FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program: Bachelor in Science *(Diploma /Degree/Honors)*		Semester - IV	Session: 2024-2025
1	**Course Code**	**PHSE-02**	
2	**Course Title**	**Mathematical Physics-I**	
3	**Course Type**	**Discipline Specific Elective**	
4	**Pre-requisite (if, any)**	**As per Program**	
5	**Course Learning Outcomes(CLO)**	➢ Revise and apply the knowledge of calculus, vectors, vector calculus, probability and probability distributions in various cases. ➢ Illustrate proficiency in writing and solving Differential equation and solving them for a given physical system. ➢ Apply and interpret the curvilinear coordinates in problems with spherical and cylindrical symmetries. ➢ Use Dirac Delta function for various physical situation, especially in quantum mechanical approaches.	
6	**Credit Value**	**4 Credits**	***Credit = 15 Hours -learning & Observation***
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks: 40**

PART -B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods(01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course Contents)	No. of Period
I	**Calculus:** **Recapitulation:** Limits, continuity, average and instantaneous quantities, differentiation. Plotting functions, Intuitive ideas of continuous, differentiable, etc. functions and plotting of curves. Approximation: Taylor and binomial series (statements only). **Calculus of functions of more than one variable:** Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Constrained Maximization using Lagrange Multipliers. **Origin and Evolution of Mathematical concepts in Ancient India:** Bhaskaracharya, the Inventor of Calculus: some examples on calculus	16
II	**First Order and Second Order Differential equations:** First Order Differential Equations and Integrating Factor. Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of existence and Uniqueness Theorem for Initial Value Problems.Particular Integral. **Orthogonal Curvilinear Coordinates:** Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl andLaplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.	16

III	**Introduction to probability**: Independent random variables: Probability distribution functions; binomial, Gaussian, and Poisson, with examples. Mean and variance. Dependent events: Conditional Probability. Bayes' Theorem and the idea of hypothesis testing.	**15**
IV	**Dirac Delta function and its properties**: Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function. Problems based on dirac-delta function and its application	**13**
Keywords	Calculus, Lagrange Multipliers, Homogeneous Equations, Particular Integral, Probability distribution, Dependent events, Dirac delta function	

Signature of Convener & Members (CBoS):

PART–C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended –

1. Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jones and Bartlett Learning
2. Mathematical Physics, Goswami, 1st edition, Cengage Learning
3. Engineering Mathematics, S. Pal and S.C. Bhunia, 2015, Oxford University Press
4. Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
5. Essential Mathematical Methods, K. F. Riley & M.P.Hobson, 2011, Cambridge Univ. Press.
6. Mathematical Physics, H.K. Dass and R. Verma, S. Chand & Company

Reference Books Recommended–

1. Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013, 7th Edn., Elsevier.
2. An introduction to ordinary differential equations, E.A. Coddington, 2009, PHI learning
3. Differential Equations, George F. Simmons, 2007, McGraw Hill.
4. Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.

Online Resources–e-Resources / e-books and e-learning portals

1. NPTEL online Courses: https://archive.nptel.ac.in/courses/115/105/115105097/
2. NPTEL online Courses: https://nptel.ac.in/courses/115103036
3. e-gyankosh- https://egyankosh.ac.in/handle/123456789/97951
4. Origin and Evolution of Calculus in India: http://mathematical-forum.org/wp-content/uploads/2021/01/Paper-1.pdf
5. https://iks.iitgn.ac.in/wp-content/uploads/2016/02/Development-of-Calculus-in-India-K-Ramasubramanian-MD-Srinivas-2010.pdf
6. Indian Mathematics: NPTEL Course : https://nptel.ac.in/courses/111101080

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**100 Marks**
Continuous Internal Assessment (CIA):	**30 Marks**
End Semester Exam (ESE):	**70 Marks**

Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment/Seminar- **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- **5x4 =20Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-**4x10=40Marks**	

Name and Signature of Convener & Members of CBoS:

10/6/19