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

COURSE TITLE:- ELECTRODYNAMICS
SEMESTER-II
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	:	Second
No. of Credits	:	04
Title of the Course	:	Electrodynamics
Course Code	:	S511PHT
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-II **Paper No.– Physics Paper–II**

Course Title: Electrodynamics **No. of Credits - 04**

Type of Vertical: Major **COURSE CODE: S511PHT**

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	Recall the basic concepts of electrodynamics from this course
CLO-02	Understand	Understand origin of Maxwell's equation, gauge invariance of Maxwell's equations, decoupling of scalar and vector potential equations in Lorentz gauge and corresponding solutions.
CLO-03	Apply	Derive fully covariant forms of Maxwell equations, Lorentz gauge condition and continuity equation.
CLO-04	Analyze	Show that acceleration of the charge gives electromagnetic radiation
CLO-05	Evaluate	Evaluate for retarded potentials and electric and magnetic fields for simple problems involving time-dependent charge-current distributions

Syllabus for First Year of Master of Science in Physics

(With effect from the academic year 2023-2024)

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

Course Title: Electrodynamics **No. of Credits - 04**

Type of Vertical: Major **COURSE CODE: S511PHT**

COURSE CONTENT			
Module No.	**Content**	**Credits**	**No. of Lectures**
Unit 1	Maxwell's equations, The Pointing vector, The Maxwellian stress tensor, Lorentz Transformations, Four Vectors and Four Tensors, The field equations and the field tensor, Maxwell equations in covariant notation.	**01**	**15**
Unit 2	Electromagnetic waves in vacuum, Polarization of plane waves. Electromagnetic waves in matter, frequency dependence of conductivity, frequency dependence of polarizability, frequency dependence of refractive index. Wave guides, boundary conditions, classification of fields in wave guides, phase velocity and group velocity, resonant cavities.	**01**	**15**
Unit 3	Moving charges in vacuum, gauge transformation, The time dependent Green function, The Lienard-Wiechert potentials, Leinard-Wiechert fields, application to fields-radiation from a charged particle, Antennas, Radiation by multipole moments, Electric dipole radiation, Complete fields of a time dependent electric dipole, Magnetic dipole radiation	**01**	**15**
Unit 4	Relativistic covariant Lagrangian formalism: Covariant Lagrangian formalism for relativistic point charges. The energy-momentum tensor, Conservation laws.	**01**	**15**
	Total	**04**	**60**

Main Reference:

1. W.Greiner, Classical Electrodynamics (Springer-Verlag, 2000) (WG).
2. M.A. Heald and J.B. Marion, Classical Electromagnetic Radiation, 3rd edition (Saunders, 1983) (HM)

Additional references:

1. J.D. Jackson, Classical Electrodynamics, 4Th edition, (John Wiley & sons) 2005 (JDJ)
2. W.K.H. Panofsky and M. Phillips, Classical Electricity and Magnetism,2nd edition, (Addison -Wesley) 1962.
3. D.J. Griffiths, Introduction to Electrodynamics,2nd Ed., Prentice Hall, India,1989.
4. J.R. Reitz ,E.J. Milford and R.W. Christy, Foundation of Electromagnetic Theory, 4th ed., Addison -Wesley, 1993

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.