

Revised Syllabus in Physics (Theory and Practical)

as per Choice based Credit and Grading system

Second year B.Sc. 2017-2018

The revised syllabus in Physics as per credit based system (with choice) of the Second Year B.Sc course will be implemented from the academic year 2017-2018.

Objectives:

- To develop analytical abilities towards real world problems
- To familiarize with current and recent scientific and technological developments
- To enrich knowledge through problem solving hands on activities, study visits, projects etc.

Semester	Paper	Title	Credits
III	USPH301	Mechanics and thermodynamics	2
III	USPH302	Vector calculus ,Analog Electronics	2
III	USPH303	Applied Physics -I	2
III	USPHP3	Practical course -3 (Group A,B,C and Skill)	3
		Total	9
IV	USPH401	Optics and Digital Electronics	2
IV	USPH402	Quantum Mechanics	2
IV	USPH403	Applied Physics-II	2
IV	USPHP4	Practical course -4 (Group A,B,C and Demo)	3
		Total	9

Proposed syllabus of SYBSc(2017-18)

USPH301 : Mechanics and thermodynamics

Learning Outcomes :

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

- i) Understand the concepts of mechanics & properties of matter & to apply them to problems.
- ii) Comprehend the basic concepts of thermodynamics & its applications in physical situation.
- iii) Learn about situations in low temperature.
- iv) Demonstrate tentative problem solving skills in all above areas.

UNIT –I15Lectures

I Compound pendulum :

Expression for period, maximum and minimum time period, centres of suspension and oscillations , reversible compound pendulum. Kater's reversible pendulum , compound pendulum and simple pendulum- a relative study.

ii Center of Mass , .Motion of the Center of Mass , Linear momentum of a Particle

Linear momentum of a System of Particles , Linear momentum wrt CM coordinate (i.e shift of origin from Lab to CM), Conservation of Linear Momentum , Some Applications of the Momentum Principle , System of Variable Mass

Torque Acting on a Particle ,Angular Momentum of a Particle , Angular Momentum of System of Particles , Total angular momentum wrt CM coordinate. Conservation of Angular Momentum

iiiOscillations , The Simple Harmonic Oscillator , Relation between Simple Harmonic Motion and Uniform Circular Motion , Two Body Oscillations, Damped Harmonic Motion ,Forced Oscillations and Resonance.

UNIT –II

15Lectures

(Review of zeroth and first law of thermodynamics)

- I Conversion of heat into work, heat engine, Carnot's cycle: its efficiency.
- ii Second law of thermodynamics, Statements, Equivalence of Kelvin and Plank statement, Carnot's theorem, Reversible and irreversible process, Absolute scale of temperature.
- iii Clausius theorem, Entropy, Entropy of a cyclic process, Reversible process, Entropy change, Reversible heat transfer, Principle of increase in entropy, generalized form of first and second law, entropy change of an ideal gas, entropy of steam, entropy and unavailable energy, entropy and disorder, absolute entropy.

UNIT –III 15 Lectures

- i Third law of thermodynamics, Nernst heat theorem, Consequences of the third law, Maxwell's thermodynamic relations, Clausius – Clapeyron equation, Thermal Expansion.
- ii Steam engine, Rankine cycle, Otto engine, Efficiency of Otto cycle, Diesel cycle, Efficiency of Diesel cycle, Otto and diesel comparison
- iii Low temp Physics: Different methods of liquefaction of gases, methods of freezing, Cooling by evaporation, cooling by adiabatic expansion
Joule - Thompson effect, JT effect of Vander Waal's gas, Liquefaction of helium, properties and uses of liquid Helium

References:

Resnick and Halliday : Physics – I

Mechanics – H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd ED.)

Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2008, 2009.

Heat thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P. S. Hemne, S. Chand, edition 2007.

Additional reference:

1. KRS: Mechanics by K.R Symon.
2. Classical Dynamics of particles and systems by Thornton and Marian, (CENGAGE Learning)
3. Basic Thermodynamics : Evelyn Guha (Narosa Publications)
4. Classical mechanics by Kleppener , Kollenkov
5. A treatise on heat :MeghanadSaha and BN Srivastava , 1969, India Press.
6. Mechanics and Electrodynamics Rev Edn. 2005 by Brijlal and Subramanyanand JeevanSeshan.

USPH401 :Optics and Digital Electronics

Learning Outcomes:

On successful completion of this course students will be able to :

- 1) Understand the diffraction and polarization processes and applications of them in physical situations.
- 2) Understand the applications of interference in design and working of interferometers.
- 3) Understand the resolving power of different optical instruments.\
- 4) Understand the working of digital circuits
- 5) Use IC 555 timer for various timing applications.
- 6) Demonstrate quantitative problem solving skills in all the topics covered.

UNIT I:

(15 Lectures)

Background knowledge (devote one lecture at commencement):

- i. Introduction, Huygens's - Fresnel theory, Distinction between interference and diffraction, Fresnel and Fraunhofer types of diffraction.
- ii. Introduction of Polarization, Natural light is unpolarized, Unpolarized and Polarized light
- iii. Brewster's law , Polaroid sheets
- iv. Prism and grating spectra ,Cornu's spiral, Fresnel's integrals.

Diffraction:

Fresnel's Diffraction: Fresnel's assumptions, Rectilinear propagation (Half period zones) of light, Diffraction pattern due to straight edge, Positions of maxima and minima in intensity, Intensity at a point inside the geometrical shadow(straight edge), Diffraction due to a narrow slit, Diffraction due to a narrow wire

Fraunhofer Diffraction : Introduction, Fraunhofer diffraction at a single slit, Intensity distribution in diffraction pattern due to a single slit, Fraunhofer diffraction at a double slit, Distinction between single slit and double slit diffraction pattern and missing orders, Plane diffraction Grating, Theory of plane transmission grating, Width of principal maxima .

Unit II (15Lectures)

Polarization: Types of polarization, Plane polarized light, Circularly polarized light, Elliptically polarized light, Partially polarized light, Production of Plane polarized light, Polarization by reflection from dielectric surface, Polarization by refraction –pile of plates, Polarization by scattering, Polarization by selective Absorption, Polarization by double refraction, Polarizer and Analyzer, Malus' Law, Anisotropic crystal, Calcite crystal, Optic Axis, Double refraction in calcite crystal, Huygens' explanation of double refraction, Ordinary and Extra ordinary rays, Positive and Negative crystals, Superposition of waves linearly polarized at right angles, Superposition of e-Ray and o-Ray, Retarders, Quarter wave plate, Half wave plate, Production of linearly polarized light, Production of elliptically polarized light, Production of circularly polarized light, Analysis of polarized light, Applications of polarized light.

Unit – III

Digital Electronics: (15Lectures)

Background knowledge (devote one lecture at commencement):

- i. Binary number system , Arithmetic building blocks , Types of registers

Digital IC signal levels, Binary to Decimal ,Decimal to binary , Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition, Unsigned binary numbers, Sign magnitude numbers , 1's complement , 2's complement , Converting to and from 2's complement representation , 2's complement arithmetic, The adder-subtractor (ignore IC specific diagrams)

RS Flip-Flops (only NOR gate latch, NAND gate latch) , Gated Flip-Flops, Edge-Triggered RS Flip-Flop, Edge- Triggered D Flip-Flop, Edge-Triggered J-K Flip-Flop, JK Master- Slave Flip-Flops, Bounce elimination switch

Types of registers : SISO , SIPO, PISO , PIPO [in this chapter the teacher should make all IC specific diagrams into general diagrams ie. Ignore pin numbers and IC numbers]

Asynchronous counter -3 bit (ignore IC specific diagrams), Synchronous counter only mod 8, Decade Counters Mod5 and Mod10

A Text Book Of Optics By: Dr.N.Subrahmanyam, Brijlal, Dr M.N. Avadhaanulu
(S.Chand, 25th Revised edition 2012 Reprint 2013)

AJOY GHATAK: OPTICS (5th Edition)

LMS – Digital Principles and Applications By Leach, Malvino, Saha 6th edn.

TF – Digital Fundamentals by Thomas L Floyd 10th edn. (Additional Reading)

RPJ – Modern Digital Electronics by R P Jain 4th edn. (Additional Reading)