BSC PHYSICS SYLLABUS UNDER CHOICE BASED CREDIT SYSTEM

Paper III: OPTICS & LASER PHYSICS

(FOR NON- MATHEMATICS COMBINATIONS)

III SEMESTER – W.E.F.2016-17

Work load: 60 hrs per semester **4 hrs/week**

UNIT –I(10 hrs)

1. Geometric optics

Aberrations in lenses-Chromatic Aberration-Achromatic Combination of lenses-Monochromatic defects-Spherical aberration-Astigmatism-Coma-Curvature and Distortion-Minimizing aberration.

UNIT-II(13 hrs)

2. Interference

The superstition principle, Condition for Interference, Classification of Interferences methods-Young's double slit experiment-Theory. Interference with white light and appearance of Young's interference fringes-Intensity in interference pattern-Optical Path length, Lloyd's single mirror-Phase change on reflection, Interference due to plane parallel wedge shaped films, Colours in thin films-Newton rings, Determination of wavelength of light. Michelson's interferometer.

UNIT-III(12 hrs)

3. Diffraction

The Fresnel and Fraunhoffer diffraction phenomena-Fraunhoffer diffraction of single Slit normal incidence and oblique incidence – Resolving power –limits of resolution for telescopes and microscope-Fraunhoffer diffraction by double slit-Intensity-pattern- Diffraction grating- Wavelength determination (Normal incidence and Minimum deviation).

UNIT-IV(13hrs)

4. Polarization

Types of Polarized light-Polarization by reflection, Brewster's law-Dichroism the Polaroid-double refraction- the calcite crystal-the principal plane-O and E rays-the Nicol Prism, Polariser and Analyser, Law of Malus-the quarter wave plate and half wave plate Plane, Circularly, elliptically polarized light-Production and analysis -Optical activity-Specific rotatory power –Polarimeter.

UNIT V: (12 hrs)

5. Lasers and Holography

Lasers: introduction, spontaneous emission, stimulated emission. Population Inversion, Laser principle- Types of lasers-He-Ne laser, Ruby laser- Applications of lasers. Holography: Basic principle of holography-Gabor hologram and its limitations, Applications of holography.

6. Fiber Optics

Introduction- different types of fibers, modes in an optical fiber, fiber material, principles of fiber communication (qualitative treatment only), applications.

REFERENCE BOOKS

1. BSc Physics, Vol.2, Telugu Academy, Hyderabad
2. Physics for Biology and Premedical Students –D.N. Burns & SGG Mac Donald
3. Unified Physics Vol.II, Optics and Thermodynamics,*Jai Prakash Nath&Co.Ltd., Meerut*.
4. Optics, AjoyGhatak, Tata Mc Graw-Hill.
5. Fundamentals of Optics, H.R. Gulati and D.R. Khanna, 1991, R. Chand Publication
6. Introduction of Lasers – Avadhanulu, S.Chand& Co.
7. Principles of Optics- BK Mathur, Gopala Printing Press, 1995

Practical Paper III: Optics & Laser Physics

Work load: 30 hrs **2 hrs/week**

Minimum of 6 experiments to be done and recorded

1. Determination of refractive index of liquid-Boy's method.
2. Refractive index of a liquid-hallow prism
3. Dispersive power of a prism.
4. Determination of thickness of a thin wire by wedge method
5. Determination of radius of curvature of a given convex lens-Newton's rings.
6. Determination of wavelength of light using diffraction grating-minimum deviation method.
7. Determination of wavelength of light using diffraction grating-normal incidence method.
8. Resolving power of grating.
9. Resolving power of a telescope.
10. Study of optical rotation –Polarimeter.
11. Determination of wavelength of Laser light using diffraction grating

Suggested student activities

Student seminars, group discussions, assignments, field trips, study project and experimentation using virtual lab

Examples

Seminars :- A topic from any of the Units is given to the student and asked to give a brief seminar presentation.

Group discussion :- A topic from one of the units is given to a group of students and asked to discuss and debate on it.

Assignment :- Few problems may be given to the students from the different units and asked them to solve.

Field trip :- Visit to Satish Dhawan Space Centre, Sriharikota / Thermal and hydroelectric power stations / Science Centres, any other such visit etc.

Study project :- Web based study of different satellites and applications.

Domain skills:

Logical derivation, experimentation, problem solving, data collection and analysis, measurement skills

***** Documental evidence is to be maintained for the above activities.**

MODEL PAPER

THREE YEAR B.Sc DEGREE EXAMINATION

CHOICE BASED CREDIT SYSTEM

THIRD SEMESTER: PART II: PHYSICS

Paper III : OPTICS AND LASER PHYSICS

(WITH NON- MATHEMATICS COMBINATION)

Time: 3 Hours Max. Marks: 75

Section-A (Essay type)

Answer All questions **Marks :5X10 = 50**

1.a) Explain Chromatic aberration . Explain the condition for removal of Chromatic aberration using two lenses separated by a distance.

OR

b) What is meant by spherical aberration? Deduce the condition for minimum spherical aberration in a combination of two lenses separated by a distance.

2. a) Explain the Young's double slit experiment with theory .

OR

b) Explain the formation of Newton's rings in reflected light. Explain the experimental determination of wave length of monochromatic light using Newton's rings.

3.a) Discuss the Fraunhoffer diffraction pattern due to single slit. Obtain expression for intensity distribution, position of the Maxima and Minima.

OR

b) Explain how to determine the wavelength of light using a grating in the minimum deviation method.

4. a) Describe the construction and working of a Nicol prism.

OR

b) Define specific rotation. Describe how specific rotation of sugar solution is determined experimentally.

5. a) What is the principle of Laser. Explain the construction and working of ruby laser.

OR

b) What is total internal reflection? Describe an optical fiber and explain how a light ray propagates in it. Write its uses.

Section-B (Short answer type)

Answer any three questions **Marks: 3X5 = 15**

6. Explain the defect astigmatism and how it is eliminated.
7. Explain the formation of colours in thin films.
8. Write the differences between Frenel and Fraunhoffer diffraction.
9. What is double refraction explain.
10. What is Holography? Write its applications.

Section-C

Answer any two questions **Marks: 2X5 = 10**

11. An achromatic lens of focal length 20 cm is to be made out of 2 thin crown and flint glass lenses in contact. If dispersive power of crown and flint glasses are 0.2 and 0.4 respectively, find the focal lengths of the lenses used.

12. In a Newton's rings experiment the diameter of the 16th ring was found to be 0.6 cm and that of 6th ring was 0.34cm if the wavelength of light used 5893 $\overset{0}{A}$. Find the radius of the Plano-convex lens used.

13. A plane diffraction grating in the second order shows an angle of diffraction 30^0 at the mercury blue line of wavelength 4360 $\overset{0}{A}$. Calculate the number of lines per centimeter of the grating plate.

14. Determine the specific rotation of the given sample of sugar solution, if the plane of polarization is turned through 24^0. The length of tube containing 20% of sugar solution is 20cm.

15. An optical fiber has a core refractive index of 1.52 and a cladding refractive index of 1.48. Determine the critical angle at the core-cladding interface.