Course Plan (Sept 2022 – Feb 2023)

Name of Instructor: Mr. Harison Cota

Program: Bachelor of Engineering [Sem I]

Course Name: Physics [FE 120]

PHYSICS					
Course Code	FE 120		Credits	3	
Scheme of Instruction Hours/ Week	L	T	P	TOTAL	
	3	0	0	39 hrs/sem	
Scheme of Examination TOTAL = 125 marks	IA	TW	TM	P	O
	25	0	100	0	0

Course Syllabus:
As per Goa University Revised Syllabus and Scheme of Instructions (RC 2019-20)

UNIT -1	
INTERFERENCE OF LIGHT: Geometric and optical path, Phase change at reflection (only statement), Interference based on division of amplitude, Interference due to reflected and transmitted light in thin parallel film, Interference in wedge shaped film, Newton's rings for reflected and transmitted light, Determination of radius of curvature of plano-convex lens, wavelength of light used and refractive index of liquid using Newton's ring experiment, applications of interference.(Surface smoothness) **ULTRASONICS:** Production of ultrasonic waves, Magnetostriction, Piezoelectric oscillator, detection of ultrasonic waves, Properties, Application of ultrasonics in various fields, Measurement of wavelength and velocity by acoustic diffraction grating.	10hrs
UNIT -2	
MAGNETISM: Introduction, Origin of magnetization, Classification of magnetic materials, Magnetic hysteresis, Soft and hard magnetic materials, Applications of magnetic materials. Electron Ballistics: CRO **SEMICONDUCTORS**: Band theory of solids, Energy Gap, Energy band structure of semiconductors, Mobility, Drift velocity, Conductivity of charge carriers, Hall effect	10hrs
UNIT -3	
LASERS: Interaction of radiation with matter from quantum mechanical point of view: absorption, stimulated and spontaneous emission of radiation, Active medium, Metastable state, Einstein's theory of stimulated emission(no derivation), Condition for light amplification, Population inversion, Pumping, Pumping schemes, Optical resonator, Properties of laser, He-Ne laser, Ruby laser, Applications. **FIBER OPTICS**: Total internal reflection, Propagation of light in optical fiber, Structure of an optical fiber and fiber cable, Acceptance angle and cone, Numerical aperture, Modes of propagation, Types of optical fibers: single and multimode fibers, Applications- fiber optic communication , endoscopy.	10hrs

UNIT -4	
X-RAYS: Origin of X-rays, characteristic and continuous X-ray spectra, Mosley's law, X-ray diffraction: Bragg's law and Bragg's spectrometer, properties and applications. **WAVE-PARTICLE DUALITY**: Compton effect, Expression for Compton shift, Wave nature of particle, de Broglie hypothesis, Davisson-Germer experiment.	9 hrs

Pre-Requisites: Unit 1: Interference of Light, Basics of Sound
Unit 2: Magnetism & Semiconductor Basics
Unit 3: Total Internal Reflection
Unit 4: Electromagnetic radiation, Photoelectric effect

Course Objectives:

1. To familiarize the students with the concept of applied science like interference, semiconductors, ultrasonics, LASERs, optical fibres, and the various topics of modern physics.
2. To train the students to think logically through the understanding of the basic laws of nature. This will be useful in all branches of higher engineering studies.

Course Outcomes:

After completion of the course students will be able to:

FE120.1 : Derive necessary formulae and expressions in topics of thin film interference, semiconductor transport phenomena, fibre optics, x-rays and Compton effect using first principles of physics and mathematics.

FE120.2 : Explain thin film interference, production and detection of ultrasonic waves and their scientific and industrial applications.

FE120.3 : Differentiate between the various types of magnetic materials and explain semiconductor transport phenomena and working of CRO.

FE120.4 : Illustrate the basic working principle of LASERs and fibre optics and explain their applications in industry.

FE120.5 : Explain the concepts and applications of modern physics topics like x-rays and wave-particle duality.

FE120.6 : Solve numerical problems from fundamental and modern physics topics like thin film interference, ultrasonics, semiconductors, magnetic materials, LASERs, optical fibres, x-rays, Compton effect & de Broglie's hypothesis.

Recommended Reading:

Sr. No	Titles	Author/s	Edition	Unit/ Module	Topic
1	A text book of Engineering Physics	M. N. Avadhanulu & P. G. Kshirsagar	9th	1 – 4	All topics
2	Engineering Physics	Uma Mukherji	2nd	2	Semiconductors
3	Engineering Physics	R. K. Gaur & S. L. Gupta	8th	1	Interference of Light
4	Modern Engineering Physics	A. S. Vasudeva	4th	1 – 4	All topics

Assessment Tools:

Assessment Tools	CO	Units	Dissemination Week	Submission Week
Internal Test I	FE120.1, FE120.2, FE120.6	1	NA	NA
Internal Test II	FE120.3, FE120.4, FE120.6	2, 3	NA	NA
Internal Test III	FE120.1, FE120.4, FE120.5, FE120.6	3, 4	NA	NA
Online Quiz I	FE120.2	1	Week 3	Week 3
Online Quiz II	FE120.2	1	Week 5	Week 5
Online Quiz III	FE120.3	2	Week 6	Week 6
Online Quiz IV	FE120.3	2	Week 10	Week 10
Online Quiz V	FE120.4	3	Week 12	Week 12
Online Quiz VI	FE120.4	3	Week 15	Week 15
Online Quiz VII	FE120.5	4	Week 16	Week 16
Online Quiz VIII	FE120.5	4	Week 17	Week 17
End Semester Exam	FE120.1 to FE120.6	1 – 4	NA	NA