	DPG Institute of Technology and Management **Sector 34, Gurugram HR -122004**
	Lesson Plan
	Course Name: Physics-II (Optics and Waves)
	Faculty Name: Dr. Dhananjay Verma

Lesson Plan

No. of Lecture Hours/Week	**3**	**Exam Hours**	**3**
Total No. of Lecture Hours	**40**	**Exam Marks**	**75**
Course Code	**BSC-ME-201G**		

Objectives of the course:

1. To have an insight into the oscillations and waves fundamentals.
2. To be able to identify and illustrate physical concept and terminology used in oscillations and optics and explain them inappropriate detail.
3. To acquire skills allowing the student to identify and apply formulas of optics and physics using coarse literature.
4. To develop a basic understanding of lasers and optical fibres and their usage in communication, optoelectronic devices, medical, etc.

Detailed Lesson Plan

Lecture No.	Topic	Teaching Methodology	Class Activity	Remarks
Unit-1				
1	Introduction to oscillatory and periodic motion	Chalk & Lecture	Lecture with Interaction	
2	Simple harmonic motion	Chalk & Lecture	Lecture with Interaction	
3	Differential equation of S.H.M.	Chalk & Lecture	Lecture with Interaction	
4	Damped and forced harmonic oscillator	Chalk & Lecture	Lecture with Interaction	
5	Differential equation of damped harmonic oscillator	Chalk & Lecture	Lecture with Interaction	
6	Mechanical and electrical harmonic oscillator	Chalk & Lecture	Lecture with Interaction	
7	Quality factor	Chalk & Lecture	Lecture with Interaction	

8	Forced mechanical and electrical oscillator	Chalk & Lecture	Lecture with Interaction	
9	Differential equation of forced harmonic oscillator	Chalk & Lecture	Lecture with Interaction	
10	Phase, superposition	Chalk & Lecture	Lecture with Interaction	
Unit-2				
11	Sinusoidal waves (concept of frequency and wavelength)	Chalk & Lecture	Lecture with Interaction	
12	Type of waves	Chalk & Lecture	Lecture with Interaction	
13	Transverse vibrations of stretched strings	Chalk & Lecture	Lecture with Interaction	
14	Longitudinal waves in solids and gas (sound)	Chalk & Lecture	Lecture with Interaction	
15	Wave group and group velocity	Chalk & Lecture	Lecture with Interaction	
16	The matrix method in paraxial optics (unit and nodal plane)	Chalk & Lecture	Lecture with Interaction	
17	Fermat's principle and its application (Mirage effect, laws of refraction and reflection)	Chalk & Lecture	Lecture with Interaction	
18	Light as an electromagnetic wave and Fresnel equations	Chalk & Lecture	Lecture with Interaction	
19	Reflectance and transmittance	Chalk & Lecture	Lecture with Interaction	
20	Brewster's angel and total internal reflection	Chalk & Lecture	Lecture with Interaction	
Unit-3				
21	Huygen's principle	Chalk & Lecture	Lecture with Interaction	
22	Superposition of waves	Chalk & Lecture	Lecture with Interaction	
23	Interference of light by wavefront splitting and amplitude division	Chalk & Lecture	Lecture with Interaction	
24	Young's double slit experiment	Chalk & Lecture	Lecture with Interaction	
25	Newton's rings	Chalk & Lecture	Lecture with Interaction	
26	Michelson interferometer	Chalk & Lecture	Lecture with Interaction	

27	Fraunhofer diffraction from a single slit	Chalk & Lecture	Lecture with Interaction	
28	The Rayleigh criterion for limit of just resolution and its application to vision	Chalk & Lecture	Lecture with Interaction	
29	Diffraction grating (Transmission)	Chalk & Lecture	Lecture with Interaction	
30	Diffraction grating dispersive and resolving power	Chalk & Lecture	Lecture with Interaction	
Unit-4				
31	Einstein'stheory of matter radiation interaction-absorption & emission	Chalk & Lecture	Lecture with Interaction	
32	Spontaneous and stimulated emission of radiation	Chalk & Lecture	Lecture with Interaction	
33	Relation between Einstein's coefficient of stimulated emission and absorption	Chalk & Lecture	Lecture with Interaction	
34	Population inversion (light amplification)& pumping in laser	Chalk & Lecture	Lecture with Interaction	
35	Three and four level laser systems	Chalk & Lecture	Lecture with Interaction	
36	Characteristics of laser beam: mono-chromaticity, coherence, directionality and intensity	Chalk & Lecture	Lecture with Interaction	
37	Gas laser (He-Ne, CO_2)	Chalk & Lecture	Lecture with Interaction	
38	Solid-state laser (Ruby, Neodymium)	Chalk & Lecture	Lecture with Interaction	
39	Laser speckles	Chalk & Lecture	Lecture with Interaction	
40	Applications of lasers	Chalk & Lecture	Lecture with Interaction	

Suggested Reference Books:

1. I. G. Main, Vibrations and waves in physics, Cambridge University Press (1993).
2. H. J. Pain, The physics of vibrations and waves, Wiley (2006).
3. A. Ghatak, Optics, McGraw-Hill Education(2012).
4. E. Hecht, Optics, Pearson Education (2008).
5.O. Svelto, Principles of lasers, Springer Science and Business Media (2010).

Course Outcomes:

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

CO201.1	To analyse the harmonic oscillator systems.
CO201.2	Understanding the wave properties from a microscopic model.
CO201.3	Analyse optical phenomena like diffraction and interference.
CO201.4	Understanding spontaneous and stimulated emission of radiation, optical pumping, population inversion, three-level and four-level lasers. Ruby, He-Ne laser in detail and its applications.

CO-PO-PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1															
CO2															
CO3															
CO4															

Signature of Staff In-charge Signature of HOD