GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

APPLIED PHYSICS
(Code: 3316303)

Diploma Programme in which this course is offered	Semester in which offered
Agricultural Engineering	1ST

1. RATIONALE.

The Applied Physics program is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

2. COMPETENCY.

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. COURSE OUTCOMES.

1. The student will demonstrate the ability to think in core concept of their engineering application by studying various topics involved in branch specific applications.
2. The student will demonstrate the ability to use appropriate mathematical techniques and concepts to obtain quantitative solutions to problems in physics.

3. In courses involving laboratory, the student will demonstrate the ability to collect and analyze data and to prepare coherent reports of his or her findings.

4. In a design module project , the student will demonstrate the ability to perform a literature search, to make use of appropriate computational or laboratory skills, and to make an effective written or oral presentation of the results of the project.

4. 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	150
03	00	02	05	70	30	30	20	

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

5. COURSE DETAILS.

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
Unit – I Units & Measurements	1.1 Explain Physical Quantities and their units. 1.2Measure given dimensions by using appropriate instruments accurately. 1.3 Calculate error in the measurement 1.4 Solve numerical based on above outcomes	1.1 Physical quantities 1.2 Fundamental and derived units 1.3 Systems of units (FPS, CGS, MKS and SI units) 1.4 Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) 1.5 Dimensional equations and their applications, conversion from one unit to another unit for density, force, pressure, work, power, energy, velocity, acceleration. 1.6 Limitations of dimensional analysis
Unit– II Force and Motion:	2.1 List Newton's laws of motion and Differentiate among various forces in nature 2.2 Define inertia, momentum and impulse of force 2.3 State Newton's	2.1 Scalar and vector quantities - examples, addition and multiplication ,scalar product and vector product of vectors 2.2 Force, resolution and composition of forces - resultant, parallelogram law of forces 2.3 Equilibrium of forces, Lami's theorem 2.4 Newton's Laws of motion - concept of momentum, Newton's laws of motion and their

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
	laws of motion 2.4 State law of conservation of momentum 2.5 Solve numerical problems based on above topics	applications, determination of force equation from Newton's second law of motion; Newton's third law of motion, conversion of momentum, Impulse and impulsive forces, simple numerical problems based on third law. 2.5 Projectile, horizontal and oblique projections and equation of trajectory 2.6 Derivation of time of flight, maximum height and horizontal range 2.7 Circular motion 2.8 Relation between linear and angular velocity and linear acceleration and angular acceleration 2.9 Centripetal force (derivation) and centrifugal force
Unit–III Work , Power and Energy	3.1Define work and identify its units. 3.2 Predict whether a force is doing positive, negative or zero work. 3.3 Define power and identify its units. 3.4 Distinguish between work and power and calculate the power for physical situations. 3.5 Define kinetic energy and potential energy, 3.6 Define mechanical energy and relate it to the amount of kinetic energy and potential energy. 3.7 Categorize forces as being conservative. 3.8 Apply the work-energy relationship to simple physical situations.	3 .1 Work: definitions and its SI units 3.2 Work done in moving an object on horizontal and inclined plane (incorporating frictional forces) 3.3 Power: definitions and its SI units, calculation of power in simple cases 3.4 Energy: Definitions and its SI units: Types: Kinetic energy and Potential energy, with examples and their derivation 3.5 Principle of conservation of mechanical energy (for freely falling bodies), transformation of energy from one form to another
Unit– IV Properties of Matter	4.1Comprehend the concept of elasticity and Define Stress, Strain and Elastic limit.	4.1 Elasticity, definition of stress and strain 4.2 Different types of modulus of elasticity 4.3 Explanation of stress - strain diagram 4.4 Pressure - its units, gauge pressure, absolute pressure, atmospheric pressure, Bourdon's pressure, manometers and barometer

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
	4.2 State Hooke's law. 4.3 List different types of pressure and gauges. 4.3 Comprehend the phenomenon of surface tension and its applications. 4.4 Explain angle of contact and capillarity. 4.5 Solve problems related to surface tension.	gauges 4.5 Surface tension - its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension
Unit– V Waves and Viberations	5.1 Comprehend the concept of wave motion 5.2Distinguish between Transverse and longitudinal waves. 5.3Define period, frequency, amplitude and wavelength 5.4Explain principle of superposition of waves 5.5Explain resonance. 5.6State Formula for velocity of sound in air. 5.7 Comprehend the vibrations of cantilever and beam.	5.1 Generation of waves by vibrating particles 5.2 Wave motion with examples 5.3 Types of wave motion, transverse and longitudinal wave motion with Examples 5.4 Velocity, frequency and wave length 5.5 Sound and Light waves 5.6 Vibration of cantilever and beam, determination of time period of cantilever 5.7 Free, forced and resonant vibrations with examples
Unit– VI Rotational Motion	6.1 Define torque, moment of inertia and radius of gyration. 6.2 Derive rotational K.E. and angular momentum. 6.3 Understand theorems of parallel and perpendicular axes.	6.1 Definitions of torque, moment of inertia, radius of gyration 6.2 Derivation of rotational kinetic energy and angular momentum 6.3 Conservation of angular momentum (qualitative) 6.4 Theorems of parallel and perpendicular axes
Unit– VII Gravitation and Satellite	7.1 State Kepler's law 7.2 State Newton's law of gravitation. 7.3 Derive escape velocity.	7.1 Kepler's law of planetary motion 7.2 Newton's law of gravitation 7.3 Escape velocity (derivation) 7.4 Satellites, Geostationary satellite

Unit	Outcomes (in cognitive domain)	Major Learning Topics and Sub-topics
	7.4 Understand satellites.	
Unit - VIII Temperature and its measurement	8.1 List various temperature scales and convert among temperatures 8.2 Distinguish between Heat and Temperature. 8.3 Comprehend pyrometer and thermometer	8.1 Principles of measurement of temperature and different scales of temperature 8.2 Difference between heat and temperature on the basis of K.E. of molecules 8.3 Bimetallic and Platinum resistance thermometer: their merits and demerits 8.4 Pyrometers - Disappearing filament optical pyrometer
Unit - IX Transfer of Heat	9.1 Explain modes of Transmission of heat and their applications. 9.2 Define thermal conductivity. 9.3 Understand to determine the thermal conductivity of the conductors. 9.4 Characterize heat radiation. 9.5 Understand Prevost's theory of heat exchange.	9.1 Modes of transfer of heat (conduction, convection and radiation with examples) 9.2 Coefficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method) 9.3 Properties of heat radiation 9.4 Prevost's theory of heat exchange

6. SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	UNITS & DIMENSION	4	2	2	2	6
2	FORCE AND MOTION	5	2	3	5	10
3	WORK,POWER AND ENERGY	5	2	3	2	7
4	GENERAL PROPERTIES OF MATTER	6	4	3	3	10
5	WAVES AND VIBERATIONS	5	2	3	3	8
6	ROTATIONAL MOTION	4	2	2	2	6
7	GRAVITATION AND SATELLITES	4	2	2	2	6
8	TEMPERATURE AND ITS	5	3	3	4	10

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	MEASUREMENT					
9	TRANSFER OF HEAT	4	2	2	3	7
TOTAL		42	21	23	26	70

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy).

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

General Notes:

1. If midsem test is part of continuous evaluation, unit numbers I and II are to be considered.
2. Ask the questions from each topic as per marks weightage. Numerical questions are to be asked only if it is specified. Optional questions must be asked from the same topic.
3. In examination, example of same chapter is to be asked in place of example.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS.

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Sr. No.	Unit No.	Practical Exercises (outcomes in Psychomotor Domain)	Teaching Hours
1	1	To find the thickness of wire using a screw gauge	02
2	1	To find volume of solid cylinder and hollow cylinder using a vernier caliper	02
3	5	To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer	02
4	4	To find the surface tension of a liquid by capillary rise method	02
5	4	To determine and verify the time period of cantilever by drawing graph between load (w) and depression (D)	02
6	4	To determine the atmospheric pressure at a place using Fortin's Barometer	02
7	4	To determine the coefficient of linear expansion of a metal rod	02
8	9	To find the coefficient of thermal conductivity of copper using Searle's conductivity Apparatus.	02
		Total	16

8 SUGGESTED LEARNING RESOURCES

A. List of Books

1. Applied Physics Vol. I, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by IN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi.

B. List of Major Equipment/ Instrument

1. Vernier Calipers And Micrometer Screw Guage
2. Spherometer
3. Travelling Microscope
4. Cantilever
5. Fortin's Barometer
6. Searle's conductivity Apparatus.

C. List of Software/Learning Websites

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