FIRST-YEAR OF MASTER OF SCIENCE PHYSICS REVISED SYLLABUS ACCORDING TO CBCS NEP2020

COURSE TITLE:-MATHEMATICAL METHODS
SEMESTER-I
W.E.F. 2023-2024

RECOMMENDED BY THE BOARD OF STUDIES IN PHYSICS
AND
APPROVED BY THE ACADEMIC COUNCIL

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal.Sangmeshwar, Dist. Ratnagiri-415804, Maharashtra, India

Academic Council Item No: **03 dated 8 July 2023**

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Master of Science
Name of the Department	:	Physics
Name of the Class	:	First Year
Semester	:	First
No. of Credits	:	04
Title of the Course	:	Mathematical Methods
Course Code	:	S501PHT
Name of the Vertical in adherence to NEP 2020	:	Major
Eligibility for Admission	:	BSc in Physics
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	PG
Pattern of Marks Distribution for SEE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2023-2024

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2023-2024)

SEMESTER - I **Paper No. – Physics Paper – I**

Course Title: Mathematical Methods **No. of Credits - 04**

Type of Vertical: Major **COURSE CODE: S501PHT**

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to…

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	Various formulae and steps involved in the methods
CLO-02	Understand	Know the importance of the mathematical methods
CLO-03	Apply	Apply various available methods to problems
CLO-04	Analyze	Explain the basic concepts behind the mathematical methods
CLO-05	Evaluate	How to use a particular mathematical technique for solving the problem
CLO-06	Create	Select proper mathematical technique for a given problem

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2023-2024)

SEMESTER - I **Paper No.– Physics Paper – I**

Course Title: Mathematical Methods **No. of Credits - 04**

Type of Vertical: Major **COURSE CODE: S501PHT**

COURSE CONTENT			
Module No.	**Content**	**Credits**	**No. of Lectures**
1	Complex Variables, Limits, Continuity, Derivatives, Cauchy-Riemann Equations, Analytic functions, Harmonic functions, Elementary functions: Exponential and Trigonometric, Taylor and Laurent series, Residues, Residue theorem, Principal part of the functions, Residues at poles, zeroes and poles of order m, Contour Integrals, Evaluation of improper real integrals, improper integral involving Sines and Cosines, Definite integrals involving sine and cosine functions.	**01**	**15**
2	Matrices, Eigenvalues and Eigen vectors, orthogonal, unitary and hermitian matrices, Diagonalization of Matrices, Applications to Physics problems. Introduction to Tensor Analysis, Addition and Subtraction of Tensors, summation convention, Contraction, Direct Product, Levi-Civita Symbol	**01**	**15**
3	General treatment of second order linear differential equations with non-constant coefficients, Power series solutions, Frobenius method, Legendre, Hermite and Laguerre polynomials, Bessel equations, Nonhomogeneous equation – Green's function, Sturm-Liouville theory.	**01**	**15**
4	Integral transforms: three dimensional fourier transforms and its applications to PDEs (Green function of Poisson's PDE), convolution theorem, Parseval's relation, Laplace transforms, Laplace transform of derivatives, Inverse Laplace transform and Convolution theorem, use of Laplace's transform in solving differential equations.	**01**	**15**
	Total	**04**	**60**

Reference Books:-

1. S. D. Joglekar, Mathematical Physics: The Basics, Universities Press 2005
2. S. D. Joglekar, Mathematical Physics: Advanced Topics, CRC Press 2007
3. M.L. Boas, Mathematical methods in the Physical Sciences, Wiley India 2006
4. G. Arfken and H. J. Weber: Mathematical Methods for Physicists, Academic Press 2005
5. A.K. Ghatak, I.C. Goyal and S.J. Chua, Mathematical Physics, McMillan

6. A.C. Bajpai, L.R. Mustoe and D. Walker, Advanced Engineering Mathematics, John Wiley
7. E. Butkov, Mathematical Methods, Addison-Wesley
8. J. Mathews and R.L. Walker, Mathematical Methods of physics
9. P. Dennery and A. Krzywicki , Mathematics for physicists
10. T. Das and S.K. Sharma, Mathematical methods in Classical and Quantum Mechanics
11. R. V. Churchill and J.W. Brown, Complex variables and applications, V Ed. Mc Graw. Hill
12. A.W.Joshi, Matrices and Tensors in Physics, Wiley India

Access to the Course

The course is available for all the students admitted for Master of Science in Physics.

Methods of Assessment

The assessment pattern would be 60:40, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

Pattern of Evaluation

The Examination/Evaluation pattern shall be framed by the Board of Examination with its final approval from the Academic Council of the College.