GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basic Physics (Group-2)
(Code: 3300005)

Diploma Programmes in which this course is offered	Semester in which offered
Electronics & Communication Engineering	**First Semester**
Biomedical Engineering,Computer Engineering,Electrical Engineering,Information Technology,Instrumentation & Control Engineering,Power Electronics Engineering,Printing Technology	**Second Semester**

1. RATIONALE

As Physics is the mother of all engineering disciplines, students must have some basic knowledge on physics to understand their core engineering subjects more comfortably. Accordingly, in reviewing the syllabus, emphasis has been given on the principles, laws, working formulae and basic ideas of physics to help them study the core subjects. Complicated derivations have been avoided because applications of the laws and principles of physics are more important for engineering students.

As Physics is considered as basic science, its principles, laws, hypothesis, concepts, ideas are playing important role in reinforcing the knowledge of technology. Deep thought is given while selecting topics in physics. They are different for various branches of engineering. This will provide sound background for self-development in future to cope up with new innovations. Topics are relevant to particular program and students will be motivated to learn and can enjoy the course of Physics as if it is one of the subjects of their own stream.

Engineering, being the science of measurement and design, has been offspring of Physics
that plays the primary role in all professional disciplines of engineering. The different streams of Physics like Optics, Acoustics, Dynamics, Semiconductor Physics, Surface Physics, Nuclear physics, Energy Studies, Materials Science, etc provide Fundamental Facts, Principles, Laws, and Proper Sequence of Events to streamline Engineering knowledge.

Note:- Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles.

Laboratory experiments have been set up keeping consistency with the theory so that the students can understand the applications of the laws and principles of physics.

2. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies…….

- Select proper measuring instrument on the basis of range, least count & precision required for measurement.
- Analyze properties of material & their use for the selection of material mostly applicable for engineering users..
- Identify good & bad conductors of heat and proper temperature scale for temperature measurement
- Identify, analyze, discriminate and interpret logical sequence of field problems with the study of physics.
- Analyze variation of sound intensity with respect to distance.
- Follow the principles used in the physical properties, its measurement and selections.

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	**150**

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit; **ESE** - End Semester Examination; **PA** - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I	*Explain Physical Quantities and their units. *Measure given dimensions by using appropriate instruments accurately. *Calculate error in the measurement *Solve numerical based on above outcomes	1.1 Need of measurement and unit in engineering and science, definition of unit , requirements of standard unit, systems of units-CGS,MKS and SI, fundamental and derived quantities and their units 1.2 Least count and range of instrument, least count of vernier caliper, micrometer screw gauge 1.3 Definition of accuracy, precision and error, estimation of errors - absolute error, relative error and percentage error, rules and identification of significant figures. (Numerical on above topics)
Unit– II	*State Coulomb's law, Ohm's law and Kirchhoff's law *Explain Electric field, potential and potential difference	2.1 Concept of charge, Coulomb's inverse square law, Electric field, intensity, potential and potential difference. 2.2 Electric current, Ohm's law, laws of series and parallel combination of resistance 2.3 D.C. circuits, Kirchhoff's law, heating effect & chemical

Unit	Major Learning Outcomes	Topics and Sub-topics
	*Define intensity, electric current, resistance *Apply laws of series and parallel combination to electrical circuits *Explain heating & chemical effect of current *Solve numerical based on above outcomes	effect of current (Numericals on above topics)
Unit– III	*Define magnetic intensity and flux and state their units *Distinguish between dia, para and ferro magnetic materials *Explain electromagnetic induction and its uses *State lenz's law *State applications of AC	3.1 Magnetic field and its units, magnetic intensity, magnetic lines of force, magnetic flux and their units 3.2 Dia, Para, Ferro magnetic materials 3.3 Electromagnetic Induction, Lenz's law and its Applications, Alternating current and its waveform
Unit– IV	*Define types of materials based on energy bands *Distinguish between intrinsic and extrinsic semiconductors *Explain p-n junction diode and its characteristics *State applications of diodes *state advantages of bridge rectifier over others * Explain types of transistors *Explain characteristics of transistors *Explain transistor operation in CE mode *State relation of current gain * Define nanotechnology and explain applications	4.1 Conductors, Insulators and Semiconductors, Energy bands, intrinsic and extrinsic semiconductors, Temperature dependence of conductivity, Superconductivity 4.2 p-n junction diode and its characteristics, Rectifier circuits - Full wave, half wave and bridge rectifiers (no design) 4.3 semiconductor transistor pnp and npn and their characteristics, transistor operation in CE mode, relation of current gain 4.4 Introduction to nanotechnology
Unit– V	*Explain wave and wave motion with example. *Distinguish between longitudinal and transverse waves *Explain propagation of sound in air. * State properties of light. *Define reflection, refraction polarization and diffraction *Explain physical significance of refractive index * Explain dispersion of light *State Properties of laser *Explain spontaneous and stimulated emission, population inversion and optical pumping *Explain construction and working of He-Ne laser *State applications of lasers. * Explain principle & working of optical fibres	Definition of wave motion, amplitude, period, frequency, and wavelength, relation between velocity, frequency and wavelength, longitudinal and transverse wave, principle of superposition of waves, definition of stationary wave , node and antinode, definition of resonance with examples, Formula for velocity of sound in air Properties Of Light, Electromagnetic spectrum, Reflection, refraction, snell's law, diffraction, polarization, interference of light, constructive and destructive interference (Only definitions), physical significance of refractive index, dispersion of light LASER, Properties of laser, spontaneous and stimulated emission, population inversion, optical pumping, construction and working of He-Ne laser, applications of lasers. Fibre Optics, Introduction, Total internal reflection, critical angle, acceptance angle, Structure of optical fibre, Numerical Aperture, Fiber optic materials, Types of optical fibres, Applications in communication systems.

Unit	Major Learning Outcomes	Topics and Sub-topics
	* State applications of optical fibres in communication systems	

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	SI Units & Measurements	05	03	02	05	10
2.	Static & Current Electricity	10	05	05	08	18
3.	Electromagnetism & AC Current	08	04	05	03	12
4.	Semiconductors & Nano-technology	10	06	06	05	17
5.	Sound, Laser & Optical Fiber	09	04	06	03	13
	Total	**42**	**22**	**24**	**24**	**70**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6. SUGGESTED LIST OF EXPERIMENTS

The experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency - **……..**

S. No.	Unit No.	Experiment
1	1	To Measure linear dimensions by vernier caliper and calculate volume
2	1	To Measure linear dimensions by Micrometer screw
3	2	To calculate resistance using Ohm's law
4	2	To verify law of Resistance in series and parallel
5	2	To find unknown resistance through whetstone bridge
6	3	To determine A.C. frequency with the help of sonometer
7	1,2	To determine errors in electrical measurements
8	5	To determine the divergence of He-Ne laser beam.
9	3	To Measure A.C. Power using resistive load
10	3	Measurement of Energy
11	4	To study p-n junction in forward bias
12	4	To calculate SA/V ratio of simple objects to understand nanotechnology

- Hours distribution for Physics Experiments :

  Minimum 8 experiments should be performed from the above list

Sr. No.	Description	Hours
1	An introduction to Physics laboratory and its experiments (for the set of first four experiments)	02
2	Set of first four experiments	08
3	An introduction to experiments (for the set of next four experiments)	02
4	Set of next four experiments	08
5	Mini project	06
6	Viva and Submission	02
	Total	28

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

Laboratory based mini projects :

1. To calculate acoustics of given class room
2. To measure diameter and calculate resistance of given set of conductors

Teacher guided self learning activities :

1. To prepare a chart of applications of nanotechnology in engineering field
2. To prepare models to explain different concepts

Course/topic based seminars :

1. Seminar by student on any relevant topic

8. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	Sears And Zemansky	University Physics	Pearson Publication
2	Paul G Hewitt	Conceptual Physics	Pearson Publication
3	Halliday & Resnick	Physics	Wiley India
4	G Vijayakumari	Engineering Physics, 4e	Vikas-Gtu Students' Series
5	Arvind Kumar & Shrish Barve	How And Why In Basic Mechanics	Universities Press
6	Ncert	Physics Part 1 And 2	Ncert

S.No.	Author	Title of Books	Publication
7	Giancoli	Physics For Scientists And Engineers	
8	H C Verma	Concepts Of Physics	
9	Gomber & Gogia	Fundamentals Of Physics	Pradeep Publications, Jalandhar

B. List of Major Equipment/ Instrument

1. Digital Vernier Calipers And Micrometer Screw Guage
2. Whetstone's Bridge
3. He – Ne Laser Instrument
4. Digital Energy Meter
5. Resistance Box
6. Battery Eliminator
7. Digital Millimeters

C. List of Software/Learning Websites

1. www.physicsclassroom.com
2. www.physics.org
3. www.fearofphysics.com
4. www.sciencejoywagon.com/physicszone
5. www.science.howstuffworks.com

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

1. Dr. S. B. Chhag, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Rajkot
2. Ku. B. K. Faldu, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad
3. Shri D. V. Mehta, Lecturer in Physics, Science Deptt, RCTI, Ahmedabad
4. Shri S. B. Singhania, Lecturer in Physics, Science Deptt, Govt. Polytechnic, Ahmedabad
5. Dr. U. N. Trivedi, Lecturer in Physics, Science Deptt, RCTI, Ahmedabad

Coordinator and Faculty Member From NITTTR Bhopal

1. Dr. P. K. Purohit, NITTTR, Bhopal