GUJARAT TECHNOLOGICAL UNIVERSITY

PHYSICS
B.E. 1st YEAR

Type of course: Basic Science (Physics)

Prerequisite: Basic understanding`of Calculus, Physics and Mathematics course on Differentiate equations

Rationale: The basic science - 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.

Instructor of Course : Instructor must have academic qualification as per norms of University in subject of Physics.

Teaching andExamination Scheme:

TeachingScheme			Credits	Examination Marks				Total Marks
L	T	P	C	TheoryMarks		Practical Marks		
				ESE (E)	PA (M)	ESE Viva (V)	PA (I)	
3	0	2	4	70	30*	30#	20	150

L-Lectures; T-Tutorial/Teacher Guided Student Activity; P-Practical; C-Credit; ESE-End Semester Examination; PA-Progressive Assessment

Content:

Sr No	Topic	Teaching Hrs.	Module Weightage
	MODULE 1: Properties of Matter • Concept of Load, Stress and Strain • Hook's Law • Stress-Strain Diagram • Ductility, Brittleness and Plasticity • Elastic behavior of solids • Working stress and factor of safety • Factors affecting elasticity • Types of Elasticity • Twisting couple on a cylinder or wire-shaft • Torsional Pendulum • Cantilever-Depression of Cantilever • Young's modulus by Cantilever • I-shape Griders • Viscosity and comparison of viscosities	**7**	**19**

	MODULE 2: Waves, Motion and Acoustics • Simple Harmonic motion • Free, forced, resonance, damped and undamped vibration • Damped harmonic motion • Force vibration and amplitude resonance • Velocity resonance and energy intake • Wave motion, transverse and longitudinal vibration • Sound absorption and reverberation • Sabine's formula and usage (excluding derivation) • Acoustic of building	**7**	**19**
	Module 3: Ultrasonic and Non distractive testing (NDT) • Ultrasonic waves • Properties of ultrasound • Production of ultrasonic waves : Piezoelectric and magnetostriction method • Detection of ultrasound • Application of ultrasound • Introduction of NDT • Advantages of NDT • NDT through ultrasound	**9**	**25**

	Module 4: Superconductivity
	• Introduction of Superconductivity
	• Properties of superconductor
	  • Effect of magnetic field
	  • Meissner effect
	  • Pressure effect
	  • Impurity effect
	  • Isotopic mass effect
	• Mechanism of Superconductivity : BCS Theory
	• Penetration depth : Magnetic field
	• Josephson's junction and its application
	• Application of superconductors
		6	**17**

	Module 5: Lasers • Properties of Laser • Einstein's theory of matter radiation : A and B coefficients • Amplification of light by population inversion • Different types of lasers • gas lasers (He-Ne) solid-state lasers(ruby) • Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles • Applications of lasers in science, engineering and medicine.	**7**	**20**

Suggested Reference Books

1. Engineering Physics by Dattu R Joshi, McGraw hill Publications
2. Engineering Physics by Shatendra Sharma & Jyotsan Sharma, Pearson Publication
3. Mechanics of Materials, SI Edition, 9th Edition, Barry J. Goodno, James M. Gere, Published: © 2018 Print ISBN: 9781337093354

Course Outcome:

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.

List ofExperiments:

Important Note

☞ Total14 experiments arelistedin the design module.

☞ Key goals of theseexperimentsare :

(1)Toenhancetheunderstanding ofstudent towardstheerrorspresent intherealtimemeasurementand the ways totake careofthem.

(2)Tocreate visualizationofvarious phenomenacoveredin the syllabus.

(3)Toinducetheskillofstudentin handlingdifferentmeasuringinstruments.

☞ Subjectteacher is advisedto setup any8 experiments fromthe followinglist.

☞ Inthesessionstudentshouldperform **minimum4setofexperiments**andcomplete **onesmallproject** based onengineering applications. This projectalong with any performed experiment should be **EVALUATEDBYEXTERNAL EXAMINER.**

1 .Diffraction and interference experiments (from ordinary light or laser pointers); measurement of speed of light on a table top modulation; minimum deviation from a prism.

2. Measurement of the Distance using Ultrasonic Sensors.

3. Study of Object Detection using Ultrasonic Sensors.

4. Melde's Experiment Transverse and Longitudinal Modes

5. To determine the frequency of given laser source.

6. Frequency of AC Supply-Sonometer method

7. Wavelength of Light -Diffraction GratingUsing LASER

8. Acoustic grating method set up for measurement of velocity of ultrasonic waves in liquid

9. Melde's experiment

10 Resonator

11. Study of Damped Simple Harmonic Motion

12. Newton's rings, Determination of using sodium light.

13. Calibration of Spectrometer & determination of unknown wavelength

14. Dispersive curve of a prism

15. Study of Fabry-Perot Etalon

16. Study of Lloyd's Mirror

17. Study of Double Refraction in Calcite Prism

18. Virtual Heat & Thermodynamics Lab

19. Virtual Advanced Mechanics Lab

20. Virtual Laser Optics Lab

21. Virtual Harmonic Motion & Waves Lab

22.Virtual Optics Lab

23. Virtual Modern Physics Lab

24. Virtual Lab on oscillations

25. Virtual Physical Sciences Lab

Open ended Projects in Science and technology study :-

Aims:

1. To provide experience in laboratory based experimentation, data recording and analysis and drawing of conclusions.
2. To develop report writing skills for scientific material
3. To develop the ability to undertake investigations where, as part of the exercise, the goals and methods have to be defined by the investigator.
4. To develop skills in literature searches and reviews.

In the beginning of the academic term, faculties will have to allot their students at least one (Students are free to select any area of science and technology)

- Open ended design based small project **or**
- Computer based simulation/web based application/analysis presentations of applied science field which may help them in their branches especially in their UDP/IDP projects.

1. These can be done in a group containing maximum three students in each.
2. Open ended design based small project OR UDP based study will be evaluated by external examiner with appropriate marks allotment given by GTU time to time.
3. Faculties should cultivate problem based project to enhance the basic mental and technical level of students.
4. Evaluation should be done on **approach of the student on his/her efforts** (not on completion) to study the design module of given task.

Open EndedProjectfields:-

Studentsarefreetoselectanyareaofscienceandtechnologymaybebasedontheirbranchesto define projects.

Some suggested projectsare listed below:

1. Design:A workingelectricmotor.
   Area:Electricityand Magnetism
   Using:1meterofbendable,insulatedwire,asize"D"battery,adiskmagnet,twopaperclips, sandpaper,wire strippers, maskingtape.

2. Design:Computerbasedsimulation/smallcalculationwithhelpbasicprogramminglanguage basedon Physics
   Area: Computationalphysics
3. Design: A Hydraulic Jack works on the principle of Pascal's law that states Area: Fluid Dynamics
   Using:pokerand scissors ,syringes, M-seal,inletpipes

List ofOpen SourceSoftware/learning website:

- The FlyingCircus of Physics 2nd edition byJearlWalker, Wiley India
- SixIdeas that shaped physics byThomas A Moore,McGrawHilleducation
- http://www.howstuffworks.com/--Tech stuff
- Howthings works by Louis A Bloomfeild,WileyPublications
- Physicsof Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- LatestjournalslikeBBCKnowledge,Howthingswork-everydaytechnologyexplainedby National Geographics.
- http://www.sciencefairadventure.com/
- vlab.co.in

***PA(M):**10 marks forActive LearningAssignments,20 marks forothermethodsofPA

ACTIVELEARNING ASSIGNMENTS:Preparation ofpower-pointslides,whichincludevideos, animations,pictures,graphicsforbetterunderstanding theory andpracticalwork–The faculty willallocate chapters/partsofchapterstogroupsofstudentssothattheentiresyllabusofPhysicsiscovered. Thepower-pointslidesshould be putup on the web-site of the College/Institute, alongwith the namesof the students of thegroup,thenameofthefaculty,DepartmentandCollegeonthefirstslide.Thebestthreeworksshouldbe sentto achievements@gtu.edu.in.

ESE Pr (V):10 marks forOpen Ended Problems, 20 marks forVIVA.

Note:Passingmarks forPA (M) will be12 outof30.
Passingmarks forESE Pract(V) will be15out of30.