Dr Ambedkar Institute of Technology, Bengaluru-56
Department of Physics
Scheme and Syllabus - 2022 -2023

Course Title	**Physics for Civil Engineering Stream**						
Course Code	**22PHT102CV/202CV**						
Category	Applied Science Course (ASC) (IC)						
Scheme and Credits	No. of Hours/Week					Total teaching hours	Credits
	L	T	P	SS	Total		
	02	02	02	00	06	40+26	04
CIE Marks: 50	**SEE Marks: 50**		**Total Max. marks=100**		**Duration of SEE: 03 Hours**		

COURSE OBJECTIVE: To introduce the Engineering students to the basics of elasticity, vibrations, Laser and fiber optics, Acoustics of auditorium & Natural hazards and Safety with an emphasis on inculcating strong analytical skills among them so that they can understand and analyze complex engineering problems with relative ease.

UNIT I **8 hours**

Elasticity: Review of elasticity. Torsion: Expression for couple per unit twist of a solid cylinder (derivation). Torsional Pendulum: Expression for period of oscillation and Rigidity modulus (derivation). Bending of Beams: Definition of beam, neutral surface and neutral axis. Expression for bending moment of a beam (derivation). Expression for Young's modulus of the material of a single cantilever (derivation). Numerical problems.

UNIT II **8 hours**

Vibrations: ***Review of Simple harmonic Motion.*** Theory of free vibrations, theory of damped vibrations and discussion of three cases of damping. Theory of Forced vibrations. Resonance: Condition for resonance, sharpness of resonance. Numerical problems.

UNIT III **8 hours**

Lasers: Interaction of radiation with matter: Induced absorption, spontaneous emission and stimulated emission of radiation. Expression for energy density in terms of Einstein's coefficients (derivation). Requisites of a laser system. Condition for laser action. Principle, construction and working of He-Ne laser. Application of laser: Holography: principle, recording (wave front division technique) and reconstruction of 3-D images. Mention of applications of holography. Numerical problems.

Optical fibers: Propagation mechanism in optical fibers. Expression for angle of acceptance and numerical Aperture (derivation). Fractional index change, V- number and modes of propagation (N). Types of optical fibers. Attenuation: Discuss the causes for attenuation in optical fibers**.** Expression for attenuation coefficient Derivation). Application of optical fibers: Point to point communication with block diagram. Advantages and limitations of fiber optic communication over conventional communication system. Numerical problems.

UNIT IV **8 hours**

Acoustics of Auditorium :

Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its Measurements, Sound Insulation and its measurements, Numerical problems.

UNIT V **8 hours**

Natural hazards and Safety:

Introduction, Earthquake, (general characteristics, Physics of earthquake, Richter scale of measurement and earthquake resistant measures), Tsunami (causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami), Landslide (causes such as excess rainfall, geological

structure, human excavation etc, types of landslide, adverse effects, engineering solution for landslides). Forest Fires and detection using remote sensing. Fire hazards and fire protection, fire-proofing materials, fire safety regulations and firefighting equipment - Prevention and safety measures. Numerical problems. Pre-requisite: Oscillations Self-learning: Richter scale

TEACHING and LEARNING PROCESS: Chalk and Talk, power point presentation, animations, videos

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1 Elucidate the concepts in elasticity
CO2 Understand, define and explain the fundamental principles of vibrations,
CO3 Understand, define and explain the fundamental principles of lasers and optical fibers
CO4 Summarize concepts of acoustics in buildings
CO5 Describe the various natural hazards and safety precautions

SCHEME FOR EXAMINATIONS

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

Continuous Internal Evaluation(CIE):

Two Tests each of 25 Marks (duration 01 hour)

- First test after the completion of 30-40 % of the syllabus
- Second test after completion of 80-90% of the syllabus

One Improvement test before the closing of the academic term may be conducted if necessary. However best two tests out of three shall be taken into consideration.

Two Assignments each of 5 marks

The teacher has to plan the assignments and get them completed by the students well before the closing of the term so that marks entry in the examination portal shall be done in time. Formative (Successive) Assessments include Assignments/Quizzes/Seminars/ Course projects/Field surveys/ Case studies/ Hands-on practice (experiments)/Group Discussions/ others. The Teachers shall choose the types of assignments depending on the requirement of the course and plan to attain the COs and POs. (to have a less stressed CIE, the portion of the syllabus should not be common
/repeated for any of the methods of the CIE. Each method of CIE should have a different syllabus portion of the course). CIE methods /test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

The sum of two tests, two assignments, will be out of 60 marks and will be scaled down to 30 marks CIE for the practical component of the Integrated Course

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 02/03 hours) at the end of the 14th /15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 20 marks.

Semester End Examination (SEE):

SEE for IC

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the course (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

The theory portion of the Integrated Course shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper shall include questions from the practical component).

Passing standard:

- The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks-30) in the theory component and 08 (40% of maximum marks -20) in the practical component. The laboratory component of the IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included**.** The maximum of 04/05 questions to be set from the practical component of IPCC, the total marks of all questions should not be more than 30 marks.
- SEE will be conducted for 100 marks and students shall secure 35% of the maximum marks to qualify for the SEE. Marks secured will be scaled down to 50.

Text Books

1. Prof. S. P. Basavaraju, Engineering Physics, Subhas Stores, Bangalore.
2. Avadhanulu M. N. and P.G. Kshirsagar, A text Book of Engineering Physics, 10th Edition (2014).
3. Engineering Physics by Gaur and Gupta, Dhanpat Rai Publications (P) Ltd.
4. K. K. Chattopadhyay, Introduction to Nanoscience and Nanotechnology, PHI India, (2009).
5.A textbook of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
6. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002,
7. Building Science:Lighting and Acoustics, B. P. Singh and Devaraj Singh, Dhanpat Rai Publications (P) Ltc.,
8. Building Acoustics: Tor Eric Vigran, Taylor and Francis, 2008 Edition.
9. Lasers and Non-Linear Optics, B B Loud, New Age Internationals, 2011 edition
10. An Introduction to Disaster Management, Natural Disaster & Man-Made Hazards, S. Vaidyanathan, IKON Books P
11. Natural Hazards, Edward Bryant, Cambridge University Press, 2nd Edition
12. Natural hazards, Earthquakes, Volcanoes, and landslides by Ramesh P Singh, and Darius Bartlett, CRC Press, Taylor and Francis group.
13. Principles of Fire Safety Engineering Understanding Fire & Fire Protection, Akhil Kumar Das, PHI Learning, II Edition.
14. Disaster Management, R.Subramanian, S. Chand Publishing, 2018.

Reference Books

Arthur Beiser, Concepts of Modern Physics, McGraw Hill, 7th edition 2017.
S. O. Pillai, Solid State Physics, New Age International. Sixth Edition.
A Marikani, Engineering Physics, PHI Learning Private Limited, Delhi - 2013
4. V. Rajendran , Engineering Physics, Tata McGraw Hill Company Ltd., New Delhi -2012

Web links and Video Lectures (e-Resources):

Simple Harmonic motion: https://www.youtube.com/watch?v=k2FvSzWeVxQ
Stress-strain curves : https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
Stress curves:https://www.youtube.com/watch?v=f08Y39UiC-o
Oscillations and waves :https://openstax.org › books › college-physics-2e
Earthquakes:www.asc-india.org
Earthquakes and Hazards:http://quake.usgs.gov/tsunami
Landslidehazards:http://landslides.usgs.gov Acoustics:https://www.youtube.com/watch?v=fHBPvMDFyO8

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning:

http://nptel.ac.in
https://swayam.gov.in
https://virtuallabs.merlot.org/vl_physics.html
https://phet.colorado.edu
https://www.myphysicslab.com

Laboratory Component:

Any Ten Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

a) Exercise

b) Demonstration

c) Structured Inquiry

d) Open Ended

Based on convenience classify the following experiments into the above categories. Select at least one simulation/spreadsheet activity.

List of Experiments:

1. Uniform Bending
2. n by Torsional Pendulum
3. Forced Mechanical Oscillations and resonance
4. Series & Parallel Resonance
5. Fermi Energy of Conductor
6. Resistivity by Four Probe Method
7. Spring Constant
8. Single Cantilever
9. I by torsional pendulum
10. Laser Diffraction
11. Optical Fiber
12. Newton's Rings
13. GNU Step Interactive Simulations
14. Study of motion using spread Sheets
15. Application of Statistics using Spread Sheet
16. PHET Interactive Simulations :

ttps://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

COs and POs Mapping (Individual teacher has to fill up)

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	1	-	-	-	-	-	-	2
CO5	3	2	1	-	2	-	-	3	3	-	-	2

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

Note: The CO-PO mapping values are indicative. The course coordinator can alter the mapping using **Competencyand Performance Indicators** mentioned in the **AICTE Exam reforms.**