

<b>COURSE TITLE</b>	<b>WAVE DYNAMICS &amp; CRYSTAL STRUCTURES</b>
<b>COURSE CODE</b>	<b>02PY0291</b>
<b>COURSE CREDITS</b>	<b>4</b>

**Objective:**

- 1 This course aims to make students learn the fundamentals of crystallography, acoustics and optics and its applications in various fields

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Apply knowledge of physics in other branches of science to solve scientific problems
- 2 Understand the basic concepts of crystal physics
- 3 Apply and analyze various properties of mechanical waves and acoustics
- 4 Compare various phenomena associated with the polarization of light

**Pre-requisite of course:** Fundamental knowledge of Mathematics and Optics.

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
4	0	0	50	30	20	0	0

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Introduction to Crystallography</b> Introduction to crystal Structure, crystal lattice and translation vectors, unit cell, basis, symmetry operations, point groups and space groups, space groups, types of lattices, lattice directions and planes, interplanar spacing, simple crystal structure, close packed structures and loose packed structures, structure of diamond, zinc blende (ZnS) structure, sodium chloride (NaCl) structure, Examples of more crystal structures	15
2	<b>Mechanical Waves:</b> Mechanical wave, types of mechanical waves, periodic waves, mathematical description of wave, speed of transverse wave, energy in wave motion, wave interference, boundary conditions and superposition, standing wave on a string, normal modes of a string	15
3	<b>Acoustics:</b> Sound waves, speed of sound waves, sound intensity, standing sound waves and normal modes, resonance and sound, interference of waves, beats, the Doppler effect, shock waves	15

Contents : Unit	Topics	Contact Hours
4	<b>Optical polarization:</b> Polarization of transverse waves, plane of polarization, polarization by reflection, biots polariscope, Brewster's law, Brewster window, polarization by refraction, Malus law, double refraction, principal section of the crystal, principal plane, nicol prism, nicol prism as an analyzer, Huygens explanation of double refraction in uniaxial crystals.	15
<b>Total Hours</b>		<b>60</b>

**Textbook :**

- 1 The Textbook of Optics, N. Subrahmanyam Brijlal., S. Chand , 2001

**References:**

- 1 Solid State Physics, Solid State Physics, R. K. Puri and V. K. Bubbar, S. Chand, 2009
- 2 SEARS AND ZEMANSKY'S University Physics with Modern Physics 13th edition , SEARS AND ZEMANSKY'S University Physics with Modern Physics 13th edition , H. D. Young and R. A. Freedman, Pearson Publication , 2012

**Suggested Theory Distribution:**

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking
20.00	20.00	30.00	15.00	15.00	0.00

**Instructional Method:**

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Supplementary Resources:**

- 1 <https://archive.nptel.ac.in/courses/115/107/115107131/>
- 2 <https://archive.nptel.ac.in/courses/112/104/112104026/>

**Supplementary Resources:**

3 <https://nptel.ac.in/courses/104106093>