Programme	BS Solid State Physics	Course Code	SSP-103	Credit Hours	3 (2-1)
Course Title	**Waves and Optics**				

Course Introduction

This course delves into the fundamental principles and applications of wave phenomena and optical systems. Covering both classical and modern theories, it explores the behavior of waves, including sound, light, and electromagnetic waves, as well as the interaction of these waves with matter. Students will gain a deep understanding of how waves propagate, interfere, and diffract, and will apply these concepts to various optical technologies and phenomena.

Learning Outcomes

By the end of this course, students should be able to:

1. Understand Wave Phenomena
2. Analyze Sound Waves
3. Apply Electromagnetic Wave Theory
4. Master Geometric and Physical Optics
5. Explore Interference and Diffraction
6. Understand Polarization and its Applications
7. Utilize Wave Optics in Modern Applications
8. Develop Problem-Solving Skills
9. Communicate Scientific Concepts

This course combines theoretical knowledge with practical applications, providing students with the skills needed to tackle complex problems in both academic and industrial settings related to waves and optics.

	Course Content	**Assignments/Readings**
Week 1	**Unit-I** 1.1 Periodic motion and mechanical waves 1.1.1 Simple harmonic motion and applications, pendulum	Define motion
Week 2	**Unit-II** 2.1 Damped oscillation, forced oscillation and resonance, mechanical waves, mathematical description speed of transfers waves	Define oscillation
Week 3	**Unit-III** 3.1 Energy and wave motion, wave interference, standing waves, normal Modes.	What is interference?
Week 4	**Unit-IV** 4.1 Sound waves 4.1.1 Speed and intensity of sound waves	

Week 5	**Unit-V** 5.1 Standing sound waves and normal modes	Review related articles
Week 6	**Unit-VI** 6.1 Resonance and interferences, beats, Doppler's effects, shock waves	What is difference between resonance and interference?
Week 7	Unit-VII 7.1 Propagation of light and geometric optics 7.2 Light waves, reflection, refraction, Speed of light	Quiz
Week 8	Mid Term Exams	
Week 9	**Unit-VIII** 8.1 Dispersion and polarization, total internal reflection, Scattering of light, Huygens' Principle	
Week 10	**Unit-IX** 9.1 Plane and spherical mirrors, spherical and refracting surfaces	What is refraction?
Week 11	**Unit-X** 10.1 Thin lenses, cameras, the eye, magnifier, microscopes and telescopes	How telescope works?
Week 12	**Unit-XI** 11.1 Interference and diffraction 11.1.1 Two source interference, coherence, interference for thin films	Review
Week 13	**Unit-XII** 12.1 Intensity in double slit interference, Michelson interferometer, Fraunhofer and Fresnel diffraction	Quiz
Week 14	**Unit-XIII** 13.1 Singe slit diffraction, intensity of single slit, Multiple slits, Grating, X-Ray Diffraction	Define XRD and its principle
Week 15	**Unit-XIV** 14.1 Circular aperture and resolving power, Holography	What is holography?
Week 16	Final Term Exams	
Textbooks and Reading Material		

1. The Physics of Vibrations and Waves, by J. Pain, Wiley, (6th edition) (2005).
2. Vibrations and Waves, by P. French, CBS Publishers (2003).
3. Physics (Volume 1 & 2) by R. Resnick, D. Halliday and K. S. Krane (5th Ed), Wiley (2002).
4. University Physics with Modern Physics by H. D. Young, R. A. Freedman (14th Edition), Addison-Wesley (2015).
5. Fundamentals of Physics by D. Halliday, R. Resnick and J. Walker (9th Ed), JWiley (2011). "Electron Microscopy: Methods and Protocols", John Kuo, Humana Totowa, NJ, 2014.

Teaching Learning Strategies

1. Course Teaching
2. Presentations
3. Quiz

Assignments: Types and Number with Calendar

1.
2.
3.
4.

Assessment