

SYLLABUS FOR APPLIED PHYSICS
SEMESTER – 3
APPLIED PHYSICS COURSE CODE : US03CAPH01 (3 Credit Course)
COURSE TITLE : Optics and Remote Sensing
(Effective from June 2018)

Unit 1 : Lens Systems and Lens Aberrations

Introduction, Cardinal Points, Principal points and Principal planes, some remarkable features of Principal planes, focal points and focal planes, nodal points and nodal planes, construction of the image using cardinal points, Newton's formula, relation between f_1 and f_2 , Gaussian formula. Lens Aberrations: Types of monochromatic aberration and their reduction- Spherical aberration, Coma, Astigmatism, Curvature of field, Distortion, Chromatic aberration in a lens

Unit 2 : Polarization of Light

Introduction, Polarized light, Natural light, polarization by reflection, Brewster's law, polarization by refraction-pile of plates, polarization by scattering, polarization by selective absorption, polarization by double refraction, polarizer and analyzer, Anisotropic crystals, Calcite crystal, Huygens' explanation of double refraction Types of polarized light, retarders or wave plates, Quarter wave plate, half wave plate, production and detection of elliptically and circularly polarized light, specific rotation, Laurent's half shade polarimeter.

Unit 3 : Basics of Remote Sensing

Introduction to remote sensing, sun and atmosphere, concept of signatures, multi-spectral concept, remote sensing system, remote sensors, platforms, data product generation, data analysis, end utilization, Electromagnetic radiation, velocity of EM radiation, polarization, coherent radiation, some more wave properties of EM radiation, Attenuation, Thermal radiation, emissivity.

Unit 4 : Fundamentals of Radiometry

Measurement geometry – concept of the solid angle, Radiometric quantities : radiant energy, radiant flux, Irradiance, radiant intensity, Radiance, Surface characteristics for radiometric measurements, Observation geometry in remote sensing, Principles of satellite motion, Kepler's laws, Locating a satellite in space, Types of orbit, Geosynchronous and geostationary orbit, Sun-synchronous orbit

Text Books :

1. A Textbook of Optics by N. Subrahmanyam, Brij Lal and M. N. Avadhanulu, S. Chand & Company Ltd., New Delhi
2. Fundamentals of Remote Sensing by George Joseph, University Press Pvt. Ltd., Hyderabad.

Reference Books :

1. Basics of Remote Sensing and GIS by Dr. S. Kumar, University Science Press
2. Remote sensing and GIS by Basudeb Bhatta, Oxford University Press, New Delhi

SYLLABUS FOR APPLIED PHYSICS

SEMESTER – 3

APPLIED PHYSICS COURSE CODE : US03CAPH02 (3 Credit Course)

COURSE TITLE : Digital Electronics & Optoelectronic Devices

(Effective from June 2018)

Unit 1 : Number Systems, Logic Gates and Logic Families

Number Systems: The decimal number system, the binary number system, representation of signed numbers and binary arithmetic in computers, the octal number system, the hexadecimal number system. Logic Gates: The AND gate, the OR gate, the NOT gate, the universal gates, the XOR-XNOR gates. Logic Families: Digital IC specification terminology, logic families, transistor-transistor logic (TTL), integrated injection logic (IIL/I²L), emitter-coupled logic (ECL).

Unit 2 : Boolean Algebra and Flip-Flops

Boolean Algebra: Logic operations, axioms and laws of Boolean algebra, reducing Boolean expressions, Boolean functions and their representation. Flip-Flops: Classification of sequential circuits, latches and flip-flops (S-R, D, J-K, T), flip-flop operating characteristics, applications of flip-flops.

Unit 3 : Combinational Logic Design

Adders, subtractors, binary parallel adder, 4-bit parallel subtractor, binary adder-subtractor, parity bit generator/checkers, encoder, decoder, multiplexer, demultiplexer

Unit 4 : Optoelectronic Devices

Introduction, light units, light emitting diodes – operation, construction, characteristics and parameters, seven segment displays – LED seven segment display, liquid crystal cells, LCD seven segment displays, Photoconductive cells – construction, characteristics, parameters and applications, photodiodes and solar cells, Optocouplers – Operation, construction, specification and applications, Laser diode – operation, characteristics and parameters.

Text book:

1. Fundamentals of Digital Circuits (2nd Ed.) by A. Anand Kumar (PHI Learning Private Limited, New Delhi)
2. Electronic Devices and Circuits by David A. Bell, Fifth edition, Oxford University Press, New Delhi

Reference book:

1. Digital Logic and Computer Design by M. Morris Mano (Pearson Publication)
2. Basic Electronics – Solid State by B. L. Theraja, S. Chand Publications

SYLLABUS FOR APPLIED PHYSICS
SEMESTER – 3
APPLIED PHYSICS COURSE CODE: US03CAPH03 (3 Credit Course)
COURSE TITLE : Practicals
(Effective from June 2018)

1. Use of multimeter
2. Use of CRO
3. Logic gate using discrete component
4. Reduction of Boolean expression
5. Logic gates using ICs
6. Flip-flops (RS, Clocked RS, D, JK Flip – flops)
7. Half and Full Adder
8. Half and Full subtracter
9. Study of resonance in an LCR circuit
10. Determination of energy band gap ' E_g ' of a semiconductor diode.
11. Verification of Malus' law
12. Determination of specific rotation of sugar by Laurent's half shade Polarimeter.
13. Verification of Stefan's fourth power law.
14. Particle size determination using Diode Laser.
15. Calibration of magnetic fields by Hall probe method.
16. Study of SMPS

Reference Books :

1. A Laboratory Manual of Physics for Undergraduates by D P Khandelwal
2. University Practical physics by D C Tayal-Himalayan publishing house.
3. Advanced Practical Physics by Worsnop & Flint.
4. Instructions manual-Kit developed for doing experiments in Physic(At BSc. and M.Sc. Physics levels) by R Srinivasan and K R S Priolkar-Indian Academy of Science, Bangalore.
5. B.Sc. Practical Physics by C. L. Arora, S. Chand & Company Ltd. New Delhi.