

**Shree Manibhai Virani and Smt. Navalben Virani Science College (Autonomous),
Rajkot**
Affiliated to Saurashtra University, Rajkot

IDC		
For the students admitted from A.Y. 2021-2022 & onwards		
Offering Department: Physics	Offered to: B.Sc. Chemistry/B.Sc. Mathematics	
Semester - II		
Course Code	Course Title	Course Credit and Hours
	IDC-2:Physics: Electronics and Radiation physics	4 Credits - 4hrs/wk(T) 3 hrs/wk(P)

Course Description:

This course will enhance students understanding of fundamental concepts of different topics such solid state physics and Nuclear Physics. Keeping focus on Nuclear Physics, X-rays and Natural Radioactivity are also included in the course which also belongs to the criteria of interdisciplinary subject between chemistry and physics.

Course Purpose:

This course aims to provide basic understanding of Solid state electronics and Nuclear physics which is foundation platform of Solid state physics and Nuclear Physics can help to understand fundamental semiconducting electronic circuits and their applications, the knowledge of X-rays can help students to understand its relevance with medical science and material testing methods.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (K ₁ to K ₆)
CO ₁	Understand the different types to semiconductor diodes and their biasing methods	K1
CO ₂	Understand performance parameters of different types of rectifier circuits	K2
CO ₃	Understand various types of special purpose diodes and their applications.	K2

CO ₄	Understand the production of X-rays and its properties and applications.	K2
CO ₅	Understand different phenomena taking place in natural Radioactivity.	K3

Course Content	Hours
Module-I : Semiconductor Diode	11 hrs
<ul style="list-style-type: none"> • Semiconductor diode • · Half wave rectifier • · Efficiency of half wave rectifier • · Full-wave rectifier • · Centre-tap full wave rectifier • · Full wave bridge rectifier • · Efficiency of full-wave rectifier • · Ripple factor, Comparison of rectifiers • · Filter circuits , Types of filter Circuits • · Voltage stabilization • · Zener diode • · Zener diode as voltage stabilizer 	
Module-II: Waves	12 hrs
<ul style="list-style-type: none"> • Wave motion • · Differential equation of a wave motion • · Particle velocity and wave velocity • · Newton's formula for velocity of sound in air and velocity of sound in water • · Laplace's correction , velocity of sound in isotropic solids • · Velocity of transverse waves along a stretched string • · Melde's experiment 	
Module III: X-rays	14hrs
<ul style="list-style-type: none"> • · Production of X-rays • · Origin of X-ray • · X-ray Spectrum, Intensity Measurement of X-rays • · Wave nature of X-ray • · Laue's Spot & Uses, Bragg's Spectrometer • · Theory of Diffraction , Bragg's Law • · Compton effect • Properties of X-ray 	
Module IV: Natural Radioactivity	11hrs
<p>(a) Basic concept of radioactivity</p> <ul style="list-style-type: none"> • Radioactivity • Natural and Artificial Radioactivity • General Properties of Radioactive Radiation, and Radioactive 	

Disintegration (b) Law of disintegration <ul style="list-style-type: none"> • Law of Radioactive Disintegration • Decay Constant • Half-life Period • Average life 	
Module V: Special Purpose Diodes:	12hrs
<ul style="list-style-type: none"> • · Light emitting diode • · Multicolour LEDs • · Applications of LED • · Photo diode • · Photo-diode operation • · Characteristics of Photo-diode • · Applications of Photo-diode 	

Text books (2 textbooks):

2.

IDC – II Practical
Physics Practical – Electronics ,Sound and Modern physics

	physics Practical	3 Hrs/Week	1 Credits
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Course Description:

The practical course includes all fundamental practical focusing on Solid State Physics and Waves. It also covers study and fabrication of various electronic circuits and frequency measurement techniques.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (S ₁ to S ₆)
CO ₁	Basic measurement methods	S1
CO ₂	Basic circuit analysis	S1
CO ₃	Understand different frequency measurement teachings	S1 & S3
CO ₄	Basis circuit arrangement	S2
CO ₅	Circuit fabrication	S2 & S3

Course Purpose:

The course of practical is develop to make student well verge to electricity tools , circuit fabrication and measurement methodology

List of Practical

1. To determine frequency of a tuning fork by Melde's method.
2. To prove Melde's law of vibrating string at constant tension and constant P/L and find the frequency of tuning fork.
3. To prove Melde's law of vibrating string at constant number of loops and constant $\frac{\sqrt{T}}{L}$ and find the frequency of tuning fork.
4. To prove Melde's law of vibrating string at constant length of string and constant $\frac{P}{\sqrt{L}}$ and find the frequency of tuning fork.
5. To study the resonance and determine the frequency of tuning fork.
6. To study the resonance and determine the velocity of sound.
7. To determine reduction factor of T. G.
8. To prove Ohm's law and find unknown resistance by T. G.
9. Calibration of ammeter by T. G.

10. To find the magnetic moment of a bar magnet by deflection magnetometer.
11. To compare magnetic moment of two bar magnets by deflection magnetometer.
12. To compare magnetic moment of two bar magnets by null method.
13. To determine I-V characteristics of a P-N Junction diode.
14. To determine I-V characteristics of a Zener diode.
15. To determine I-V characteristics of a Photo diode at constant illumination.
16. Characteristics of P-N junction diode and dynamic resistance.
17. Study of half wave rectifier.
18. Study of full wave rectifier.
19. Fabrication of half wave rectifier.
- 20.** Fabrication of full wave rectifier.

Reference books (2 or 3 reference books):

1. C.L.Arora Practical Physics, S. Chand Comp.
2. Chauhan & Singh Advanced Practical Physics. Pragati Prakashan.
3. Experimental Physics, University Granth Nirman Board, (Gujarati Medium)
4. B.Saraf et al-Physics through experiments Vol. I & II
5. Chattopadhyay, Rakshit & Saha Practical Physics
6. A.S. Vasudeva Modern Engineering Physics, S.Chand Company.

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Seminar
- Videos

pMethods of Assessment & Tools:

Components of CIE: 30 marks (Example as below)

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1 st 2 units	1 ^{1/2} hours	5 (Set for 30)	20
	Test 2	All 5 units	3 hours	15 (Set for 70)	
B	Assignment			5	10
C	Class activity			5	
Grand Total					30
Assignment		<ul style="list-style-type: none"> • Abstract and executive summary • Experimental design • Concept mapping • Student generated handbook • Essay writing etc... 			
Class activity		<ul style="list-style-type: none"> • Reaction paper • Quiz • One-minute paper • Situation based question • Application card etc.. 			

Note : Any other assessment tools or methods can be adopted as per requirement of the course.