

## SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar-388120

B.Sc. (Semester - 3)

Subject: Physics

Course: US03CPHY21

### Optics

(Four Credit Course –4 Hours per week)

(Effective from June-2019)

#### UNIT - I Geometrical Optics

**Lens Systems:** Introduction to lenses, Equivalent focal length of two thin lenses, Focal length of the equivalent lens, Distance of equivalent lens from  $L_2$  and  $L_1$ , Powers, Cardinal points, Principal points and Principal planes, Focal points and Focal planes, Nodal points and Nodal planes, Construction of image using cardinal points, Newton's formula, Cardinal points of a coaxial system of two thin lenses- Object at infinity

**Lens Aberrations:** Introduction, Types of aberration, Spherical aberration, Reducing spherical aberration, Coma, Astigmatism, Curvature of field, Distortion, Chromatic aberration, Chromatic aberration in a lens- Object at infinity and object at finite distance

**Eyepieces:** Introduction to objective and eyepiece, Huygens eyepiece, Cardinal points of Huygens eyepiece, Ramsden eyepiece, Cardinal points of Ramsden eyepiece, Comparison of Ramsden and Huygens eyepieces

#### UNIT - II Interference and Diffraction

**Interference:** Introduction, Techniques for obtaining interference, Fresnel's biprism, Experimental arrangement, Determination of wavelength of light, Interference fringes with white light, Lateral displacement of fringes, Lloyd's single mirror, Determination of wavelength, Newton's ring, Condition for bright and dark rings, Circular fringes, Radii of dark fringes, Dark central spot, Determination of wavelength of light, Concept of multiple beam interference, Feby-Perot interferometer and Etalon, Formation of fringes, Determination of wavelength, Measurement of difference in wavelength, Lummer and Gehrcke plate

**Diffraction:** Introduction, Distinction between interference and diffraction, Fresnel and Fraunhofer types of diffraction, Diffraction pattern due to a narrow slit, Diffraction due to a narrow wire, Fraunhofer diffraction at a circular aperture, Fraunhofer diffraction at double slit- Interference and diffraction maxima and minima

#### UNIT - III Polarization

Introduction, Polarized light, Production of linearly polarized light, Polarization by reflection, Polarization of refraction- pile of plates, Polarization by scattering, Polarization by selective absorption, Polarization by double refraction, Polarizer and analyzer, Construction and working of Nicol prism, Polaroid sheets, Effect of polarizer on natural light, Effect of analyzer on plane polarized light- Malus' law, Anisotropic crystals, Calcite crystal, Optic axis, Principle section, Double refraction, Huygens' explanation of double refraction, o-Ray and e-Ray, Positive crystals and negative crystals, Superposition of waves linearly polarized at right angles, Retarders or Wave plates, Quarter wave plate, Half wave plate, Production and detection of elliptically polarized light, Production and detection of circularly polarized light, Analysis of polarized light, Babinet compensator- construction and production of polarized light, Specific rotation, Laurent's half shade polarimeter, LCDs

#### UNIT - IV Fibre Optics

Introduction, Optical fibre, Necessity of cladding, Optical fibre system, Optical fibre cable, Total internal reflection, Propagation of light through an optical fibre, Critical angle of propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Modes of propagation, Classification of optical fibres, Single mode step index fibre, Multimode step index

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fibre, Graded index fibre, Materials, All glass fibres, All plastic fibres, PCS fibres, Bandwidth, Characteristics of the fibers, Applications, Illumination and image transmission, Optical communications, Medical applications, Military applications, Fibre optic communication system, Merits and demerits of optical fibers

**Text Book:**

1. A Textbook of Optics  
Subrahmanyam, Brij Lal and Avadhulu  
S Chand Publication (24<sup>th</sup> Revised addition 2010)

**Reference Books:**

1. Optics  
Ajoy Ghatak,  
McGraw-Hill Publishing Co. Ltd.
2. Textbook of light  
D N Vasudev  
Atma Ram and Sons, New Delhi
3. Fundamental of Optics  
F A Jenkin and H E White  
Tata McGraw Hill Book Co. Ltd.

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# SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar-388120

B.Sc. (Semester - 3)

Subject: Physics

Course: US03CPHY-2, 2

## Basic Solid State Electronics

(Four Credit Course –4 Hours per week)

(Effective from June-2019)

### UNIT I DC Load Line, Transistor Biasing and Stabilization of Operating Point

Introduction, Basic CE amplifier circuit, DC load line, Bias a Transistor, Selection of operating point, Need for bias stabilization, Requirement of biasing circuit, Different biasing circuits, Fixed-bias circuit, Collector to base bias circuit, Bias circuit with emitter resistor, Voltage divider biasing circuit, Approximate analysis, Accurate analysis, Emitter- bias circuit, PNP transistor biasing circuit

### UNIT II Small Signal Amplifiers, h-parameters and Multi-Stage Amplifiers

Introduction, Single stage transistor amplifier, Amplifier performance analysis methods, Graphical method, Dc and AC load line, Calculation of gain, Input and output phase relationship, Equivalent circuit method, Development of transistor AC equivalent circuit, h- parameter equivalent circuit, Amplifier analysis, Requirement of more than one stages, Gain of multi-stage amplifier, Decibel, Gain of multi-stage amplifier in dB, Why dB is used, How to couple two stages, Resistance-Capacitance coupling, Transformer coupling, Direct coupling

### UNIT III Feedback in Amplifiers and Oscillators

Concepts of feedback in amplifiers, Types of feedback, Voltage gain of feedback amplifier Advantages of negative feedback, Stabilization of gain, Reduction in distortion and noise, Increase in input impedance, Decrease in output impedance, Increase in bandwidth, Amplifier circuit with negative feedback, RC coupled amplifier without bypass capacitor, Emitter follower, **Oscillators:** Need of an oscillator, Classification of oscillators, Tuned circuit for generation of sine waves, Frequency of oscillation in LC circuit, Sustained oscillations, Positive feedback amplifier as an oscillator, The starting voltage, Hartley oscillator, Colpitts oscillator, Basic principles of RC oscillators, Phase shift oscillator, Wien bridge oscillator

### UNIT IV FET and MOSFET

**FET:** Basic Ideas, Drain curves, Transconductance curves, Biasing in the ohmic region, Biasing in the active region, Transconductance, JFET amplifiers, The JFET analog switch, Other JFET applications (Multiplexing, Chopper amplifiers, Voltage control resistance, Automatic gain control), **MOSFET:** The depletion mode MOSFET, The enhancement mode MOSFET, The ohmic region, Passive load switching, Active load switching, CMOS

#### Text Books:

1. Basic Electronics and Linear Circuits  
N N Bhargava, D C Kulshreshtha and S C Gupta  
Tata McGraw Hill Publishing Co. Ltd., New Delhi
2. Electronic Principles  
A P Malvino  
Tata McGraw Hill Publishing Co. Ltd., New Delhi

#### Reference Books:

1. Basic Electronics (Solid State)  
B L Theraja  
S Chand, New Delhi
2. Principle of Electronics  
V K Mehta and Rohit Mehta  
S Chand & Co., New Delhi
3. Electronic Devices and Circuits- An Introduction  
Allen Mottershead  
PHI Learning Pvt. Ltd., New Delhi

**SARDAR PATEL UNIVERSITY**

Vallabh Vidyanagar - 388 120

**B.Sc. (Semester -3)**

**Subject: Physics Practical**

**Course No. US03CPHY23**

**(Two Credit Course -4 Hours per week)**

**(Effective from June-2019)**

**List of Practical:**

1. Determination of 'g' by Kater's pendulum (fixed distance)
2. 'Y' by Koenig's method
3. Cardinal points of two lens system
4. Dispersive curve and power of a prism.
5. Resolving power of a telescope
6. Determination of wavelength of monochromatic light using Biprism
7. Velocity of sound by resonance tube
8. Determination of unknown wavelength of spectra using Hartmann's formula
9. Determination of specific rotation of optically active substance using Laurent's half shade polarimeter
10. Numerical differentiation

**Note:** To provide flexibility up to the maximum of 20% of total experiments can be replaced/ added as per the availability of local facilities of the college.

**Books Recommended:**

1. Advanced Practical Physics for students  
B L Wosnop and H T Flint  
Methuen and Co. Ltd., London
2. B.Sc. Practical Physics  
C L Arora  
S.Chand & Co. Ltd., New Delhi
3. Advanced Practical Physics  
M S Chauhan and S P Singh  
Pragati Prakashan, Meerut
4. Advanced Practical Physics  
S L Gupta and V Kumar  
Pragati Prakashan, Meerut



**List of Practical:**

1. Load line and determination of Q-point for BJT
2. Frequency response of a RC coupled amplifier (without feedback)
3. Study of transformer parameters
4. Variation of  $I_c$  and  $V_{ce}$  with temperature for Fixed bias/ Potential divider circuit
5. Impedance by voltage drop method
6. Inductance L by Maxwell's bridge
7. Study of L-C-R series resonance circuit
8. RC Phase shift oscillator
9. Planck's constant 'h' using photocell
10. Exponential least square fitting

**Note:** To provide flexibility up to the maximum of 20% of total experiments can be replaced/ added as per the availability of local facilities of the college.

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3. Advanced Practical Physics  
M S Chauhan and S P Singh  
Pragati Prakashan, Meerut
4. Advanced Practical Physics  
S L Gupta and V Kumar  
Pragati Prakashan, Meerut

