SRI VENKATESWARA UNIVERSITY
B.Sc. DEGREE COURSE IN PHYSICS (NON MATHS)
FIRST YEAR - SECOND SEMESTER
(Under CBCS W.E.F. 2020-21)

Course II: WAVE OPTICS
(For Non-Maths Combinations)

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

Course outcomes:

On successful completion of this course, the student will be able to:

❖ *Explain about the different aberrations in lenses and discuss the methods of minimizing them.*

❖ *Understand the phenomenon of interference of light and its formation in Lloyd's single mirror Thin films and Newton's rings.*

❖ *Distinguish between Fresnel's diffraction and Fraunhoffer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.*

❖ *Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.*

❖ *Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.*

❖ *Comprehend the basic principles of laser and fibre optic communication and their applications.*

UNIT –I: Geometric optics   **(12 hrs)**

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

UNIT-II:Interference   **(12 hrs)**

The superposition principle, Condition for Interference, Classification of Interferences methods-Young's double slit experiment-Theory, Intensity in interference pattern- Phase change on reflection ; Lloyd's single mirror; Interference due to plane parallel wedge shaped films, Colours in thin films-Newton rings, Determination of wavelength of light using Newton's rings.

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UNIT-III:Diffraction   **(12 hrs)**

Fresnel and Fraunhoffer diffraction phenomena, Differences between interference and diffraction, Fraunhoffer diffraction of single Slit;Diffraction grating- Determination of wavelength of light using diffraction grating (Normal incidence and Minimum deviation); Resolving power; Rayleigh's criterion –limits of resolution for telescopes and microscope,Zone plate-construction and its comparison with convex lens

UNIT-IV: Polarization (12 hrs)

Polarized light: Production of plane polarized light by reflection, Double refraction; Brewster's law; Malus law; Nicol prism; Nicol prism as polarizer and analyzer- Quarter wave plate, Half wave plate- Production and detection of plane, circularly and elliptically polarized light, Optical activity, determination of specific rotation by Laurent's half shade polarimeter

UNIT V: Lasers& Fiber Optics(12 hrs)

Lasers-characteristics; Stimulated and Spontaneous emission, Population inversion, Laser principle, Ruby laser, He-Ne laser, Applications of lasers
Introduction to fibres,Different types of fibres, Principles of fiber communication (qualitative treatment only), Advantages of optical fibre communication

REFERENCE BOOKS

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

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SRI VENKATESWARA UNIVERSITY B.Sc.
DEGREE COURSE IN PHYSICS (NON MATHS)
FIRST YEAR - SECOND SEMESTER
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PRACTICAL COURSE II: WAVE OPTICS

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

On successful completion of this practical course, the student will be able to;

1. *gain hands-on experience of using various optical instruments like spectrometer, polarimeter and making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.*

2. *understand the principle of working of polarimeter and the measurement of specific rotatory power of sugar solution*

3. *know the techniques involved in measuring the resolving power of telescope and dispersive power of the material of the prism.*

4. *be familiar with the determination of refractive index of liquid by Boy's method and the determination of thickness of a thin wire by wedge method.*

Minimum of 6 experiments to be done and recorded:

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

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RECOMMENDED CO-CURRICULAR ACTIVITIES:

MEASURABLE

1. Assignments (in writing and doing forms on the aspects of syllabus content and outside the syllabus content. Shall be individual and challenging)

2. Student seminars (on topics of the syllabus and related aspects (individual activity))

3. Quiz (on topics where the content can be compiled by smaller aspects and data (Individuals or groups as teams)

4. Field studies (individual observations and recordings as per syllabus content and related areas (Individual or team activity)

5. Study projects (by very small groups of students on selected local real-time problems pertaining to syllabus or related areas. The individual participation and contribution of students shall be ensured (team activity)

GENERAL

1. Group Discussion

2. Visit to Research Stations/laboratories and related industries

3. Others

RECOMMENDED ASSESSMENT METHODS

Some of the following suggested assessment methodologies could be adopted;

1. The oral and written examinations (Scheduled and surprise tests),

2. Closed-book and open-book tests,

3. Individual and group project reports,

4. Efficient delivery using seminar presentations,

5. Viva voce interviews.

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V. Balour

BOS Chairman

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MODEL QUESTION PAPER COMMON FOR ALL FIVE THEORY COURSES

Time: 3 hrs   *Max marks: 75*

SECTION-A

(Short Answer Type Questions)   *Marks*: 5x5M = 25M

Answer any five out of the following ten questions

1. Short answer type question from Unit-I

2. Short answer type question from Unit-I

3. Short answer type question from Unit-II

4. Short answer type question from Unit-II

5. Short answer type question from Unit-III

6. Short answer type question from Unit-III

7. Short answer type question from Unit-IV

8. Short answer type question from Unit-IV

9. Short answer type question from Unit-V

10. Short answer type question from Unit-V

SECTION-B

(Essay Type Questions)   *Marks*: 5x10M = 50M

Answer All questions with internal choice from each Unit

11.   Essay type question from Unit-I

            Or

    Essay type question from Unit-I

12.   Essay type question from Unit-II

            Or

    Essay type question from Unit-II

13.   Essay type question from Unit-III

            Or

    Essay type question from Unit-III

14.   Essay type question from Unit-IV

            Or

    Essay type question from Unit-IV

15.   Essay type question from Unit-V

            Or
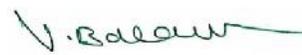
    Essay type question from Unit-V

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SUBJECT EXPERTS

Prof.K.T.Rama Krishna Reddy
Dept of Physics,
S V University,
Tirupati

Dr.M.Ravi Kumar,
Lecturer in Physics,
Govt. Degree College,
Ananthapuram

SYLLABUS VETTED BY

Prof.R.Rama Krishna Reddy
Dept of Physics,
S K University,
Anantapur

V.Balan

BOS Chairman