BENGALURU CITY UNIVERSITY

SYLLABUS For B.Sc. PHYSICS
(I to VI Semester)

CHOICE BASED CREDIT SYSTEM

2020-2021

Department of Physics

Bengaluru Central University

Proceedings of the BOS meeting in Physics (UG) held during 17th to 25th July 2020 (Through circulation)

The syllabus (Physics) for Three year B.Sc., course (CBCS Scheme) prepared in the required pattern as suggested by the University along with the scheme and pattern of the question papers (To be implemented from the academic year 2020-2021) were sent to the members of Board of Studies for scrutiny, finalisation and its approval through circulation by mail (From 17th to 25th July 2020). The members have gone through the syllabus carefully and gave their suggestions and approval through the mail. The syllabus which was corrected for the suggestions was recommended for its submission to the University for its acceptance.

Prof N Nagaiah
Chairman, BOS in Physics (PG)
Bengaluru City University

Question Paper Pattern

I / II / III and IV Semester (Papers PHY101/PHY201/PHY301/PHY401)

Part A: Multiple Choice Questions 10 out of 10 x 1Mark = 10 Marks (One out of Four Choice should be correct.

Part B: Short Answer Questions: 5 out of 8 x 2Marks = 10Marks (2 questions from each unit compulsorily to be given)

Part C: Long Answer Questions: 5 out of 8 x 6 Marks = 30Marks (2 questions from each unit compulsorily to be given)

Part D: Numerical Problems: 4 out of 8 x 5 Marks = 20 Marks (2 Problems from each unit compulsorily to be given)

V and VI Semester Papers (PHY501/PHY503/PHY601/PHY603)

Part A: Multiple Choice Questions 10 out of 10 x 1Mark = 10 Marks (One out of Four Choice should be correct.

Part B: Short Answer Questions: 5 out of 8 x 2Marks = 10 Marks (2 questions from each unit compulsorily to be given)

Part C: Long Answer Questions: 5 out of 7 x 6 Marks = 30 Marks (Minimum of 2 questions from each unit compulsorily to be given, but not exceeding 3 questions)*

Part D: Numerical Problems: 4 out of 8 x 5 Marks = 20 Marks (2 Problems from each unit compulsorily to be given)

*Three problems from the unit in which two questions have been set in Part C have to be given in part D

BENGALURU CENTRAL UNIVERSITY

Scheme of Instruction & Examination for B.Sc., Physics, CBCS Scheme (from 2020 -21)

Sl. No.	Course Number	Teaching hours per week	Exam duration	Maximum marks		Maximum total marks	Credits
				Final exam	Internal Assessment		
01	PHY 101	4	3 hours	70	30	150	2
02	PHY 102	3	3 hours	35	15		1
03	PHY 201	4	3 hours	70	30	150	2
04	PHY 202	3	3 hours	35	15		1
05	PHY 301	4	3 hours	70	30	150	2
06	PHY 302	3	3 hours	35	15		1
07	PHY 401	4	3 hours	70	30	150	2
08	PHY 402	3	3 hours	35	15		1
09	PHY 501	3	3 hours	70	30	150	2
10	PHY 502	3	3 hours	35	15		1
11	PHY 503	3	3 hours	70	30	150	2
12	PHY 504	3	3 hours	35	15		1
13	PHY 601	3	3 hours	70	30	150	2
14	PHY 602	3	3 hours	35	15		1
15	PHY 603	3	3 hours	70	30	150	2
16	PHY 604	3	3 hours	35	15		1
					Grand Total	1200	24

Note-I:

- The course number is a three digit number with ' **0** ' in the middle
- The digit to the left of ' **0** ' indicates the semester number
- Odd number to the right of ' **0** ' indicates a theory paper
- Even number to the right of ' **0** ' indicates a practical paper

Note-II:

The marks distribution for the final practical examination is as follows:

- Formula/Formulae with explanation of symbols - 03 marks
- Diagram/Circuit diagram and tabular column - 03 marks
- Experimental setup + systematic entry of readings - 08 marks
- Accuracy of readings - 05 marks
- Graphs and Calculations - 04 marks
- Final result and units - 02 marks
- Practical record book valued by the examiner - 05 marks
- Viva voce - 05 marks

Total for the practical examination – 35 marks

Note-III:

A minimum of **EIGHT** (8) experiments must be performed in each practical paper.

BENGALURU CENTRAL UNIVERSITY
Syllabus for I Semester B. Sc. (Physics)
PHY101: Mechanics and Properties of Matter

Unit -1

Newton's laws and their applications

Statement and explanation of the Newton's laws of motion, Inertial frames of reference, Galilean transformations, Atwood machine, Static and dynamic friction, Motion along inclined plane with and without frictional force, Use of free body diagrams, motion in a resistive medium, terminal velocity.

(8 hours)

Non-inertial frames of reference, Rotating coordinate system, Pseudo forces, Centrifugal and Coriolis forces, effects of Centrifugal and Coriolis forces at earth's surface, the Foucault pendulum (qualitative)

(5 hours)

Unit -2

Work, energy and conservation laws

Work done by a constant and a variable force, power, kinetic energy, conservative and non-conservative forces, potential energy, law of energy conservation, momentum, impulse, collisions, elastic and inelastic collisions, conservation of momentum, ballistic pendulum, rocket motion. (8 hours)

Motion due to gravitation

Newton's law of gravitation, inertial and gravitational mass, gravitational potential energy, weight of a body, Satellite motion, artificial satellites, escape velocity, circular orbits, planetary motion, Kepler's laws.

(5 hours)

Unit - 3

Motion of rigid bodies

Angular velocity, angular momentum and acceleration, kinetic energy in rotational motion, moment of Inertia of a body; calculation of moment of inertia of a disk, annular ring, solid sphere and rectangular bar; parallel and perpendicular axis theorems, torque and dynamics of rotational motion, Conservation of angular momentum with illustrations. (8 hours)

Periodic motion

Amplitude, period, frequency of period of oscillations, Simple harmonic oscillation; amplitude, frequency and energy in SHM, Simple and physical pendulum; damped oscillations; forced oscillations - concept of resonance; coupled oscillators.

(5 hours))

Unit - 4

Surface tension

Molecular interpretation of surface tension; Surface energy; Angle of contact and wetting, Pressure difference across a curved surface; Interfacial tension; Drop weight method with necessary theory, factors affecting surface tension. (4 hours)

Elasticity

Elasticity and plasticity, Stress and strain, elastic moduli, relationship between elastic constants, Poisson's ratio, work done in stretching a wire, bending of beams, bending moment, theory of single cantilever, couple per unit twist, torsional oscillations. (6 hours)

Viscosity

Laminar flow, the coefficient of viscosity, Poiseuille's method of measuring viscosity, temperature dependence of viscosity, Stokes' law.

(3 hours)

References

1. Fundamentals of Physics- R Resnick and D Halliday, 10th edition, Wiley, 2014.
2. University Physics Education, Sears and Zemansky, 13th Edition, Pearson, 2014.
3. Physics-Classical and Modern, FK Keller, WE Gettys and MJ Skove, McGraw Hill, 2nd Edition, 1989.
4. Concepts of Physics Vol (1)-HC Verma, Bharathi Bhavan Publishers, 2004.
5. Mechanics- Berkeley Physics Course Vol(1)- Mittal, Knight & Rudermann, TMH, Delhi, 1981.
6. Mechanics, K R Symon, 3rd Edition, Pearson, 2016.
7. Mechanics, S Datta, Pearson, 2012.
8. Oscillations and Waves – DP Khandelwal, Himalaya Publishing House, 1976.
9. Elements of Properties of matter – DS Mathur, Shamlal Charitable Trust, Delhi, 1996.
10. Properties of Matter - Brijlal & Subramanyam, S Chand & Co, 1982.
11. Newtonian Mechanics- AP French, Nelson & Sons UK, 1971.
12. Mechanics & Thermodynamics, G Basavaraju & Dipan Ghosh, TMH Publishing Limited, New Delhi, 1984.
13. A treatise on general properties of matter, Sengupta and Chatterjee, New Central Book Agency, Calcutta, 2001.
14. University Physics, Young and Freedman, Pearson, 2017.
15. College Physics, Vol I-A.B.Gupta, Books and Allied (P) Ltd, 2001(Revised Reprint: 2009)
16. Physics (A Calculus based approach)- Serway Jewett, India Edition Brooks/Cole CENGAGE Learning, 2007.
17. Waves and Oscillations, S L Kakani et al, CBS, 2002.
18. Waves, Berkeley physics course, F S Crawford, TMH, 2008.
19. Properties of matter, B H Flowers et al, Wiley, 1970.
20. Physics, 5th ed., J D Cutnell and Johnson, Wiley India, 2001.

Syllabus for I Semester B. Sc. (Physics)
PHY 102: Practical Physics – I

List of Experiments

1. Atwood machine – with photo gate.
2. Torsional pendulum – to determine C and Rigidity modulus.
3. Spring mass- (a) static case to determine 'k'
   (b) dynamic case to determine 'k'
   (c) 'k' as a function of L of spring
4. Bar pendulum – effective length and T.
5. Coupled oscillator – string coupled with change of tension.
6. Verification of parallel and perpendicular axis theorem.
7. Searle's double bar.
8. Work done by variable force.
9. Cantilever of negligible mass to find Young's modulus.
10. Young's modulus by Stretching.
11. Fly wheel.
12. Verification of principle of conservation of energy.

13. Determination of coefficients of static, kinetic and rolling frictions.
14. q by uniform bending.
15. q by single cantilever.
16. Surface and interfacial surface tension by drop-weight method.
17. Surface tension by capillary ascent, variation with concentration of salt.
18. Coefficient of viscosity by Stokes method.
19. Coefficient of viscosity using Poiseuille's method.

Note: A minimum of EIGHT (8) experiments must be performed.

References

1. B Saraf et al, Physics through experiments, Vikas Publications, 1980.
2. D P Khandelwal,A Laboratory Manual of Physics for Undergraduate Classes, Vani Publications, 1985.
3. Advanced Practical Physics for Students, Worsnop & Flint, Methuen & Co, London, 2011.
4. An Advanced Course in Practical Physics, D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002
5. BSc Practical Physics, C L Arora, S Chand & Co, New Delhi, 2007.

BENGALURU CENTRAL UNIVERSITY
Syllabus for II Semester B. Sc. (Physics)
PHY 201: Thermodynamics and Kinetic Theory of Gases

Unit - 1

Basic Concepts and the zeroth law of thermodynamics

Macroscopic and microscopic descriptions of a system; Thermal Equilibrium - Zeroth Law of Thermodynamics; Concept of temperature; Thermodynamic equilibrium; Thermodynamic coordinates - extensive and intensive; Equations of state; Various processes - PVT indicator diagrams.

(3 hours)

First Law of Thermodynamics

The first law of Thermodynamics; Sign convention for heat and work; Work done in an isothermal process for an ideal gas; Internal energy as a state function; Application of the first law for (i) Cyclic Process (ii) Adiabatic Process (iii) Isochoric Process (iv) Isobaric Process and (v) Isothermal Process.

(3 hours)

Second Law of Thermodynamics

Reversible and irreversible processes; Carnot Cycle and its efficiency (with derivation); Second law of thermodynamics (Kelvin's & Clausius' statements and their equivalence); Carnot Engine; Practical internal combustion engines - Diesel Cycles (qualitative treatment).

(4 hours)

Entropy

The concept of entropy; Entropy of an ideal gas; Entropy - reversible process, Entropy - irreversible process; Entropy and the second law; Clausius inequality; Principle of increase of entropy; Entropy change in adiabatic and isobaric process; Entropy and disorder.

(3 hours

Unit - 2

Thermodynamic potentials

Internal Energy; Enthalpy; Helmholtz free energy; Gibbs free energy and their significance; Maxwell's thermodynamic relations and their significance; TdS relations; Energy equations and Heat Capacity equations; Third law of thermodynamics (Nernst Heat theorem).

(4 hours)

Phase transitions of the first order

Melting, vaporization and sublimation; Condition of equilibrium of phases in terms of Gibbs potential; Clausius-Clapeyron equation - elevation of boiling point, depression of freezing point; Equilibrium between phases - triple point.

(3 hours)

Conduction and convection

Heat transfer, thermal conduction, coefficient of thermal conductivity, conduction along a bar, Forbes method for thermal conductivity, conductivity of liquids, conductivity of gases, natural and forced convection, Reynold's number.

(6hours)

Unit - 3

Low Temperature Physics

Methods of producing low temperatures: (i) Joule Thomson (Joule Kelvin / Throttling / Porous plug) experiment, Joule Thomson Coefficient, inversion temperature (ii) Adiabatic demagnetization - working and theory.

(5 hours)

Liquefaction of gases

Cascade process; Regenerative cooling coupled with Joule Thomson cooling; Adiabatic expansion with Joule Thomson cooling (qualitative).

(3 hours)

Black body radiation

Kirchhoff's law, perfect black body, Stefan-Boltzmann law, spectral energy distribution, Wien's displacement law, Rayleigh-Jeans law, Planck's distribution(derivation), radiation pyrometry, temperature of the sun, the solar constant.

(5 hours)

Unit – 4

Kinetic Theory of Gases

Basic assumptions of the kinetic theory; Derivation of $pV = \frac{1}{3}mnc^2$ - deduction of perfect gas equation; Maxwell's law of distribution of velocity *(without derivation)*; Calculation of most probable velocity, mean velocity and root mean square velocity; Derivation of expression for mean free path; Degrees of freedom and principle of equipartition of energy; Derivation of $U = \frac{3}{2}RT$, Specific heats of an ideal gas, atomicity of gases

(7 hours)

Transport Phenomena

Viscosity and thermal conduction in gases *(with derivation)*; Relation between coefficient of viscosity and coefficient of thermal conductivity of a gas

(2 hours)

Real Gases

Derivation of van der Waal's equation of state; Andrews experiments on Carbon dioxide; Derivation of the critical constants; Comparison of van der Waal's isotherms with Andrew's isotherms

(4 hours)

References

1. Fundamentals of Physics- R Resnik, D Halliday and KS Krane, Asian Books Private Limited, New Delhi, 2014.
2. Heat and Thermodynamics- M M Zemansky,(International Edition) McGraw Hill New Delhi, 1981.
3. Heat & Thermodynamics, MW Zemansky & RH Dittman, McGraw Hill Book company, 5th Print, 1986.
4. Heat and Thermodynamics- Brij Lal and N Subramanyam, S Chand & Co, New Delhi, 1985.
5. Concepts of Physics Vol 1 and 2 - HC Verma, Bharathi Bhavan Publications, New Delhi, 1996.
6. Heat and Thermodynamics - DS Mathur, S Chand & Co, New Delhi, 5th Edition, 2004.
7. Heat, Thermodynamics & Statistical Physics, Brij Lal & Subramanyam, S Chand & Company, 2012.
8. Thermodynamics & Statistical Physics, Sharma & Sarkar, Himalaya Publishing House, 1991.
9. Thermodynamics, Kinetic theory & Statistical Thermodynamics, FW Sears & GL Salinger, Narosa Publishing House, 3rd Edition, 2013.
10. Mechanics & Thermodynamics, G Basavaraju & Dipan Ghosh, TMH Publishing Limited, New Delhi, 1984
11. Fundamentals of Classical Thermodynamics, Gordon J V Wylen & Richard E Sonntag, Wiley Eastern Limited, 1966.
12. Thermal Physics, S C Garg, R M Bansal & C K Ghosh, TMH Publishing Company, New Delhi, 2015.
13. Statistical Physics, Thermodynamics & Kinetic theory, V S Bhatia, S Chand & Co, 5th Edition,1993.
14. Perspectives of Modern Physics, Arthur Beiser, McGrawHill Book Company, Fourth Edition, 1987
15. Thermal Physics, B K Agarwal, Lokbharathi Publications, Allahabad, Third Edition 1993
16. Elements of Statistical Mechanics, Kamal Singh & SP Singh, S Chand & Co, 2nd Edition, 1992.
17. Theory & Problems of Thermodynamics, Michael M Abbott & Hendrick C Van Ness, Schaum's Outline Series, McGraw Hill International Book Company, Singapore, 1972.
18. University Physics-Sears & MW Zemansky, 2014.
19. Mechanics and Thermodynamics, C Basavaraju and D Ghosh, 1985.
20. Thermal Physics- *C* Kittel, Wiley, 6th edition, 1986.
21. An Introduction to Thermal Physics, D V Schroder, Pearson, 2014.
22. Heat and Thermodynamics, A K Saxena and Tiwari, Narosa, 2014.
23. College Physics, Vol I-A.B.Gupta, Books and Allied (P) Ltd, 2001(Revised Reprint: 2009).
24. Theory and Experiment on Thermal Physics- P.K.Chakrabarthi, New Central Book Agency(P) Ltd, 2006.
25. Thermal Physics and Statistical Mechanics-S.K.Roy, New Age International (P) Ltd Publishers, 2001.
26. Thermodynamics-M.S.Yadav, Anml Publication Pvt, Ltd, Second revised and Enlarged edition, 2000.

Syllabus for II Semester B. Sc. (Physics)
PHY 202: Practical Physics – II

List of Experiments

1. Specific heat by Newton's law of cooling
2. Specific heat of water using a thermistor
3. Thermal conductivity of a bad conductor by Lee's and Charlton's method
4. Thermal conductivity of rubber
5. Thermal behavior of a torch filament
6. γ- by measuring velocity of sound- using CRO
7. Verification of Newton's law of cooling and Stefan's law of radiation
8. Determination of Stefan's constant by emissivity method
9. Calibration of thermocouple for Temperature measurement
10. Verification of Clausius-Clapeyron equation using pressure cooker
11. Determination of Solar constant
12. Monte Carlo experiment & error analysis
13. Verification of Maxwell's distribution of velocity
14. Maxwellian distribution of velocities for electron using EZ81vacuum diode

Note: A minimum of EIGHT (8) experiments must be performed

References

1. B Saraf et al., Physics through experiments, Vikas Publications, 1980.
2. D P Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publications, 1985.
3. Advanced Practical Physics for Students, Worsnop & Flint, Methuen & Co, London, 2011.
4. An Advanced Course in Practical Physics, D Chattopadhyay, PC Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002
5. B SC, Practical Physics, C L Arora, S Chand & Co, New Delhi, 2007.

BENGALURU CENTRAL UNIVERSITY
Syllabus for III Semester B Sc. (Physics)
PHY 301: Electricity and Magnetism

Unit - 1

Network theorems

Concept of Voltage and Current Sources, Kirchhoff's Current Law, Kirchhoff's Voltage Law (statements). Principle of Duality (voltage and current source equivalents). Superposition theorem; Thevenin's theorem; Norton's theorem; Maximum power transfer theorem (for dc circuits - with problems)

(8 hours)

Magnetic fields and forces

Motion of charged particles in a magnetic field; Magnetic force on a current carrying conductor; Force and torque on a current loop, Concept of dead beat; Theory of a BG, Determination of high resistance by leakage.

(5 hours)

Unit - 2

Source of magnetic field

Magnetic field due to moving charge, Biot -Savart law; Magnetic field due to a straight current carrying conductor; Force between parallel conductors; Definition of ampere; Magnetic field of a circular loop; Theory of HTG; Field on the axis of a solenoid, Ampere's law, Application of Ampere's law to straight wire, solenoid and toroid.

(8 hours)

Electromagnetic induction

Faraday's laws; Lenz's law; Expression for induced emf; motional emf; earth inductor, mutual inductance, self inductance, the reciprocity theorem, the transformer, eddy currents and applications

(5 hours)

Unit - 3

Transient currents

Self inductance; Magnetic field energy stored in an inductor; Growth and decay of current in RC, LR, LCR circuits; Damped, under-damped and over-damped conditions.

(5 hours)

Alternating current

Alternating current circuits, Resistance, Reactance and Impedance; LCR series and parallel circuits, j-operator method Resonance, Power and energy in AC circuits, Representation of sinusoids by complex numbers, AC bridge - Maxwell bridge, Anderson's Bridge, the Skin effect.

(8 hours)

Unit - 4

Scalar and vector fields

Gradient of a scalar function; Relation between field and potential; Divergence and curl product rules; Physical Significance of Gradient, Divergence and Curl; Line, surface and volume integrals; Gauss' theorem, Stokes' theorems (statements only)

(3 hours)

Electromagnetic waves

Maxwell's equations (derivation and significance), The displacement current, Electromagnetic waves - Derivation of wave equation, Velocity of EM waves, Relation between refractive index and permittivity, Plane EM waves, Energy and momentum of EM waves, Poynting theorem (only statement), Significance of the Poynting vector, radiation pressure. (Qualitative)

(6 hours)

Polarization

Review of plane polarized light and method of production. Double refraction at crystals; Huygens' explanation of double refraction; Theory of retarding plates - Quarter wave plates and Half wave plates; Production and detection of linearly, elliptically and circularly polarized light. (4 hours)

References

1. Electricity and magnetism by Brij Lal and N Subrahmanyam, Rathan Prakashan Mandir, 19th Edition, 1993.
2. Principles of Electronics by VK Mehta and Rohit Mehta, S Chand & Company, 11th Edition, 2008.
3. Feynman Lecture series, Vol II, RP Feynman et al, Narosa Publishing House, New Delhi, 2013.
4. Electricity & Magnetism, NS Khare & SS Srivastava, AtmaRam & Sons, S Chand, New Delhi, 1973.
5. Electricity & Magnetism, DL Sehgal, KL Chopra, NK Sehgal, S Chand & Co, 6th Edition, 1988.
6. Electricity & Electronics, DC Tayal, Himalaya Publishing House, 6th Edition, 1988.
7. Basic Electronics & Linear Circuits, NN Bhargava, DC Kulshrestha & SC Gupta, TMH

Publishing Company Limited, 28th Reprint, 1999.
8. Fundamentals of Physics by Halliday, Resnick and Walker, Asian Books Private Limited, New Delhi, 5th Edition,1994.
9. Introduction to Electrodynamics, DJ Griffiths, 4th Edition, Pearson, 2015.
10. Electricity and electromagnetism, ICFAI, Pearson, 2012.
11. Electromagnetics by BB Laud, 3rd edition, New Age Internal Publishers, 2011.
12. Fundamentals of Magnetism and Electricity, D N Vasudeva, S Chand, 2013.
13. A Text Book of Electrical Technology- B.L.Theraja & A.K.Thereja, revised by S.K.Tarnekar-S.Chand and Company, 2005.

Syllabus for III Semester B Sc. (Physics)
PHY 302: Practical Physics – III

List of Experiments

1. To find L and C by equal voltage method
2. Energy consumption in an electrical circuit - to find power factor
3. Resonance in LCR series circuit
4. Resonance in LCR parallel circuit
5. Mirror galvanometer- figure of merit
6. High resistance by leakage using BG
7. Thermoelectric circuit -To find Seebeck coefficients
8. Study of thermo emf as a heat pump
9. Black box – identification & measurement of R, L and C
10. Verification of Thevenin's theorem
11. Verification of Superposition theorem
12. Verification of maximum power transfer theorem
13. Maxwell's impedance bridge
14. Desauty's bridge
15. Anderson's bridge

Note: A minimum of EIGHT (8) experiments must be performed

References

1. Physics through experiments, B Saraf etc, Vikas Publications, 1980.
2. Advanced practical physics, Chauhan & Singh, Pragathi Publications, 2017.
3. Practical Physics, D Chattopadhyaya et al, Central Publications.
4. An Advanced Course in Practical Physics, D Chattopadhyay, PC Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
5. Practical Physics, TC Tayal.

BENGALURU CENTRAL UNIVERSITY
Syllabus for IV Semester B.Sc. (Physics)

PHY 401: Physical Optics, Lasers, Holography and Fiber Optics

Unit - 1

Wave Theory

Huygens' wave theory of light; Huygens' Principle; Construction Huygens' wave front; Laws of reflection and refraction using spherical wave front at a plane surface

(3 hours)

Interference – a Review:

Coherent sources and their production; Conditions for observing interference; Conditions for constructive and destructive interference

(1 hour)

Coherent sources by wave front division

Biprism-theory and working, experiment to determine wavelength; Effect of thin film in the path of one of the beams; Calculation of thickness of the film

(5 hours)

Coherent sources by amplitude division:

Interference at thin films - reflected and transmitted light Colours of thin films; Theory and experiment of air wedge; Theory and experiment of Newton's rings.

(4 hours)

Unit - 2

Fraunhoffer diffraction

Theory of single slit diffraction; Theory of grating - normal and oblique incidence - Experimental determination of wavelength; Discussion of Dispersive power; Resolution, Rayleigh's criterion; Expression for resolving power of grating and telescope; Comparison of prism and grating spectra

(6 hours)

Fresnel diffraction

Division of wave front into Fresnel's half period zones; Theory of rectilinear propagation using these ideas; Construction and working of Zone plate; Comparison of Zone plate with lens; Theory of diffraction at a straight edge

(7 hours)

Unit - 3

Lasers and their applications

Introduction; Spontaneous and stimulated emission; Einstein's coefficients and optical amplification; Population inversion; meta stable states, Main components of a laser; Lasing action; Ruby Laser - construction and working - energy level diagram; He-Ne Laser - construction and working - energy level diagram; Solid State Laser - construction and working; Chemical lasers, Characteristics of laser light, spatial and temporal coherence, divergence of laser light, laser tuning , Applications of lasers in science :Stimulated Raman Effect, lasers in industry : Laser Welding, Hole Drilling, Laser Cutting & LIDAR, lasers in medicine.

(13 hours)

Unit - 4

Holography

Principles of Holography, Recording of holograms, types of holograms, reconstruction of objects from holograms, applications of holography: 3D reconstruction, Interferometry.

(5 hours)

Optical Fibers

Optical fiber-principle, description and classification; Why glass fibers? Coherent bundle; Numerical aperture of fiber; Attenuation in optical fibers - limit Multimode optical fibers; Ray dispersion in multi-mode step index fibers; Dispersion due to material; Dispersion and maximum bit rates; Fiber optic sensors

(8 hours)

References

1. Introduction to Modern Optics, Ajoy Ghatak, Tata McGraw Hill Publications, 2009.
2. Fundamentals of Physics by Halliday, Resnick and Walker, Asian Books Private Limited, New Delhi, 10th Edition, 2014.
3. Contemporary Optics, A K Ghatak and K Thyagarajan, Macmillan, 1981.
4. Fundamental of optics, 4th Edition, Jenkins and White, Tata McGraw Hill, 2011.
5. Optics, E Hecht and Ganesan, Pearson, 2008.
6. Optics, BrijLal and Subramaniyam, S Chand & Company, 22nd Edition, 1994.
7. Principles of Optics, B K Mathur, Gopal Printing Press, Kanpur, 6th Edition,1996.
8. An Introductions to LASERS-Theory & Applications, MN Avadhanulu, S Chand & Co, 2001.
9. Introduction to Fibre Optics, Ajoy Ghatak & K Thyagarajan, Cambridge University Press, 1st Edition Reprint, 2002.
10. Optical Fibre Communications, Gerd Keiser, McGraw Hill, 3rd Edition, 2000.
11. Fibre Optic Communication, D C Agarwal, Wheeler Publications, 2nd Edition Reprint, 1996.
12. Optics, Klein and Furtak, Wiley Publications, 1986.
13. B B Laud, Lasers and nonlinear Optics, Wiley Eastern, 1987.
14. Introduction to Optics, G Chartier, Springer, 2010.

Syllabus for IV Semester B.Sc. (Physics)
PHY 402: Practical Physics – IV

List of Experiments

1. Verification of Brewster's law
2. Refractive index of a liquid by parallax method
3. Biprism – determination of wavelength of light
4. Air wedge – determination of thickness of object
5. Newton's rings – determination of radius of curvature of a lens surface
6. Diffraction grating in minimum deviation position
7. Diffraction grating in normal incidence position
8. Resolving power of telescope
9. Diffraction at straight edge
10. Polarimeter – determination of specific rotation of a solution
11. Diffraction of LASER at a wire
12. Fraunhoffer diffraction of LASER at single slit
13. Diffraction of LASER at graduations of a metal scale
14. Measurement of numerical aperture of an optical fiber

Note: A minimum of EIGHT (8) experiments must be performed

References

1. An Advanced Course in Practical Physics, D Chattopadhyay, PC Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, 6th Revised Edition, 2002.
2. Practical Physics, Experiments with He-Ne laser, RS Sirohi, 1986.
3. Advanced Practical Physics, Worsnop & Flint, Asia Publishing house, 1961.
4. BSc, Practical Physics, CL Arora, S Chand & Company, New Delhi, 6th Revised Edition, 2002.

BENGALURU CENTRAL UNIVERSITY
Syllabus for V Semester B.Sc. (Physics)
PHY 501: Quantum Mechanics, Solid State Physics and Electronics

Unit -1

Quantum Mechanics

Failures of classical physics: Black body radiation spectrum- atomic spectra- photoelectric effect; de-Broglie's hypothesis and de-Broglie's wavelength; Davisson-Germer experiment; Heisenberg's uncertainty principle; γ-ray microscope experiment; wave function and its interpretation; Schrodinger's time dependent equation, time independent equation; Physical conditions on wave functions, Operators and Eigen values-Eigen functions, Expectation values of position, momentum and kinetic energy operators.

(9 hours)

Applications: Eigen values and eigen functions of a particle in one-dimensional box- particle in a three-dimensional box; Simple Harmonic Oscillator.

(4 hours)

Unit - 2

Solid State Physics

Free electron theory of metals: Electrical conductivity- classical theory (Drude-Lorentz model); Thermal conductivity; Wiedemann - Franz's law; Density of states for free electrons; Fermi-Dirac distribution function and Fermi energy; Expression for Fermi energy and Kinetic energy at absolute zero and above absolute zero (no derivation)

(5 hours)

Band theory of solids: Elementary ideas regarding formation of energy bands; Bloch equations; One dimensional Kronig-Penney model; Density of states; Effective mass; Energy gap

(4 hours)

X ray diffraction: Bragg's law; Types of crystals; Miller indices; the structure of NaC1 and KC1 crystals; Continuous and characteristic X-ray spectra; Mosley's law

(4 hours)

Unit - 3

Electronics

Basics of transistors and their operation, transistor amplifier(CE mode only), feedback concepts, transistor oscillators, Operational amplifiers; Ideal characteristics; The basic op-amps circuits; Inverting amplifier, Non-inverting amplifier; Applications of op-amp-summer, integrator, differentiator, voltage follower.

(8 hours)

Basic logic concepts

Logic states; Voltage range of high and low logic states; Number codes; Hexadecimal representation; BCD; Logic gates and truth tables; OR gate, AND gate; Inverter (the NOT function); NAND and NOR; exclusive OR; exclusive NOR.

(5 hours)

References

1. Fundamentals of Physics, Volume-II, Quantum Mechanics & Nuclear Physics, DK Chaturvedi & SK Gupta, S Chand & Co, New Delhi, 8th Edition, 2005.
2. Fundamentals of Quantum Mechanics, YR Waghmare, S Chand, New Delhi, 2014.
3. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles – Eisenberg & Resnick, John Wiley & Sons, 1974.
4. Concepts of Modern Phyiscs, Beiser, Third Edition (Student Edition), New Delhi, 1981.
5. Introduction to Modern Physics, HS Mani & GK Mehta, West Press, 1989.

6. Modern Physics, Murugesan, S Chand & Co, 1996.
7. Quantum Mechanics, V Murugan, Pearson, 2014.
8. The Feymann Lectures on Physics Volume-III, Narosa Publishing House, New Delhi, 1963.
9. Elements of Modern Physics, SH Patil, TMH, New Delhi,1984.
10. Principles of Modern Physics, AP French, John Wiley, London, 1958.
11. Modern Physics, SN Ghoshal- Part –I & Part –II, S Chand & Co, 1996.
12. Solid State Physics, C Kittel, Wiley Eastern Limited, 5th Edition.
13. Solid State Physics, AJ Dekker, Macmillan India Limited, 1986.
14. Quantum Mechanics, Aruldass, PHI, 2012.
15. Solid state Physics, M Ali Omar, Pearson, 2005.
16. Solid State Physics, R J Singh, Pearson, 2011.
17. Digital Principles, D.P. Leach and A.P Malvino -Tata McGraw-Hill Education Pvt Ltd- (SIE) Special Indian Edition(7e), 2011.
18. Solid state Physics, K Ilangovan, MJP publishers, 2013.
19. Solid State Physics, M A Wahab, Norosa, 2007.
20. Quantum Physics, Berkeley Physics course, E H Wichman, TMH, 2008.
21. Quantum Mechanics, J Guha, Books and Allied, 2013.
22. Fundamentals of Quantum Mechanics, A B Gupta, Books and Allied, 2015.
23. Quantum Mechanics, Statistical Mechanics and Solid State Physics, S P Kulia, Books and Allied, 2015.
24. Textbook of Quantum mechanics, Mathews and Venkatesan, TMH, 2010.

Syllabus for V Semester B.Sc. (Physics)
PHY 502: Practical Physics V(A)

List of Experiments

1. CRO & its applications to (a) determine voltage of AC
   (b) determine frequency of AC
   (c) study the Lissajous patterns
2. Digital GATEs - Half adder & Full adder circuits.
3. Opamp - Inverter and Summing Amplifiers.
4. Opamp - differentiator and integrator.
5. Inverting and non inverting amplifier.
6. Realization of basic gates from NAND and NOR gates.
7. Wein Bridge Oscillator using OP AMP.
8. Phase Shift Amplifier using OP AMP.
9. Study of LASER diode – to draw its characteristics
10. Analysis of X-ray photograph.
11. Determination of crystal constant by analysis of diffraction pattern obtained by Laue's method.
12. Determination of crystal constant by analysis of diffraction pattern obtained by powder method.
13. Determination of Fermi energy.
14. Energy gap of semi conductor.
15. Transistor as a switch and an active device.
16. Determination of thermal conductivity of a material.
17. Resistivity of a material by four probe method.

18. Semi conductor temperature sensor
19. Thermal conductivity of a conductor.
20. Weidman-Franz law.
21. Hysteresis loop for iron and finding energy loss.
22. Measurement of dielectric constant.

Note: A minimum of EIGHT (8) experiments must be performed

References

1. An Advanced Course in Practical Physics, D Chattopadhyay, PC Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, 2002.
2. IGNOU-Practical physics manual.
3. Experiments in physics, Saraf.
4. Advanced practical physics, Raj kumar & Madan Lal.
5. Practical Physics, SP Singh.
6. Electronics, Bhargava et al, TTTI.
7. A lab course in electronics, Ramalingom & Raghupalan.

BENGALURU CENTRAL UNIVERSITY
Syllabus for V Semester B.Sc. (Physics)
PHY 503: Statistical, Atomic, Molecular and Nuclear Physics

Unit -1

Statistical Physics

Classical and quantum particles, identical particles, Wave functions of identical particles, Pauli's Exclusion Principle, Bose-Einstein and Fermi- Dirac Distributions, Maxwell-Boltzmann distribution, Applications of BE Statistics – Specific heat and pressure of a BE gas, Black Body Radiation. Einstein's Theory of Specific heat, Bose Einstein Condensation, Applications of FD Statistics – the pressure and specific heat of an FD gas, Super conductivity and super fluidity (qualitative).

(13 hours)

Unit -2

Atomic Physics

A brief account of the Sommerfeld atomic model (qualitative), Electron spin, Stern- Gerlach experiment, space quantization, the vector model of the atom, spin -orbit interaction, Fine structure of spectral lines, The Pauli's exclusion principle and the electronic configuration of atoms, The Normal Zeeman Effect (Quantum Theory).

(7 hours)

Molecular spectra

Pure rotational Spectrum and selection rules, vibrational spectrum and selection rules, Rotational-vibrational spectrum, scattering of light- Tyndall, Rayleigh and Raman's scattering, Experimental study of Raman Effect, Quantum theory of Raman effect, Applications of Raman effect.

(6 hours)

Unit -3

Nuclear physics

Alpha decay: Gamow's theory of alpha decay, Q-value of alpha decay, Exact energy of alpha particle emitted, characteristics of alpha spectrum, Geiger- Nuttal law.

Beta decay: Types of beta decay (electron, positron decay and electron capture,) Characteristics of beta spectrum and Pauli's neutrino hypothesis.

Detectors: Variation of ionization current with applied voltage in a gas counter, GM Counter.

Particle accelerator : Cyclotron, Tandem Van-de-Graff.

Nuclear reactions: Types of Nuclear reactions, Conservation laws, Expression for Q value of a nuclear reaction, Endoergic and Exoergic reactions, threshold energy.

(13 hours)

References

1. Fundamentals of Physics, Volume-II, Quantum Mechanics & Nuclear Physics, 8th edition, DK Chaturvedi & SK Gupta, R Chand & Co, New Delhi, 2005.
2. Introduction to Atomic & Nuclear Physics, HE White, Affiliated East West Press Private Limited, 1968.
3. Atomic and Nuclear physics, Brij Lal and Subramanyam, S Chand, 2013.
4. Spectra, HG Kaun, Atomic Physics, JB Rajam, S Chand & Co, 1979.
5. Modern Physics, Murugesan, S Chand & Co, 1996.
6. Elements of Modern Physics, SH Patil, TMH, New Delhi, 1984.
7. Principles of Modern Physics, AP French, John Wiley, London, 1958.
8. Modern Physics, SN Ghoshal, Part I & II, S Chand & Co, 1996.
9. Physics of the Atom, Wehr et al, McGraw Hill.
10. Nuclear Physics, Rajkumar, Campus Books International, New Delhi, 1st Edition, 2005.
11. Concepts of Nuclear Physics, B.L. Cohen, McGraw-Hill Book Co., New York, 1971.
12. Introductory Nuclear Physics, K.S. Krane, John Wiley & Sons, New York, 1987.
13. Elements of Nuclear Physics, W.E. Meyerhof, McGraw Hill Book Co., New York, 1971.
14. Atomic and Nuclear Physics, Vol. II, S.N. Ghoshal, S. Chand & Co., New Delhi, 1994.
15. Fundamentals of Physics, Extended 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley & Sons, New York, 2002.
16. The Atomic Nucleus, RD Evans, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1955.
17. Nuclear physics - Theory and experiment, R.R.Roy & B.P.Nigam, Wiley Eastern Limited, New Delhi, 1986.
18. Introduction to Nuclear Physics, Harald A Enge, Addison – Wesley Pub. Company, 1966.
19. Nuclear Physics, Irving Kaplan, Addison – Wesley, 1963.
20. Nuclear Physics, V Devanathan, Narosa, 2016.
21. Principles of Modern Physics, A K Sexena, narosa, 2007.
22. Modern Physics, R Murugeshan et al., S Chand, 2007.
23. Physics of the Atom, A B Gupta, Books and Allied, 2012.
24. Atomic and Nuclear Physics, A B Gupta, Books and Allied, 2017.

Syllabus for V Semester BSc (Physics)

PHY 504: Practical Physics V(B)

List of Experiments

1. Fine structure constant.
2. Vibration Band structure of Iodine molecule.
3. Absorption Band of KMnO4.

4. Rotation Spectra of Nitrogen molecule.
5. Rotation Vibration spectra of HBr.
6. Verification of Moseley's law.
7. SCR—characteristics
8. LED characteristics.
9. Study of LDR – to draw its characteristics.
10. Determination of dielectric constant.
11. Determination of electrical conductivity.
12. Study of Hydrogen spectrum – determination of Rydberg constant.
13. Characteristics of GM counter.
14. Linear and Mass Absorption Coefficient of Al using GM counter.
15. Verification of Inverse square law using GM counter.
16. Study of Photo diode – to draw its characteristics.
17. Study of Solar cell – to draw its characteristics.
18. MOSFET characteristics.
19. Study of LASER diode – to draw its characteristics.

References

1. IGNOU : Practical Physics Manual, IGNOU publications.

2. Saraf : Experiment in Physics, Vikas publications.

3. S.P. Singh : Advanced Practical Physics

4. Melissons : Experiments in Modern Physics.

5. Misra and Misra, Physics Lab. Manual, South Asian publishers (**2000**)

6. Gupta and Kumar, Practical physics, Pragati prakashan, (**1976**)

7. Ramalingom & Raghuopalan : A Lab. Course in Electronics

8. Bharagav et al : Electronics, TTI tata MacGraw Hill 33rd Reprint (**2002**)

BENGALURU CENTRAL UNIVERSITY

Syllabus for VI Semester B.Sc. (Physics)

PHY 601: Atmospheric Physics, Relativity and Astrophysics

Unit - 1

Atmospheric Physics

Composition of the earth's atmosphere, Weather and Climate, Vertical structure of the atmosphere, Fixed and variable gases, Mechanism of production and destruction of atmospheric constituents, Troposphere, Stratosphere, Mesosphere and Thermosphere. Temperature variation in the atmosphere, Lapse rate, Stability and Instability of atmosphere. Thermodynamics of dry air & moist air, Virtual temperature, Potential temperature, Scale height, Hydrostatic balance, Change of pressure with altitude, Total potential energy of air column, Green house effect, Climate change. Aerosols: Sources, size, distribution, transport and residence time.

(13 hours)

Unit – 2

Special theory of Relativity

Inertial frames of reference, the velocity of light, Michelson -Morley experiment, Einstein's postulates, Derivation of the Lorentz transformations, constancy of the speed of light, length contraction, time dilation, relative nature of simultaneity, the twin paradox, the law of addition of velocities, relativistic momentum, relativistic energy, rest mass, rest energy, mass- energy equivalence, muon decay lifetime, relativistic Doppler effect, relativistic collisions.

(13 hours)

Unit - 3

Astrophysics

Distances in astronomy- light year and parsec, solar and sidereal time scales, Luminosities, apparent and absolute magnitude scales, Stellar spectra, spectral classification, H-R diagram, Temperatures of stars, linear density model for stars (Calculation of Gravitational Potential Energy, Mean and core temperature and pressure based on lsm), Formation of stars (qualitative), Energy production in stars, the proton-proton cycle, Evolution of stars (qualitative), End stages of stars- white dwarfs, neutron stars and black holes (qualitative), Optical telescopes- their types, characteristics and applications.

(13 hours)

References

1. The physics of Atmosphere, 3rd Edition – John Houghton, Cambridge University Press, 2002.
2. An Intoduction to Atmospheric Physics, David.G.Andrews, Cambridge University Press, 2000.
3. An Introduction to Dynamic Meteorology, 4th Edition. James R Holton, Elsevier and academic press, 2004.
5. Meteorolgy for Scientists and Engineers, 2nd Edition. Ronald. B. Stull Brookes/Cole, 2000.
6. Meteorlogy – Understanding the Atmosphere, Steven. A. Ackerman, John. A. Knox Thomson/ Brooks/ Cole – 2003.
7. Meteorology, Ghadekar S R, Agromet Publishers, Nagpur-10 Maharashtra, 2001.
8. Concepts in Space science, R R Daniel (Editor), Universities press, ISRO, 2002.
9. Mechanics, D S Mathur, Vikas Publishing House, 1978.
10. Introduction to Astrophysics, Baidyanath Basu, Printice Hall, 1997.
11. An introduction to the study of stellar structure, Chandrasekhar S, Dover Publications, 2003.
12. Stellar Evolution – An exploration from the observatory, Thorne KS, Princeton University Press, 2016.
13. Fundamental Astronomy, Karltunen H, Oja H and others, Springer Verlag, 1987.
14. Introduction to Astrophysics, Baidyanath Basu, Printice Hall, 1997.
15. The New Cosmos, Unsold A, Springer – verlag, 1969.
16. Astronomy- a beginer's guide, Eric Chaisson, Pearson, 2017.
17. Introduction to Modern Astrophysics, Carroll & Ostlie, Pearson Eduction, 2006.
18. Introduction to Astronomy and Astrophysics, Pankaj Jain, CRC press, 2014.
19. Special Relativity, S P Puri, Pearson, 2013.
20. Introduction to Special Relativity- Robert Resnick- Wiley Student Edition, 2005.
21. A primer on Special relativity- P.L.Sardesai, New Age International Publishers, 2005.
22. Environmental Physics, C Smith, Routledge, 2001.
23. Astrophysics- stars and galaxies, K D Abhyankar, Univ. Press, 2007.
24. Astrophysics of the Solar system, K D Abhyankar, Univ. Press, 1999.
25. Modern Astronomy, C Sivaram and K Arun, Anne Books, 2009.
26. Astronomy and Astrophysics, A B Bhattacharya et al, Overseas Press, 2010.
27. India in Space, M S Rajan, PDBN, Govt. of India, 2008.

Syllabus for VI Semester B.Sc (Physics)

PHY 602: Practical physics VI (A)

List of Experiments

1. H R Diagram - Physical Properties of stars.
2. Determination of temperature of a star (artificial).
3. Analysis of stellar spectra.
4. Analysis of sunspot photographs & solar rotation period.
5. Determination of distance by parallax method.
6. Mass luminosity curve – Estimation of mass of a star
7. Mass of binary stars.
8. Temperature of air- by using Thermograph (Bimetallic type)- Plotting the graph of temperature vs. time.
9. Temperature of air- inside the room/ outside the room for 3 Hours duration.
10. Measurement of humidity and diurnal variation in absolute humidity- by using Hair hygrometer.
11. Relative humidity.
12. Wind speed.
13. Solar constant- determination.
14. Aerosol experiment.
15. Radiation measurement.
16. Evaporation experiment.
17. Effect of albedo on temperature.

Note: A minimum of EIGHT (8) experiments must be performed

References

1. IGNOU-Practical physics manual.
2. Physics through Experiments, Saraf and Khandewal, Vikas, 1994.
3. Advanced practical physics, SP Singh and Chavan, Pragati prakashan, 2017.
4. Experiments in Modern Physics, Adrian Melissinos, Academic Press, 2003.
5. An Advanced Course in Practical Physics, D Chattopadhyay, PC Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, 6th Revised Edition, 2002.

BENGALURU CENTRAL UNIVERSITY

Syllabus for VI Semester B.Sc (Physics)
PHY603: Nano Physics, Material Science and Elementary particles

Unit -1

Nano materials: Introduction, classification, electron confinement, size effects, bulk materials, distinct properties of nano materials, Quantum dots, nanowires, nanofilms, multilayered materials, Fullerenes, Carbon nanotubes (CNT), Nano wires, Carbon Nano cones, Hackelites, Graphene, Synthesis techniques, characterization techniques, Production methods for CNT, Mechanical and Electric properties of CNT, Nano material advantages. Applications to fuel cells, phosphors, computer chips, sensors.

(13 hours)

Unit -2

Deformation of metals: Introduction, Elastic and Plastic deformation, Mechanism of deformation, Deformation by slip.

(3 hours)

Thermal properties: Introduction, heat capacity, Vibrational heat capacity, Dulong-Petit's law (classical model). Einstein's theory, Deby's theory (Qualitative), mechanism of heat conduction in metals, ceramics, Polymers and Superconductors.

(4 hours)

Optical properties of metals: Interaction of radiation with materials, Atomic transition, Absorption and emission of photons in metals, Optical properties of non-metals, Refractive index, Absorption coefficient, Luminescence, Photo conductivity.

(3 hours)

Superconductivity: Experimental observation, Critical field, Meissner effect, Types of super conductors. Phenomenological theories of super conductivity, London equations, B.C.S theory of super conductivity (qualitative), Application of super conductivity, Josephson effect (AC and DC).

(3 hours)

Unit - 3

Fundamental interactions: Gravitational, Electro-magnetic, Weak (nuclear) and strong (nuclear) interactions, Classification of elementary particles into Leptons, Quarks and force mediators .

(2 hours)

Leptons: Electron, mu meson, tau meson and the associated neutrinos. Lepton quantum number and antiparticles.

(2 hours)

Quarks: Properties of heavier mesons and baryons, Related quantum numbers such as strangeness, The eight-fold way. Anomalous properties of neutron and proton leading to the idea that they are not 'elementary particles'.

(3 hours)

The quark model of Gellmann and Zweig, Types of quarks, Flavor and colour, Quarks as constituents of proton. neutron and mesons, Qualitative explanation of spin and magnetic moment of nucleons.

(3 hours)

Force Mediators: Mediators for electro-magnetic, weak and strong interactions, Photon, W and Z bosons, and gluons. Higgs Bosons. The standard model of elementary particles.

(3 hours)

References

1. Material Science and Engineering. 2nd edition, William D. Callister, Adapted by R.Balasubramaniam, Wiley Publications, 2014.
2. Physical Foundation of Material Science, Gottesten Springer, Wiley Publication, 2004.
3. Material science. S.L.Kakani, Amit kakani, New Age International Publication, 1st Editon, 2004.
4. Rudiments of Material Science. S.D. Pillai, New Age International Publication, 2nd Edition, 2007.
5. Material Science and Engineering. V.Raghavan, PHI, 2002.
6. Foundation of material science and Engineering. Smith, 3rd Edition, Mc Graw Hill, 1997.
7. Introduction to particle physics, M P Khanna, PHI, 2009.

8. Nuclear Physics, D C Tayal, Himalaya pub. House, 2018.
9. Nanoscience and Technology, KK Choudhary, Narosa, 2018.
10. Science of Engineering Materials and Nanotubes, C.M.Srivatsa and C.Srinivasan, New Age International Publishers, 3rd Edition, 2010.
11. Introduction to Nano technology, Charles. P. Poole Jr and Frank J.Owes, Wiley Student Edition, Wiley India, 2006.
12. Nano - The Next revolution, Mohan Sundarajan, National Book Trust of India, Revised edition, 2010.
13. Callister's Material Science and Enginerng; William D Callister Jr,and David D. Rethwisch (Adapted by R Balasubramaniam), Wiley 2nd Edition.
14. Nuclear Physics, S N Ghoshal, S Chand, 2014.
15. Introductory Nuclear Physics, S S M Wong, PHI, 2010.
16. Nuclear and Particle Physics, B R Martin, Wiley, 2009.
17. Concepts of Particle physics, K Gottfried, OUP, 1986.
18. Introduction to high energy physics, D H Perkins, Addison Wesley, 1986.

Syllabus for VI Semester B.Sc. (Physics)
PHY 604: Practical physics VI(B)

List of Experiments

1. Determination of energy gap of semiconductor by four probes method.
2. Study of elastic deformation in metals.
3. Transistor amplifier.
4. Measurement of heat capacity of metals.
5. Ultrasonic interferometer- measurement of ultrasonic velocity in solids by Piezo-electric technique.
6. Kelvin's bridge.
7. AC bridges, Capacitance bridges.
8. Determination of energy gap of semiconductor by four probes method.
9. Thermal conductivity of glass.
10. Thermal conductivity of bad conductor by Forbes method.
11. Conductivity of solution of various concentrations by Kohlrousch's method.
12. Study of elastic deformation in metals.
13. Measurement of heat capacity of metals.
14. Ultrasonic interferometer- measurement of ultrasonic velocity in solids by Piezo-electric technique.
15. Calibration of spectrometer using a channel spectrometer by Edser-Buttler method and hence determine the thickness of mica sheet.
16. Measurement of refractive index of non -metals.
17. Study of crystals defects by analyzing photographs.
18. Study of Hysteresis curve using C.R.O.
19. Determination of Fermi energy of copper.
20. Dipole moment of organic liquid.
21. Curie – Weiss law.

Note: A minimum of Eight (8) experiments must be performed in the practical paper.

References

1. Practical Physics, G L Squires, CUP, 1999.
2. Advanced level Practical Physics, Nelkon and Parker, CBS, 1995.
3. Undergraduate physics, M M J French, Medtec, 2015.
4. A textbook of Practical Physics, H P Shrivastava, ABD publishers, 2006.
5. A lab manual of experimental physics, L R Ingersoll et al, McGraw Hill, 1953.
5. Physics Lab Manual, Misra and Misra, South Asian publishers, 2000.
6. Practical physics, Gupta and Kumar, Pragati prakashan, 1976.