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

COURSE TITLE:- NUCLEAR MODELS AND PARTICLE PHYSICS
SEMESTER - III
W.E.F. 2024 - 2025

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: **dated 19 April 2024**

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	:	Second Year
Semester	:	Third
No. of Credits	:	02
Title of the Course	:	Nuclear Models and Particle Physics
Course Code	:	S606PHT
Name of the Vertical in adherence to NEP 2020	:	Elective
Eligibility for Admission	:	Any student admitted to Second year of M.Sc, degree programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra.
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	:	2024 - 2025

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2024 - 2025)

SEMESTER - III **Paper No.–Physics Paper–VI**

Course Title: Nuclear Models and Particle Physics **No. of Credits - 02**

Type of Vertical: Elective **COURSE CODE: S606PHT**

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	Understand	Explain various nuclear models and their properties
CLO-02	Understand	Explain the types of nuclear reactions and calculations involved
CLO-03	Understand	Understand the standard model of particle physics
CLO-04	Understand	Understand various basic aspects of Quantum Electrodynamics / Chromodynamics
CLO-05	Apply	Solve problems based on the theory

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2024 - 2025)

SEMESTER - III **Paper No.–Physics Paper–VI**

Course Title: Nuclear Models and Particle Physics **No. of Credits - 02**

Type of Vertical: Elective **COURSE CODE: S606PHT**

COURSE CONTENT			
Module No.	**Content**	**Credits**	**No. of Lectures**
1	**Nuclear Models:** Shell Model (extreme single particle): Introduction, Assumptions, Evidences, Spin-orbit interactions, Predictions including Schmidt lines, limitations, Collective model - Introduction to Nilsson Model. **Nuclear Reactions:** Kinematics, scattering and reaction cross sections, Compound nuclear reaction, direct nuclear reaction-value equation, energy release in fusion and fission reaction.	**01**	**15**
2	Introduction to the elementary particle Physics, The Eight fold way, the Quark Model, the November revolution and aftermath, The Standard Model, Revision of the four forces, cross sections, decays and resonances, Introduction to Quantum Electrodynamics, Introduction to Quantum Chromo dynamics. Weak interactions and Unification Schemes (qualitative description), Revision of Lorentz transformations, Four-vectors, Energy and Momentum. Properties of Neutrino, helicity of Neutrino, Parity, Qualitative discussion on Parity violation in beta decay and Wu's Experiment, Charge conjugation, Time Reversal, Qualitative introduction to CP violation and TCP theorem.	**01**	**15**
	Total	**02**	**30**

References Books:

1. Introductory Nuclear Physics, Kenneth Krane, Wiley India Pvt. Ltd.
2. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, Robert Eisberg and Robert Resnick, Wiley (2006)
3. Introduction to Nuclear Physics, H. A. Enge, Eddison Wesley
4. Nuclei and Particles, E. Segre, W. A. Benjamin
5. Concepts of Nuclear Physics, B. L. Cohen
6. Subatomic Particles, H. Fraunfelder and E. Henley, Prentice Hall
7. Introduction to Nuclear and Particle Physics, A. Das & T. Ferbel, World Scientific
8. Introduction to high energy physics, D. H. Perkins, Addison Wesley
9. Nuclear and Particle Physics, W. E. Burcham and M. Jones, Addison Wesley
10. Introductory Nuclear Physics, S. M. Wong, Prentice Hall.

11. Nuclear Physics: An Introduction, S. B. Patel, New Age International.
12. Nuclear Physics : S. N. Ghoshal
13. Nuclear Physics: Roy and Nigam

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.