BIRLA INSTITUTE OF TECHNOLOGY

NEP-2020 CURRICULUM BOOK

(Effective from Academic Session: Monsoon 2024)

Bachelor of Technology

DEPARTMENT OF _____

INSTITUTE VISION

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INSTITUTE MISSION

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DEPARTMENT VISION

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DEPARTMENT MISSION

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PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. . Can be 3-5. Depends on the Department
2. .
3. .
4. .
5. .
6. .

PROGRAMME OUTCOMES (POs)

1. .
2. .
3. .
4. .
5. .
6. .
7. .
8. .
9. .
10. .
11. .
12. .

PROGRAMME SPECIFIC OUTCOMES (PSOs)

1. .
2. .
3. .

Mapping of Pos and PSOs with PEOs

	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6
PO1						
PO2						
PO3						
PO4						
PO5						
PO6						
PO6						
PO7						
PO8						
PO9						
PO10						
PO12						
PSO1						
PSO2						
PSO3						

Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3

Program Course Structure

Birla Institute of Technology, Mesra, Ranchi

Course Structure for B.Tech. (Electronics and Communication Engineering)
Based on NEP-2020, CBCS and OBE, Effective from 2024-2025

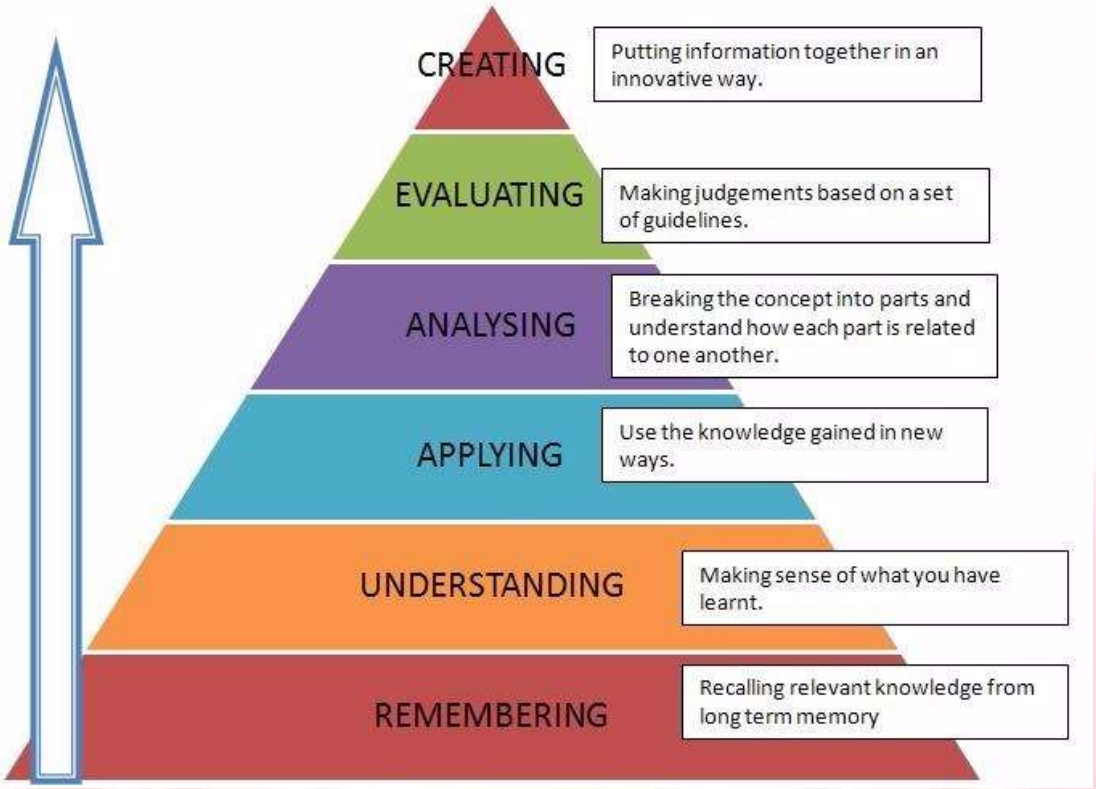
Sr. No.	Semester of Study (Recommended)	Category of Course	Course Code	Subjects	Mode of Delivery & Credits *L-Lecture; T-Tutorial; P-Practical*			Total Credits
					L (*Periods/ Week*)	**T** (*Periods/ Week*)	**P** (*Periods/ Week*)	
	FIRST	**THEORY**						
I.1		FS	MA24101	Mathematics - I	3	1	0	4
I.2			CH24101	Chemistry	3	1	0	4
		GE	EC24101	Basic Electronics	2	1	0	3
I.4			ME24101	Basics of Mechanical Engineering	2	1	0	3
I.5		FS	CE24101	Environmental Sciences	2	0	0	2
		LABORATORIES						
I.6		FS	CH24102	Chemistry Lab	0	0	2	1
I.7		GE	EC24102	Basic Electronics Lab	0	0	2	1
I.8			ME24102	Engineering Graphics	0	0	4	2
I.9			PE24102	Workshop Practice	0	0	2	1
I.10		MC	MC24 101/ 102 /103/ 104/105	Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA) /Entrepreneurship	0	0	2	1
TOTAL (Theory + Labs)								**22**
	SECOND	THEORY						
II.1		FS	MA24103	Mathematics - II	3	1	0	4
II.2			PH24101	Physics	3	1	0	4
			BE24101	Biological Sciences for Engineers	2	0	0	2
II.4		GE	CS24101	Programming for Problem Solving	3	1	0	4
II.5			EE24101	Basics of Electrical Engineering	2	1	0	3
		LABORATORIES						
II.6		FS	PH24102	Physics Lab	0	0	2	1
II.7		GE	CS24102	Programming for problem Solving Lab.	0	0	2	1
II.8			EE24102	Electrical Engineering Lab.	0	0	2	1
I.9		HSS	HS24131	Communication Skill - I	0	0	3	1.5
I.10		MC	MC24 106 /107/108/109/110	Choice of : NCC/NSS/ PT & Games/ Creative Arts (CA) /Entrepreneurship	0	0	2	1
TOTAL (Theory + Labs)								**22.5**
GRAND TOTAL FOR FIRST YEAR								**44.5**

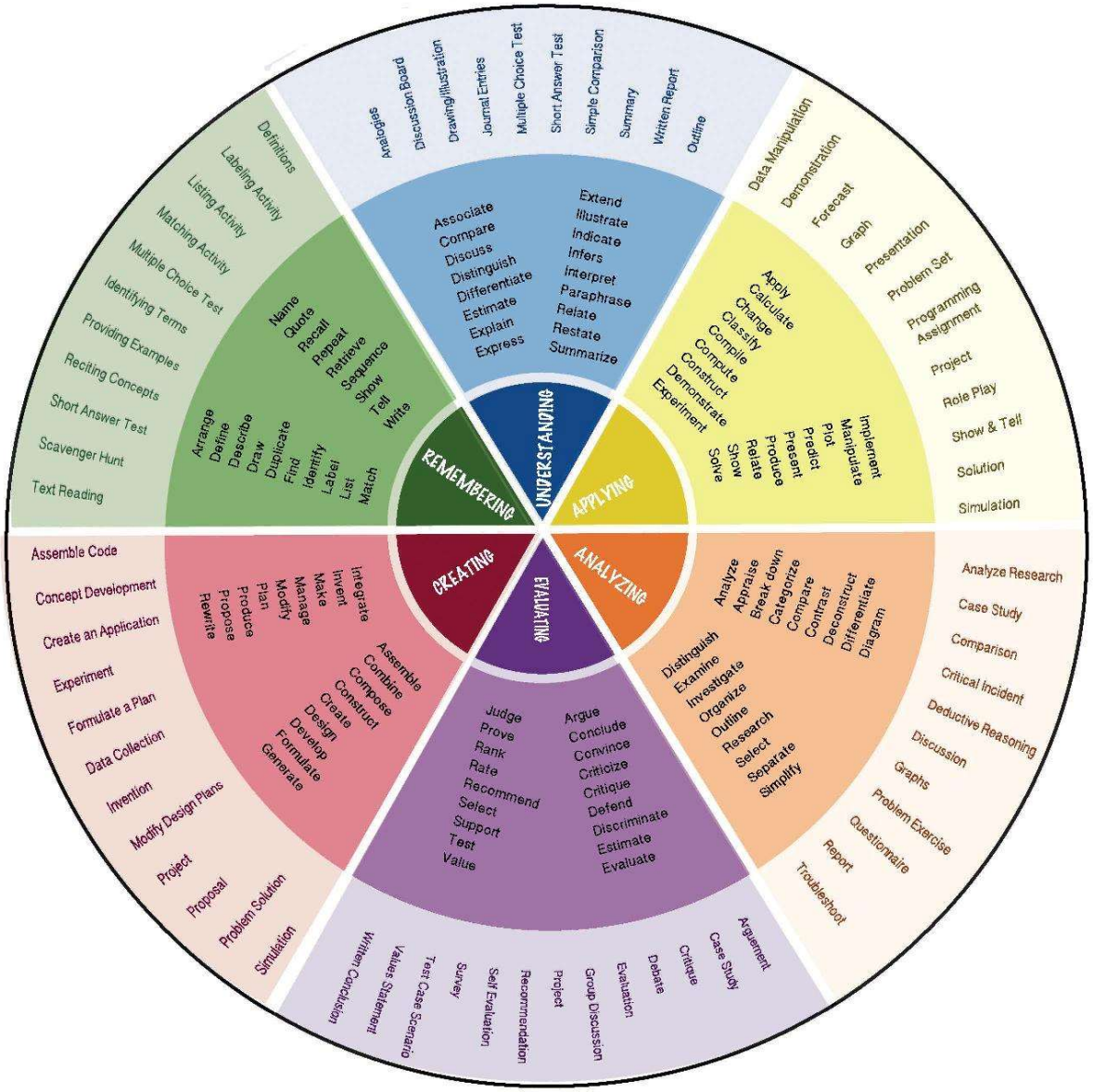
Vocational Courses for Exit after 1st Year								
Vocational Course I: Course Code. Course Name					1	0	4	**3**
Vocational Course II: Course Code. Course Name					1	0	4	**3**
	THIRD	THEORY						
III.1		PC	EC24201	Electronic Devices	3	1	0	4
III.2			EC24203	Digital System Design	3	0	0	3
III.3			EC24205	Network Theory	3	1	0	4
III.4			EC24207	Signals and Systems	3	0	0	3
III.5			EC24209	Probability and Random Processes	3	0	0	3
III.6		HSS	MT24131	UHV-II: Understanding Harmony	3	0	0	3
		LABORATORIES						
III.7		PC	EC24202	Electronic Devices Lab	0	0	2	1
III.8		PC	EC24204	Digital System Design Lab	0	0	2	1
III.9		MC	MC24 201/202/ 203/204 / 205	Choice of: NCC/NSS/ PT & Games/ Creative Arts (CA) / Entrepreneurship	0	0	2	1
	TOTAL (Theory + Labs)							**23**
	FOURTH	THEORY						
IV.1		PC	EC24251	Analog Circuits	3	1	0	4
IV.2			EC24253	Analog Communication	3	1	0	4
IV.3			EC24255	Computer Architecture	3	0	0	3
IV.4			EC24257	VLSI Design	3	1	0	4
IV.5		PE	XX24XXX / MO24201	Open Elective - I / MOOC - I	3	0	0	3
IV.6			HS24211	Indian Knowledge System	2	0	0	0
		LABORATORIES						
IV.8		PC	EC24252	Analog Circuits Lab	0	0	2	1
IV.9		PC	EC24258	VLSI Design Lab	0	0	2	1
IV.11		MC	MC24 206/ 207/208 / 209/ 210	Choice of: NCC/NSS/ PT & Games/ Creative Arts (CA) / Entrepreneurship	0	0	2	1
TOTAL (Theory + Labs)								**21**
GRAND TOTAL FOR SECOND YEAR								**44**
Vocational Course III: Course Code. Course Name					1	0	4	**3**
Vocational Course IV: Course Code. Course Name					1	0	4	**3**
	FIFTH	THEORY						
V.1		PC	EC24301	Electromagnetic Fields and Waves	3	1	0	4
V.2		PC	EC24303	Digital Communication	3	0	0	3
V.3		PC	EC24305	Microprocessors	3	0	0	3
V.4		PC	EC24307	Data Communication and Computer Networking	3	1	0	4
V.5		PE	EC24XXX	Program Elective-I (PE-I)	3	0	0	3
		OE	XX24XXX /MO24301	Open Elective - II / MOOC - II	3	0	0	3
		LABORATORIES						
V.7		PC	EC24304	Communication System Lab	0	0	2	1
V.8		PC	EC24306	Microprocessors Lab	0	0	2	1

V.9		PC	EC24300	Project - I				2
TOTAL (Theory + Labs)								**24**
		THEORY						
VI.1	SIXTH	PC	EC24351	Digital Signal Processing	3	1	0	4
VI.2		PC	EC24353	Control Systems	3	1	0	4
VI.3		PC	EC24355	Embedded Systems	3	0	0	3
VI.4		PE	EC24XXX	Program Elective-II (PE-II)	3	0	0	3
VI.5		OE	XX24XXX / MO24303	Open Elective - III / MOOC - III	3	0	0	3
		HSS	MT24204	Constitution of India	2	0	0	0
		LABORATORIES						
VI.6		PC	EC24352	Digital Signal Processing Lab	0	0	2	1
VI.7		PC	EC24356	Embedded Systems Lab	0	0	2	1
		PE	EC243XXX	Program Elective-II Lab	0	0	2	1
		PC	EC24350	Project - II				2
VI.8		HSS	HS24133	Communication Skill - II	0	0	3	1.5
TOTAL (Theory + Labs)								**23.5**
GRAND TOTAL FOR THIRD YEAR								**47.5**
		THEORY						
VII.1	SEVENTH	PC	EC24401	Microwave Theory and Techniques	3	1	0	4
VII.2		PE	EC24XXX	Program Elective-III (PE-III)	3	0	0	3
VII.3		PE	EC24XXX	Program Elective-IV (PE-IV)	3	0	0	3
		PE	EC24XXX	Program Elective-V (PE-V)	3	0	0	3
		OE	XX24XXX / MO24401	Open Elective - IV / MOOC - IV	3	0	0	3
		LABORATORIES						
VII.6		PC	EC24402	Microwave Lab	0	0	2	1
VII.7		MC	MC24400	Summer Training (Minimum Four Weeks / 160 Hrs)				4
VII.8		PC	EC24400	Project - III				3
TOTAL (Theory + Labs)								**24**
VIII.1	EIGHTH	PC	EC24450/ EC24490	Project-IV / Industry Internship				6
VIII.2			EC24498	Comprehensive Viva				2
	TOTAL (Theory + Labs)							**8**
GRAND TOTAL FOR FOURTH YEAR								**32**
GRAND TOTAL FOR B.TECH.								**168**

BLOOM'S TAXONOMY FOR CURRICULUM DESIGN AND ASSESSMENT:

Preamble
The design of curriculum and assessment is based on Bloom's Taxonomy. A comprehensive guideline for using Bloom's Taxonomy is given below for reference.




REMEMBERING
UNDERSTANDING
APPLYING
ANALYZING
EVALUATING
CREATING
Definitions
Labeling Activity
Listing Activity
Matching Activity
Multiple Choice Test
Identifying Terms
Providing Examples
Reciting Concepts
Short Answer Test
Scavenger Hunt
Text Reading
Name
Quote
Recall
Repeat
Retrieve
Sequence
Show
Tell
Write
Arrange
Define
Describe
Draw
Duplicate
Find
Identify
Label
List
Match
Analogies
Discussion Board
Drawing/Illustration
Journal Entries
Multiple Choice Test
Short Answer Test
Simple Comparison
Summary
Written Report
Outline
Associate
Compare
Discuss
Distinguish
Differentiate
Estimate
Explain
Express
Extend
Illustrate
Indicate
Infers
Interpret
Paraphrase
Relate
Restate
Summarize
Data Manipulation
Demonstration
Forecast
Graph
Presentation
Problem Set
Programming Assignment
Project
Role Play
Show & Tell
Solution
Simulation
Apply
Calculate
Change
Classify
Compile
Compute
Construct
Demonstrate
Experiment
Implement
Manipulate
Plot
Predict
Present
Produce
Relate
Show
Solve
Analyze Research
Case Study
Comparison
Critical Incident
Deductive Reasoning
Discussion
Graphs
Problem Exercise
Questionnaire
Report
Troubleshoot
Analyze
Appraise
Break down
Categorize
Compare
Contrast
Deconstruct
Differentiate
Diagram
Distinguish
Examine
Investigate
Organize
Outline
Research
Select
Separate
Simplify
Argument
Case Study
Critique
Debate
Evaluation
Group Discussion
Project
Recommendation
Self Evaluation
Survey
Test Case Scenario
Values Statement
Written Conclusion
Judge
Prove
Rank
Rate
Recommend
Select
Support
Test
Value
Argue
Conclude
Convince
Criticize
Critique
Defend
Discriminate
Estimate
Evaluate
Assemble Code
Concept Development
Create an Application
Experiment
Formulate a Plan
Data Collection
Invention
Modify Design Plans
Project
Proposal
Problem Solution
Simulation
Integrate
Invent
Make
Manage
Modify
Plan
Produce
Propose
Rewrite
Assemble
Combine
Compose
Construct
Create
Design
Develop
Formulate
Generate

COURSE INFORMATION SHEET

Course Code: PH24101
Course Title: Physics
Pre-requisite(s): Intermediate Physics and Intermediate Mathematics
Co- requisite(s): Mathematics I
Credits: 4 L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B.Tech.
Semester / Level: I
Branch: All
Name of Teacher:

COURSE OBJECTIVES

This course envisions to impart to students:

1.	The principles of physical optics and basic concept of fiber optics.
2.	Fundamental laws of electromagnetism leading to Maxwell's equations.
3.	The posulates of special theory of relativity, Lorenz transformation equation and their consequences: Einstein energy mass relation and relativistic energy-momentum relation
4.	The limitations of classical physics and basic concepts such as wave-particle duality, and working of quantum mechanics with the help of particles in a box problem
5.	Concepts of stimulated emission and working principle of laser with examples, concepts of nuclear physics and plasma physics

COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

CO1	analyse the intensity variation of light due to polarization, interference and diffraction.
CO2	formulate and solve the problems on electromagnetism
CO3	explain and apply concepts of special theory of relativity and its consequences
CO4	Apply the concepts of quantum mechanics such as wave-particle duality and obtain the solution of simple quantum mechanical problems.
CO5	explain working principle of lasers and to summarize its applications, describe basic concepts of nuclear and plasma physics

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
Module – I: **Physical Optics:** Polarization, Malus' Law, Brewster's Law, Double Refraction, Interference in thin parallel films, Interference in wedge-shaped layers, Newton's rings, Fraunhofer diffraction by single slit and double slit. Elementary ideas of fibre optics and application of fibre optic cables	**8**
Module – II: **Electromagnetic Theory:** Gradient, Divergence and Curl, Statement of Gauss theorem & Stokes theorem, Gauss's law, Applications, Concept of electric potential, Relationship between E and V, Polarization of dielectrics and dielctric constant, Boundary conditions for E & D, Gauss's law in magnetostatics, Ampere's circuital law, Boundary conditions for B & H, Equation of continuity, Displacement current, Maxwell's equations.	**8**
Module – III: **Special Theory of Relativity:** Introduction, Inertial frame of reference, Galilean transformations, Postulates, Lorentz transformations and its conclusions, Length contraction, time dilation, velocity addition, Mass change, Einstein's mass energy relation.	6
Module – IV: **Quantum Mechanics:** Planck's theory of black-body radiation, Compton effect, Wave-particle duality, De Broglie waves, Davisson and Germer's experiment, Uncertainty principle, Brief idea of Wave Packet, Wave Function and its physical interpretation, Schrodinger equation in one-dimension, free particle, particle in an infinite square well	9
Module – V **Modern Physics:** Laser-Spontaneous and stimulated emission, Einstein's A and B coefficients, Population inversion, Light amplification, Basic laser action, Ruby and He-Ne lasers, Properties and applications of laser radiation, Nuclear Physics: Binding Energy Curve, Nuclear Force, Liquid drop model, Introduction to Shell model, Applications of Nuclear Physics, Concept of Plasma Physics and its applications.	9

TEXTBOOKS:

1. A. Ghatak, Optics, 4th Edition, Tata Mcgraw Hill, 2009
2. Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, 2001
3. Arthur Beiser, Concept of Modern Physics, 6th edition, Tata McGraw- Hill, 2009
4. F. F. Chen, Introduction to Plasma Physics and controlled Fusion, Springer, Edition 2016.

REFERENCE BOOKS:

1. Fundamentals of Physics, Halliday, Walker and Resnick

GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)

POS MET THROUGH GAPS IN THE SYLLABUS

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN

POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination	25
End Sem Examination	50
Quiz	20
Teacher's assessment / Assignment	05

Continuous Internal Assessment	% Distribution
Mid Sem Examination	50
Quiz	40
Teacher's assessment / Assignment	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	Y	Y	Y	Y	
Semester End Examination	Y	Y	Y	Y	Y

INDIRECT ASSESSMENT

1. Student Feedback on Course Outcome

COURSE DELIVERY METHODS

CD1	Lectures by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Self- learning such as use of NPTEL materials and internets
CD4	
CD5	
CD6	
CD7	

MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**M**	**M**		**L**	**L**				**M**	**L**		**L**			
CO2	**M**	**M**		**L**	**L**				**M**	**L**		**L**			
CO3	**M**	**L**		**L**	**L**				**M**	**L**		**L**			
CO4	**M**	**L**		**L**	**L**				**M**	**L**		**L**			
CO5	**M**	**L**		**L**	**L**				**M**	**L**		**L**			

Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course Code: PH24102
Course Title: Physics lab
Pre-requisite(s): Intermediate Physics
Co- requisite(s):
Credits: 1 L: 0 T: 0 P: 2
Class schedule per week: 2
Class: B.Tech.
Semester / Level: I
Branch: All
Name of Teacher:

COURSE OBJECTIVES

This course enables the students to:

1.	Understand the fundamentals of physical measurements and learn to account for inevitable errors in physical measurements.
2.	Understand and verify the basic principles of physics by hands-on experiments and making suitable measurements.
3.	Make electrical connections reliably to form functional circuits for measuring electrical quantities such as voltage, current, resistance, and resistivity
4.	Learn to set up different types of oscillating systems to study their characteristics, viz -a-viz resonant frequency, frequency response, phase relationship, bandwidth, and quality factor
5.	Develop an understanding of optical phenomena like dispersion, interference and diffraction and make measurements on the patterns produced to obtain physical quantities such as wavelength of light and refractive index of transparent materials.

COURSE OUTCOMES (COs)

After the completion of this course, students will be able to:

CO1	Make reliable measurements and report results along with errors.
CO2	Wire simple electrical circuits for experimentally determining measurable electrical quantities.
CO3	Build oscillating systems and make measurements over them.
CO4	Set up and customize simple second-order electrical circuits, characterize them, and gain knowledge about their applications such as electrical filters, and tank circuits.
CO5	Produce interference and diffraction patterns and make measurements for determining physical quantities.

SYLLABUS (List of experiments)

1. Error analysis in Physics Laboratory (CO: 1)
2. To determine the frequency of AC mains with the help of a sonometer. (CO:1, 2, 3)
3. Experimentally obtaining the profile of axial magnetic field due to a circular coil carrying current using Stewart and Gee arrangement. (CO:1, 2)
4. Measurement of electrical equivalent of heat (CO:1, 2)
5. To determine the wavelength of sodium lines by Newton's rings method (CO:1, 5)
6. To determine the frequency of tuning fork using Melde's Experiment (CO:1,3)
7. Determination of resistance using post office box (PO box) (CO: 1,2, 3, 4)
8. To determine the emf of a cell using stretched wire potentiometer (CO:1, 2)
9. Determination of refractive index of the material of a prism using spectrometer and sodium light (CO:1, 5)
10. To study the frequency response of a series LCR circuit (CO:1, 2, 3,4)
11. To study Lorentz force using Current balance (CO:1,2)
12. To study electromagnetic induction and verification of Faraday's laws. (CO:1,2,3)
13. To measure the wavelength of prominent spectral lines of mercury light by a plane transmission grating. (CO:1, 5)
14. To determine the Planck's constant using photocell and optical wavelength filters. (CO:1, 2)
15. Determination of wavelength of laser light using single slit experiment (CO: 1, 5)

REFERENCE MATERIALS:

1. Lab manuals (available on department website)

GAPS IN THE SYLLABUS (TO MEET INDUSTRY/PROFESSION REQUIREMENTS)

POS MET THROUGH GAPS IN THE SYLLABUS

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN

POS MET THROUGH TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

DIRECT ASSESSMENT

Assessment Tool	% Contribution during CO Assessment
Lab Journal	30
Lab quizes	20
Progressive viva	20
End Sem Examination	30

Continuous Internal Assessment	% Distribution
Lab Journal	30
Lab quiz	10
Progressive viva	20

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	Y	Y	Y	Y	Y
Semester End Examination	Y	Y	Y	Y	Y

INDIRECT ASSESSMENT

1. **Student Feedback on Course Outcome**

COURSE DELIVERY METHODS

CD1	Introductory lecture by use of boards/LCD projectors
CD2	Laboratory experiments/ teaching aid
CD3	Self- learning such as use of NPTEL materials and internets
CD4	
CD5	
CD6	
CD7	

MAPPING BETWEEN COURSE OUTCOMES AND POs and PSOs

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	**M**	**M**		**L**	**L**				**M**	**L**		**L**			
CO2	**M**	**M**		**L**	**L**				**M**	**L**		**L**			
CO3	**M**	**L**		**L**	**L**				**M**	**L**		**L**			
CO4	**M**	**L**		**L**	**L**				**M**	**L**		**L**			
CO5	**M**	**L**		**L**	**L**				**M**	**L**		**L**			

Grading: No correlation – 0, Low correlation - 1, Moderate correlation – 2, High Correlation - 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3