

LENSES AND OPTICAL FIBERS**BSC 4TH SEMESTER OPEN ELECTIVE COURSE****Unit I:****Basics of lenses and spherical mirrors. 15 Hours**

Types of lenses, Important terms (Principal axis, Principal focus, Focal length, Optical center), Sign convention, Magnification, Thick and thin lenses (qualitative). Image types, convex concave and plane mirrors, Mirror formula (mention only), Image formation by plane mirror, image formation by lenses and spherical mirrors, Lens formula (mention only), Lens makers formula (mention only). Power of a lens, unit of power.

Lens combination (derivation), Power of lens combination.

Types of glass used in lens making.

Aberrations:

Spherical (longitudinal and lateral), chromatic (longitudinal and lateral) aberrations. Methods to reduce spherical aberration (qualitative). Condition for Achromatism of two thin lenses in contact and separated by a distance.

Numerical problems.

Unit II:**Introduction of Fiber Optics: 15 Hours**

History and Evolution of Fiber Optics, Concept of refractive index, construction of optical fibres, TIR condition, Light propagation through optical fibres. Types of optical fibres: step index, graded index, concept of modes, single mode and multimode fibres, Numerical aperture, acceptance angle and their relation, skew rays, attenuation (absorption, scattering and bending losses) and dispersion (material, waveguide and intermodal dispersion) in optical fibres. Optical sources: Light emitting diodes: Principle and efficiency, Laser diodes: Principle and efficiency, comparison between real laser light and light produced by laser diode. Fiber Bragg grating (qualitative, mention applications)

Effective refractive index, optical fibre refractive index sensor, mention of other applications (temperature, displacement, pressure, force, level sensors) of optical fibre sensors. Mention of Plastic optical fibres.

Unit III:**Applications of Lenses 15 Hours**

Microscope, Telescope (different types and differences between them, Ray diagrams, mention of corresponding formulae).

Visual angle and accommodation of eye, Use of lenses in Eyesight correction, (myopia, hyperopia, astigmatism, presbyopia, cataract and glaucoma), corresponding ray diagrams, significance of eyesight correction number. Resolution of optical instrument (qualitative).

Eyesight vision, 6/6 and 6/9 vision. 20/20, 20/200 and 20/10 vision. Normal vision range.

Ramsden's and Huygen's eyepieces (qualitative), uses. Differences between Ramsden's and Huygen's eyepieces.

Basics of communication, Need for optical fibre communication, advantages of optical fibres in communication, Block diagram of optical fibre communication system, working of each block, Principle of fibre optic sensors.