Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-2(B.Sc.)

Subject: Electrodynamics and Relativity – BSCPH12303

Type of course: Major

Prerequisite: Concept of inertial and non-inertial frames of reference, Concept of electric flux, Gauss's law in integral & differential form.

Rationale: This course has been designed to make the students know about basic principles of Physics. The students learn fundaments of physics understand the physics applications in real world and developing critical thinking skills. It helps students to develop problem-solving abilities and prepare them to shape career in advanced physics. Ultimately, pursuing a B.Sc. in Physics offers a combination of intellectual stimulation, practical skills, and versatile career opportunities. It equips you with a deep understanding of the physical world and provides a strong foundation for further education or a wide range of professional endeavors

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				SEE		CCE			
CI	T	P	C	Theory	Practical	MSE	LWA/V	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voice; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Report writing** Students have to Write **Michelson–Morley Experiment** aim, setup sketch, and explain null result and upload it to GMIU Web Portal.	10
2	**Minor project** Students prepare a working model based on any topic related to syllabus Prepare a small video on your project and upload it to GMIU Web Portal.	10
3	**Draw and explain** Students will draw Plane EM Wave in Free Space E, H, and propagation direction k mutually perpendicular. Then upload in PDF format on GMIU web Portal (10 MCQs).	10
4	**Video Presentation** Student will prepare short video on the topic given by the faculty and upload on the GMIU web portal.	10
5	**Attendance** Student should present in class room during lecture.	10
	Total	**50**

Course Content:

Unit No	Course content	Hrs.	% Weightage
1	Chapter:1 Relativity Frame of reference, Newtonian Relativity, Galilean transformation equations, The Ether hypothesis and the Michelson-Morley experiment with result, Postulates of special theory of relativity, The Lorentz transformation equations, Length contraction, Time dilation, Addition of velocity, Variation of mass with velocity, Mass energy equivalence (E=mc2), Example,	10	25
2	Chapter: 2 Special Theory of Relativity Invariance of space-time interval, Types of space-time interval, Gedanken experiment to demonstrate relativity of simultaneity, Light clock, example: Muon decay, Twin paradox, Relativistic Doppler effect (transverse and longitudinal), Relativistic momentum, force and Work, Relativistic energy-momentum relation,	10	25
3	Chapter: 3 Electrostatics Di-electric Polarization, Relative permittivity Relation between D, E and P, Point charge in Di-electric fluid, Potential and field due to polarized sphere - At external and internal point, Di-electric sphere is placed in uniform electrostatic field- Resultant field inside and outside the Di-electric sphere, Molecular field in a Di- electric (Clausius- Mossotti Relation) Validity of Clausius- Mossotti Relation, Examples,	12	25
4	Chapter: 4 Maxwell's Equation and Propagation of plane EM waves Maxwell's equations (without derivation) Differential and integral form, in free space and in Linear isotropic media, Electromagnetic wave in free space -Wave equation for free space condition - Plane electromagnetic wave in free space (Characteristic impedance), Plane electromagnetic wave in matter, Plane electromagnetic wave propagation in Isotropic Di-electric(Non conducting media: Equation of propagation of E & H vector - E & H are transverse - Intrinsic impedance of space - speed of EM wave - Refractive index, Propagation of plane EM waves in conducting media equation of motion (wave equation) - phase velocity and refractive index, Boundary conditions for the electromagnetic field vectors E,D,H & B (At the interface between two media), Examples,	13	25

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks **(Revised Bloom's Taxonomy)**						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20 %	30%	30%	-	20%	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Apply relativistic velocity addition formula to different frames of reference.
CO2	Derive expressions for relativistic momentum, force, and work.
CO3	Describe dielectric polarization at the microscopic and macroscopic levels.
CO4	Derive the electromagnetic wave equation in free space.

List of Practical

Sr. No	Descriptions	Unit No	Hrs.
1	To determine temperature coefficient of thermal conductivity by Lee's method	1	4
2	To determine wavelength of mercury spectral lines with the help of grating method.	1	2
3	To determine Poisson's ratio of rubber tube	1	2
4	To determine magnetic moment and pole strength using deflection magnetometer.	2	2
5	To study resonator to determine unknown frequency of tuning fork	2	4
6	To determine Melde's tuning fork frequency and to verify laws of vibrating string.	3	2
7	To determine radius of curvature of a given lens and refractive index of glass using optical lever method.	3	4
8	To study forward characteristics of a P-N Junction diode.	4	4
9	To determine moment of inertia of a disk using Torsional pendulum	4	4
10	To determine Young Modulus 'Y' of the given rectangular bar by Cantilever.	4	2
		Total	**30**

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

References Books:

1. Modern physics by Murugeshan
2. Modern physics by Basier
3. Modern physics by Aruldas & P Rajagopal
4. Advanced practical physics by Chauhan and Singh
5. B.Sc. Practical Physics by C L Arora
6. Digital Electronics by A. Anand
7. Electrodynamics by S. L. Gupta & V. Kumar (S. P. Sinsh, Pragati prakshan)
8. Introduction to Electrodynamics by D. J. Griffith
9. Practical Physics by Kumar and Gupta Electricity and Electronics by D.C. Tayal
10. Advanced practical physics by Chauhan and Singh
11. B.Sc. practical physics by C L Arora