

SEMESTER 4

MATHEMATICS FOR PHYSICAL SCIENCE – 4

Course Code	GCMAT401	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Mins.
Prerequisites (if any)	Basic calculus.	Course Type	Theory

Course Objectives:

1. To familiarize students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.
2. To provide the students with the basics of various numerical methods to develop problem solving skills used in various engineering disciplines.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Random variables, Discrete random variables and their probability distributions, Cumulative distribution function, Expectation, Mean and variance, Binomial distribution, Poisson distribution, Poisson distribution as a limit of the binomial distribution, Joint pmf of two discrete random variables, Marginal pmf, Independent random variables, Expected value of a function of two discrete variables. [Text 1: Relevant topics from sections 3.1 to 3.4, 3.6, 5.1, 5.2]	9
2	Continuous random variables and their probability distributions, Cumulative distribution function, Expectation, Mean and variance, Uniform, Normal and Exponential distributions, Joint pdf of two Continuous random variables, Marginal pdf, Independent random variables, Expectation value of a function of two continuous variables. [Text 1: Relevant topics from sections 3.1, 4.1, 4.2, 4.3, 4.4, 5.1, 5.2]	9

3	Confidence Intervals, Confidence Level, Confidence Intervals and One-side confidence intervals for a Population Mean for large and small samples (normal distribution and t -distribution), Hypotheses and Test Procedures, Type I and Type II error, z Tests for Hypotheses about a Population Mean (for large sample), t Test for Hypotheses about a Population Mean (for small sample), Tests concerning a population proportion for large and small samples. [Text 1: Relevant topics from 7.1, 7.2, 7.3, 8.1, 8.2, 8.3, 8.4]	9
4	Newton-Raphson Method, Gauss Elimination Method, Gauss - Jordan Method, Numerical solution of ordinary differential equations-Euler's method, Modified Euler's method, Runge - Kutta method of 2 nd Order, Numerical solution of Laplace equation –Jacobi's Method, Curve Fitting by Method of Least Squares - Straight lines, Parabola. (Text 2: Relevant topics from sections 2.5, 4.2, 7.5, 8.4, 8.5, 9.4)	9

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
2 Questions from each module. - Total of 8 Questions, each carrying 3 marks (8x3 =24marks)	- Each question carries 9 marks. - Two questions will be given from each module, out of which 1 question should be answered. - Each question can have a maximum of 3 sub divisions. (4x9 = 36 marks)	60

Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the concept, properties and important models of discrete random variables and to apply in suitable random phenomena.	K3
CO2	Understand the concept, properties and important models of continuous random variables and to apply in suitable random phenomena.	K3
CO3	Estimate population parameters, assess their certainty with confidence intervals, and test hypotheses about population means and proportions using z -tests and the one-sample t -test.	K3
CO4	Apply numerical methods to find solutions of linear system of equations, ordinary differential equations and Laplace equations.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	2
CO2	3	3	2	2	-	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2
CO4	3	3	2	2	-	-	-	-	-	-	-	2

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Probability and Statistics for Engineering and the Sciences	Devore J. L	Cengage Learning	9 th edition, 2016
2	Introductory Methods of Numerical Analysis	S S Sastry	PHI Learning Pvt Limited	5 th edition, 2012

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Probability, Random Variables and Stochastic Processes,	Papoulis, A. & Pillai, S.U.,	McGraw Hill.	4 th edition, 2002
2	Introduction to Probability and Statistics for Engineers and Scientists	Ross, S. M.	Academic Press	6 th edition, 2020
3	Numerical methods for Engineers	Steven C. Chapra, Raymond P. Canale	McGraw Hill Education	8 th edition, 2021

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://archive.nptel.ac.in/courses/117/105/117105085/
2	https://archive.nptel.ac.in/courses/117/105/117105085/
3	https://archive.nptel.ac.in/courses/117/105/117105085/
4	https://archive.nptel.ac.in/courses/111/107/111107105/