



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	Bachelor of Technology	Year of Regulation	2019-20
Department	Physics	Semester	V

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
PH 373	Special Theory of Relativity	2	0	0	2	50	50	100	200

Course Objectives	To understand the failure of Newtonian mechanics at relativistic speed.	Course Outcomes	CO1	Able to understand the need for modification of laws of physics at relativistic speed.
	To understand various concepts of special theory relativity.		CO2	Able to understand the concepts of special theory of relativity and its application to GPS
	To understand the motion of objects at relativistic speed.		CO3	Able to acquire information about dynamics of particle and its application to collider Physics.
	To understand the concepts of Lorentz symmetry.		CO4	Able to deduce the Lorentz invariance of Maxwell equations.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
2	CO2	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
3	CO3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0
4	CO4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0

SYLLABUS

No.	Content	Hours	COs
I	Principles of Special Relativity : Galilean transformations and Newtonian relativity, experimental background of relativity: Michelson Morley experiment, postulates of special theory of relativity.	5	CO1
II	Relativistic Kinematics : Relativity of Simultaneity, Lorentz Transformations, length contraction, time dilation and its application to Global Positioning System (GPS), twin and other paradoxes, the relativistic addition of velocities.	7	CO2
III	Relativistic Dynamics : Relativistic momentum, relativistic force law, Equivalence of mass and energy, transformation properties of momentum, energy, mass and energy, single particle dynamics and its application to particle accelerator, center of momentum frame of collider, head-on collision at collider.	7	CO3
IV	Relativistic Electrodynamics : Relation between E and B fields; Field of uniformly moving point charge; Field of a current carrying wire; Forces between moving charges; Lorentz invariance of Maxwell equations.	5	CO4
Total Hours		24	

Essential Readings

1. Robert Resnick, "Introduction to Special Relativity", Wiley India, 2007.
2. James B. Hartle, "Gravity: An Introduction to Einstein's General Relativity", Pearson, 2007.

Supplementary Readings

1. Jayant V. Narlikar, "An Introduction to Relativity", Cambridge University Press, 2002.
2. D. Kleppner and R. Kolenkow, "An Introduction to Mechanics", Tata McGraw-Hill Education, 2007.