		

Unit Syllabus: Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic Analysis.

Objective: To introduce Fourier series analysis this is central to many applications in engineering.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to periodic functions, Bernoulli's formula, Fourier series and Dirichlet's conditions.	T1-pg.395	LCD/BB
2	General Fourier series and problems based on that.	T1-pg.395-407	LCD/BB
3	Fourier series for functions with arbitrary intervals	T1-pg.395-407	LCD/BB
4	Tutorial class	Work sheet	LCD/BB
5	Introduction to odd and even functions and Fourier series for odd and even functions	T1-pg.408-411	LCD/BB
6	Half range cosine series and problems.	T1-pg.412-416	LCD/BB
7	Half range sine series and problems.	T1-pg.412-416	LCD/BB
8	Tutorial class	Work sheet	LCD/BB
9	RMS value of a function, Derivation of Parseval's Identity	T1-pg.417-419	LCD/BB
10	Problems using Parseval's Identity	T1-pg.417-419	LCD/BB
11	Harmonic analysis for functions with period 2π and arbitrary period	T1-pg.420-423	LCD/BB
12	Tutorial class	Work sheet	LCD/BB
Content beyond syllabus covered (if any): Application to specific area's included (like medical electronics) heat pulse.			

* Session duration: 50 minutes



Sub. Code / Sub. Name: MA22358 – Transforms and Random Process

Unit III : Partial Differential Equations

Unit Syllabus: Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear homogeneous partial differential equations of second and higher order with constant coefficients.

Objective: To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes.

Session No *	Topics to be covered	Ref	Teaching Aids
13	Introduction to PDE and Formation of PDE by elimination of arbitrary constants and by elimination of arbitrary functions.	T1-pg.577	LCD/BB
14	Formation of PDE by elimination of arbitrary functions.	T1-pg.577-579	LCD/BB
15	Tutorial class	Work sheet	LCD/BB
16	Various solutions of a general PDE – complete, singular, particular and general integrals	T1-pg.584-587	LCD/BB
17	Solving standard types of PDEs of the form $F(p, q) = 0$ and $F(z, p, q) = 0$.	T1-pg.584-587	LCD/BB
18	Solving standard types of PDEs of the form $z = px + qy + f(p, q)$ and $F_1(x, p) = F_2(y, q)$.	T1-pg.584-587	LCD/BB
19	Equations reducible to standard forms	T1-pg.584-587	LCD/BB
20	Tutorial class	Work Sheet	LCD/BB
	Formative Assessment Test-I		
21	Solving Lagrange's linear equation by Method of multipliers	T1-pg.581-583	LCD/BB
22	Tutorial class	Work sheet	LCD/BB
23	Solution of homogeneous linear partial differential equations of second and higher order with constant coefficients.	T1-pg.590-595	LCD/BB
24	More problems on homogeneous linear partial differential equations of second and higher order with constant coefficients.	T1-pg.590-595	LCD/BB

Content beyond syllabus covered (if any): Basic concepts of partial differential equations.

* Session duration: 50 mins



Sub. Code / Sub. Name: MA22358 - Transforms and Random Process

Unit III : Fourier and Z - Transforms

Unit Syllabus: Fourier transform pair - Fourier sine and cosine transforms - Properties (without proof) - Convolution theorem - Parseval's identity. Z- Transforms - Elementary properties - Inverse Z - transform (using partial fraction) - Convolution theorem - Solution of difference equations using Z - transform.

Objective: To understand the basic concepts of the Fourier transform and Z-transform techniques and its application in Engineering.

Session No *	Topics to be covered	Ref	Teaching Aids
25	Introduction to infinite Fourier Transform and Z transforms	T1-pg.766	LCD/BB
26	Fourier transforms pair and problems.	T1-pg.766-768	LCD/BB
27	More problems on Fourier transform pair	T1-pg.766-768	LCD/BB
28	Fourier cosine and sine transform and problems	T1-pg.769-775	LCD/BB
29	More problems on Fourier cosine and sine transform	T1-pg.769-775	LCD/BB
29	Problems on Properties of FT, FCT and FST	T1-pg.769-775	LCD/BB
30	Problems based on elementary properties of Z-transforms	T1-pg.793-796	LCD/BB
31	Inverse Z - transform using partial fraction	T1-pg.805-807	LCD/BB
32	Inverse Z - transform using partial fraction	T1-pg.805-807	LCD/BB
33	Inverse Z - transform using Convolution theorem.	T1-pg.802-804	LCD/BB
34	Tutorial class	Work sheet	LCD/BB
35	Formation of difference equations	T1-pg.808-809	LCD/BB
36	Solution of difference equation using Z-transforms	T1-pg.808-809	LCD/BB
	Formative Assessment Test-II		

Content beyond syllabus covered (if any): Applications of transforms.



* Session duration: 50 mins

Sub. Code / Sub. Name: MA22358 – Transforms and Random Process

Unit IV : Random Variable

Unit Syllabus: Discrete and continuous random variables – Moment generating functions. Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Central limit theorem.

Objective: To provide the required Mathematical support in real life problems and develop probabilistic models. This can be used in several areas of science and engineering. To acquire skills in handling situations involving more than one random variable and functions of random variables.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Introduction to Discrete and continuous random variables,	T4-pg.41	LCD/BB
38	Probability mass function, probability density function.	R4-pg.38-42	LCD/BB
39	Cumulative distribution function and their properties	R4-pg.38-42	LCD/BB
40	Moments, Moment generating functions, properties	T4-pg.77-84	LCD/BB
41	Joint distributions	T4-pg.109	LCD/BB
42	Tutorial	Work sheet	LCD/BB
43	Marginal and conditional distributions.	R4.pg.81-83	LCD/BB
44	Covariance.	R4.pg.84-85	LCD/BB
45	Properties and problems on Correlation coefficients.	R4.pg.84-85	LCD/BB
46	Properties and problems on linear Regression.	R4.pg.84-85	LCD/BB
47	Central limit theorem	R4.pg.84-85	LCD/BB
48	Problems based on central limit theorem	R4.pg.84-85	LCD/BB
Content beyond syllabus covered (if any): Basic probability concepts			

* Session duration: 50 mins



Sub. Code / Sub. Name: MA22358 – Transforms and Random Process

Unit V : Random Process

Unit Syllabus: Classification – Stationary process – Poisson process – Gaussian process- Random telegraph process - Auto correlation functions – Power spectral density functions – Wiener-Khinchine theorem.

Objective: To understand and characterize phenomena which evolve with respect to time in Probabilistic manner.

Session No *	Topics to be covered	Ref	Teaching Aids
49	Introduction-Random process.	T4-pg.179	Teaching Aids
50	Classification of random process with examples	T4-pg.179	LCD/BB
51	Stationary processes-first and second order	T4-pg.185-194	LCD/BB
52	Wide-sense stationary processes (WSS)	T4-pg.185-194	LCD/BB
53	Problems solved	Work Sheet	LCD/BB
54	Poisson processes	T4-pg.203-206	LCD/BB
55	Gaussian process	T4-pg.206-208	LCD/BB
56	Random telegraph process.	T4-pg.208-210	LCD/BB
57	Auto correlation and Cross correlation function and properties	T4-pg.220-237	LCD/BB
58	Problems solved	T4-pg.220-237	LCD/BB
59	Power spectral density, Cross spectral density, Properties	T4-pg.220-237	LCD/BB
60	Wiener-Khinchine relation	T4-pg.220-237	LCD/BB
	Formative Assessment Test-III		

Content beyond syllabus covered (if any): Basic concepts of Standard probability Distributions

* Session duration: 50 mins



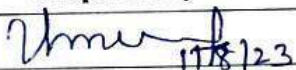
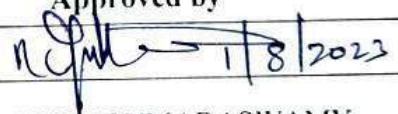
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TEXT BOOKS:

1. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi 2012.
2. Narayanan.S., ManicavachagomPillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt. Ltd. 1998.
3. Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.
4. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002.

REFERENCES:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10 th Edition, Wiley India, 2011.
2. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd , 2007
3. Veerarajan. T., "Transforms and Partial Differential Equations", Tata MGravHill PublishingCompany Ltd., New Delhi, 2012
4. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.

	Prepared by	Approved by
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Date	1/08/2023	1/08/2023
Remarks *:	-	
Remarks *:	-	

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD