



**GOVINDRAM SEKSARIA SCIENCE COLLEGE
(AUTONOMOUS) BELAGAVI**

TILAKWADI, BELAGAVI (KARNATAKA)

B.Sc., Physics Course

STRUCTURE AND SYLLABUS

as per Revised Curriculum Framework for
Undergraduate Course

STATE EDUCATION POLICY-2024-25

III & IV Semesters

FINAL APPROVED COPY

With Effect from the Academic Year 2024-25

STATE EDUCATION POLICY-2024-25

B.Sc. Program with Optional Subject: PHYSICS

B.Sc., PHYSICS First and Second Semester Syllabus as per SEP (With effect from the academic year 2024-25 and onwards)								
Sem	Part	Paper Code	Title of the Paper	Hours/ Week	Marks			Subject Credits
					IA	Exam	Total	
I	DSC	PHYDSCT1.1	Mechanics and Properties of Matter	4	20	80	100	3
		PHYDSCP1.1	Practical I	4	10	40	50	2
		Total: Hours / Credits			8			150
II	DSC	PHYDSCT2.1	Electricity & Magnetism	4	20	80	100	3
		PHYDSCP2.1	Practical II	4	10	40	50	2
		Total: Hours / Credits			8			150

T: Theory, P: Practical, DSC: Discipline Specific Course. Ele- Elective,

**B.Sc., PHYSICS Third and Fourth Semester Syllabus as per SEP
(With effect from the academic year 2025-26 and onwards)**

Sem	Part	Paper Code	Title of the Paper	Hours/ Week	Marks			Subject Credits
					IA	Exam	Total	
III	DSC	PHYDSCT3.1	Thermodynamics-I, Geometrical Optics, Sound and Waves	4	20	80	100	3
		PHYDSCP3.1	Practical III	4	10	40	50	2
	Ele-I	PHYELEP4.1	Medical Physics -I	3	10	40	50	2
		Total: Hours / Credits		11			200	7
IV	DSC	PHYDSCT4.1	Thermodynamics-II, and Physical Optics	4	20	80	100	3
		PHYDSCP4.1	Practical IV	4	10	40	50	2
	Ele-II	PHYELEP4.1	Lenses and Optical Fibers	3	10	40	50	2
	Skill-1	PHYSKLP4.1	DOMESTIC ELECTRICAL WIRING	4	10	40	50	2
		Total: Hours / Credits		15			250	9

T: Theory, P: Practical, DSC: Discipline Specific Course. Ele- Elective,

Third Semester B.Sc. (Physics)

Paper Code: PHYDSCT3.1

Paper Title: Thermodynamics-I, Geometrical Optics, Sound and Waves

Teaching Hours: 4 Hrs / Week

Marks: Th-80+IA-20

Total hours:60

Credits :3

Unit I

Kinetic Theory of Gases

Postulates of kinetic theory of gases. Derivations of Maxwell's law of distribution of velocities (assuming constants a and b). Derivations of average, RMS and most probable velocity. Mean free path. Derivation of Clausius expression of mean free path. Problems.

Transport Phenomena

Concept of viscosity (η), mention its expression. Derivation of expression for thermal conductivity (K). Relation between η & K . Concept of the coefficient of diffusion (D), mention its expression. Problems.

Black Body Radiation

Black body, Energy distribution in the black body spectrum. Radiation pressure, Derivation of Stefan's law. Derivation of Plank's law and deduction of Wien's displacement law and Rayleigh Jean's law. Problems.

15 Hours

Unit II

Thermodynamics

Mention of Four Fundamental thermodynamic potentials (Internal energy, Enthalpy, Helmholtz free energy and Gibbs free energy). Zeroth law of thermodynamics. First law of thermodynamics and its application to various processes viz cyclic, adiabatic, isothermal, Isochoric and isobaric processes. Second law of thermodynamics and entropy. Carnot's cycle. Working with an Otto engine, derivation of expression for efficiency. Diesel engines with mention of expression for efficiency. Change of entropy in reversible and irreversible processes. Entropy- Temperature diagram. Third law of thermodynamics. Derivation for Maxwell's thermodynamic relations. Clausius-Clapeyron's equation. Problems.

15 Hours

Unit III

Geometrical Optics:

Fermat's principle-statement and explanation, derivation of laws of reflection and refraction.

Cardinal points of optical system: Principal foci, principal points and nodal points. Equivalent focal length of two thin lenses separated by distance (derivation) and location of Cardinal Points. Newton's formula and graphical construction of images. Mention expression for focal length of thick lens and power of thick lens (qualitative).

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. Ramsden's and Huygen's eyepieces: Construction and location of cardinal points. Differences between Ramsden's and Huygen's eyepieces.

Problems.

15 Hours

Unit IV

Waves

SHM, Equation of SHM, Differential equation of SHM, Composition of two co-linear oscillations having (i) equal frequencies (ii) Different frequencies (analytical method). Concept of beats. Composition of two perpendicular oscillations having (i) equal frequencies (ii) Different frequencies (analytical method). Lissajous figures with equal and unequal frequencies (qualitative). Problems.

Sound

Free vibrations forced vibrations and resonance. Theory of Helmholtz resonator. Intensity and loudness of sound-decibels. Intensity level- musical note and scale. Acoustics of building. Reverberation and time of reverberation- absorption coefficient. Derivation of Sabine's formula. Measurement of reverberation time. Acoustic aspects of hall and auditorium. Working principle of loudspeaker and microphone. Problems.

15 Hours

REFERENCE BOOKS:

- 1) Heat and Thermodynamics- M M Zemansky, McGrawHill Education (India) 8ed (2011).
- 2) Heat & Thermodynamics, M W Zemansky & RHDittman, McGraw Hill Book company, Inc. US Seventh Revised edition (1997).
- 3) Heat and Thermodynamics- Brij Lal and N Subramanyam, S Chand & Co, New Delhi -1985.
- 4) Heat and Thermodynamics – D S Mathur, SChand & Co, New Delhi, 5th Edition (2004).
- 5) Heat, Thermodynamics & Statistical Mechanics, BrijLal & Subramanyam, S. Chand & Company, Delhi; (2008 ed).
- 6) Thermodynamics & Statistical Physics, Sharma & Sarkar, Himalaya Publishing House, Third Edition (1991).
- 7) Thermodynamics, Kinetic theory & Statistical Thermodynamics, F W Sears & G L Salinger, Narosa Publishing House (Third Edition 1998).
- 8) Fundamentals of Classical Thermodynamics, Gordon J V Wylen & Richard E Sonntag, John Wiley Eastern

Limited; 4th ed (1994).

- 9) Thermal Physics, S C Garg, R M Bansal & C K Ghosh, Mc Graw Hill Education (India) Second ed (2013).
- 10) Kinetic Theory of Gases (I – edition) – Ideal Book Service, Pune.(1967)
- 11) Kinetic Theory of Gases – Kelkar V N.
- 12) Kinetic theory of gases – R. S. Bhoosanurmath
- 13) Heat and Thermodynamics and Statistical Physics (XVII Edition) –Singhal, Agarwal and Satyaprakash
- 14) A Treatise on Heat: Meghnad N. Saha and B. N. Srivastava, Indian Press, (1958).
- 15) A Text Book of Heat and Thermodynamics for Degree Students : J. B. Rajam, S. Chand Publications, (1981).
- 16) Properties of Matter - Brijlal & Subramanyam, S Chand & Co, (2002)
- 17) Elements of Properties of matter – D S Mathur, S.chand(GL) 7 Co Ltd,Dehi 1ed(2010)
- 18) Fluid Mechanics: Robert W. Fox & Alan T. Mcdonald, Wiley India, 8th Edn.
- 19) Low-Temperature Physics: Hans- Christian Stahl, Siegfried Hunklinger, Springer Science & Business Media, (2005).
- 20) Waves & Oscillations, P K Mittal & Jai Dev Anand, Hari Anand Publications Pvt Ltd (2011ed).
- 21) Physics of Waves, University Leadership Project, Prasaraanga, Bangalore University.
- 22) A text book of Sound (II Edition) – Brijlal and Subramanyam, Vikas Publishing House, 1977.
- 23) Text book of Sound (I Edition) – Khanna and Bedi, Atmaram and Sons,1985.
- 24) Text book of Sound (III Edition) – M. Ghosh, (S.Chand).
- 25) Waves and Optics, S P Taneja, R Chand & Co. New Delhi.
- 26) Thermal Physics, Ashok Kumar, S P Taneja, R Chand & Co. New Delhi.
- 27) Optics, Brij Lal and Subramaniam, S Chand & Company, 22nd Edition, (1994).
- 28) Principles of Optics, B K Mathur, Gopal Printing Press, Kanpur, 6th Edition, (1996).
- 29) Geometrical Optics (I-Edition) – D.P.Acharya (Oxford & IBH Pub. Co., 1970).
- 30) Optics and Spectroscopy (VI Edition) – Murugesan, Kiruthiga and ShivaPrasad (S.Chand).
- 31) Fundamentals of Optics (V-Edition) – Khanna and Bedi (R.Chand, New Delhi).
- 32) Geometrical Optics: A. Verstraetin

Practical

Paper Code: PHYDSCP3.1

Paper Title: Practical III

Teaching Hours: 4 Hrs / Week

Marks: Pr-40+IA-10

Credits : 2

- 1 Searle's Goniometer
- 2 Helmholtz Resonator
- 3 Velocity of sound through wire (Sonometer)
- 4 Thermal conductivity by Lee's method
- 5 Frequency of AC using sonometer.
- 6 Specific heat of solid by cooling.
- 7 Verification of Stefan's law of radiation.
- 8 Lissajous figures using CRO
- 9 Thermal Behavior of Bulb Filament.
- 10 Characteristics of Loudspeaker and Microphone.
- 11 The thermoelectric power of thermocouple.
- 12 Measurement and estimation of Power consumption by household electrical instruments.

Note :

1. Experiments are of four hours duration.
2. Minimum of eight experiments to be performed.

References:

1. Physics through experiments. B Saraf etc,- Vikas Publications (2013)
 2. D P Khandelwal – A Laboratory Manual of Physics for Undergraduate Classes, Vikas Publications First ed (1985)
 3. Advanced Practical Physics for Students – Worsnop & Flint, Methuen & Co, London.
 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, CL Arora, SChand & Co, New Delhi, (2007) Revised Edition.
- B.Sc. Practical Physics, Geeta Sanon R. Chand & Co. New Delhi

**OPEN ELECTIVE COURSE
MEDICAL PHYSICS**

Teaching Hours: 3 Hrs / Week
Total hours:45

Marks: Th-40+IA-10
Credits :2

(Elective for 3rd Semester) From 2025-26

Total: 39 hours

Unit I: X Rays Basics

(12 hours)

Qualitative Overview of human anatomy - cells, cell structure, type of cells and functions, tissues, organs, and their functions. Different systems in the human body, their structure and function, physiological properties of the circulatory system, digestive system, respiratory system, reproductive system, excretory system, endocrine system and nervous system. (03 Hours)

Outline of atomic structure, electromagnetic radiation waves and quanta, general properties of electromagnetic radiation- fundamentals of radioactivity radiations (alpha, beta and gamma). Light-intensity and quality, spectrum of white light, line spectra, photo-electric emission, photocell, fluorescence, phosphorescence. (05 Hours)

Principle, and production of X rays, Conditions necessary for production of x-rays, Heterogeneous nature of the x-ray beam, Electron emission, electron acceleration through electric field, Types of x-ray tubes: diagnostic, therapeutic, stationary anode, rotating anode, gas tubes (ionic), Coolidge tubes (thermionic) (04 Hours)

Unit II: Interaction of X-rays with Human body, Basics of Laser

(12 hours)

Properties of x-rays, frequency, energy, the effect of voltage on these properties, absorption of x-rays, the absorption of primary radiation in striking matter, Secondary, scattered and characteristic radiation, Detection of x-radiation, action on the emulsion of the photographic film, physiological action on living tissue, ionizing effects. Unit of ionizing radiation quantity, the roentgen., Permissible dosage for x-ray operators (0.3 r per week) (04 Hours)

Interaction of X-rays with human body. Effect of x-ray exposure on human body, x-ray protection, permissible exposure, international recommendations for protection of persons exposed to ionizing radiation, the protective materials lead, Lead Aprons, building materials, lead equivalents and variation with quality and room protection, Use of X-rays in medical diagnosis, X-ray imaging systems. (04 Hours)

Laser : Induced absorption, spontaneous emission and stimulated emission. Einstein's A and B coefficients – Mention of relation between Einstein's coefficients and radiation energy density; Condition for amplification of light; Population inversion; Methods of pumping (qualitative); Requisites

of laser – energy source, active medium and laser cavity; Qualitative discussion about Helium-Neon Laser and Ruby Laser, Characteristics of laser light and its applications. (medicine, industry and defence). (04 Hours)

Unit III: Radiation Technology (Medical Diagnostics)

(12 Hours)

Computed Tomography scan (CT scan): principle and generation of CT. – Basic Physics – Recent developments, applications etc. (02 Hours)

NMR (Nuclear Magnetic resonance) (Qualitative), MRI–Magnetic Resonance Imaging – basic principle and image characteristics. Strength of typical magnetic field, methods of production of high magnetic field, Superconducting coils, Effect of magnetic field on human body, Basic terms used in MRI Operations, Applications. (05 Hours)

Ultrasonics, – Ultrasound Imaging: Interaction of sound waves with body tissues, production of ultrasound, transducers, acoustic coupling, image formation, modes of image display and color Doppler. Types of ultrasound – Techniques of ultrasound scanning in different parts. (05 Hours)

Student activities and Mini Project: (09 hours)

The Student shall carry out following activities and understand the fundamentals and basics of X-Rays, CT, MRI and USG. He/she shall prepare a mini project report signed and attested, preferably by Radiologist/Lab technician. **It will be evaluated for 10 marks by staff in charge and shall be considered as Internal Assessment Marks.**

Student Activities:

1. Construction of models of human anatomy and physiology.
2. Visit to nearby hospitals/diagnostic centers to study the working of X-ray machines, X-ray films, CT Scan, MRI and USG..
3. Visit to radiotherapy centers to study the modalities of radiotherapy.

Text Books

1. C. H. Best and N. B. Taylor. A Text in Applied Physiology. Williams and Wilkins Company, Baltimore, 1999.

2. C. K. Warrick. Anatomy and Physiology for Radiographers. Oxford University Press, 2001.
3. Jerrold T. Bushberg. The Essential Physics for Medical Imaging (2nd Edition). Lippincott Williams & Wilkins, 2002.
4. Jean A. Pope. Medical Physics: Imaging. Heinemann Publishers, 2012.
5. Faiz M. Khan and Roger A. Potish. Treatment Planning in Radiation Oncology. Williams and Wilkins, USA, 2003.
6. D. Baltas. The physics of modern brachytherapy for oncology. Taylor and Francis, 2007.

Reference Books

1. J. R. Brobek. Physiological Basis of Medical Practice. Williams and Wilkins, London, 1995.
2. Edward Alcamo, Barbara Krumhardt. Barron's Anatomy and Physiology the Easy Way. Barron's Educational Series, 2004.
3. Lippincott, Anatomy and Physiology. Lippincott Williams & Wilkins, 2002.
4. W. E. Arnould Taylor. A textbook of anatomy and physiology, Nelson Thornes, 1998.
5. G. S. Pant. Advances in Diagnostic Medical Physics. Himalaya Publishing House, 2006.
6. Sabbahaga, Diagnostic Ultrasound applied to OBG. Maryland, 1980.
7. Faiz M Khan. The Physics of Radiation Therapy (3rd edition). Lippincott Williams & Wilkins, USA, 2003.
8. Jatinder R. Palta and T. Rockwell Mackie. Intensity Modulation Radiation Therapy. Medical Physics publishing, Madison, Wisconsin, 2003.
9. AAPM Report No. 72. Basic Applications of Multileaf collimators, AAPM, USA, 2001.
10. AAPM Report No. 91. Management of Respiratory motion in radiation oncology, 2006.
11. CA Joslin, A. Flynn, E. J. hall. Principles and Practice of Brachytherapy. Arnold publications, 2001.
12. Peter Hoskin, Catherine Coyle. Radiotherapy in Practice. Oxford University Press, 2011.
13. W. R. Handee. Medical Radiation Physics. Year Book Medical Publishers Inc., London, 2003.
14. Donald T. Graham, Paul J. Cloke. Principles of Radiological Physics. Churchill Livingstone, 2003.
15. Thomas S. Curry. Christensen's Physics of Diagnostic Radiology (4th Edition). Lippincott Williams & Wilkins, 1990.
16. Madison. MRI – Perry Sprawls – Medical Physics Publishing. Wisconsin, 2000.
17. Steve Webb. The Physics of Three-Dimensional Radiotherapy. Institute of Physics Publishing, Bristol and Philadelphia, 2002.
18. Radiation oncology physics: A Handbook for teachers and students. IAEA publications, 2005.
19. F. M. Khan. The Physics of Radiation Therapy (3rd Edition), Lippincott Williams and Wilkins, U.S.A., 2003.

Fourth Semester B.Sc. (Physics)

Paper Code:PHYDSCT4.1

Paper Title: Thermodynamics-II, and Physical Optics

Teaching Hours: 4 Hrs / Week

Marks: Th-80+IA-20

Total hours :60

Credits :3

Unit I

Low Temperature and Low Pressure Physics

Production of low pressure: Rotary pump and its characteristics (Rotary pressure, degree of vacuum attainable and speed of pump).

Diffusion pump: Principle, construction & working.

Ionization gauge: Principle, construction & working.

Production of low temperature: Introduction, freezing mixtures, Joule Thomson Effect, Porous Plug Experiment, Principle of Regenerative Cooling. Different Methods of liquification of gases, liquification of air, oxygen and helium, production of low temperatures by an adiabatic demagnetization, Properties of materials at low temperatures.

Problems

15 Hours

Unit II

Thermo-Electricity

Seebeck Effect –explanation. Variation of emf with temperature; Neutral Temperature and Temperature of inversion. Thermo-electric Series. Laws of Thermo-Electric effects. Peltier Effect-explanation. Peltier's Coefficients. Thermodynamics of Peltier's Effect. Thomson Effect explanation. Thomson Coefficient.

Derivation of the relation $\pi = T \frac{dE}{dT}$ and $\sigma_A - \sigma_B = T \frac{d^2E}{dT^2}$

Thermo-Electric (Tait) diagrams, its applications to determine, (1) Total emf (2) Peltier emf (3) Thomson emf (4) Neutral temperature and (5) Temperature of inversion.

Thermocouple K and J types. Problems.

15 Hours

Unit III

Interference

Interference due to division of wavefront & amplitude. Young's double slit experiment. Lloyd's mirror Fresnel biprism. Phase change on reflection: Stokes' treatment of reflection and transmission at interface. Interference in thin films – due to reflected light and transmitted light. Newton's rings

due to reflected light and transmitted light & measurement of wavelength. Michelson's interferometer. Problems.

15 Hours

Unit IV

Diffraction

Fresnel's Diffraction. Half Period Zone using rectilinear propagation of light. Zone plate: Construction, theory and working. Fresnel's diffraction pattern due to straight edge and position of minima and maxima. Fraunhofer's diffraction at single slit (qualitative). Diffraction grating. Theory of plane transmission grating (qualitative). Resolving power. Rayleigh's criteria. Resolving the power of prism. Resolving power of telescope. Resolving power of grating (qualitative). Problems.

Polarization

Transverse nature of light waves- plane of vibration and plane of propagation. Malu's law. Double refraction. Positive and negative plates. Retardation plates: Quarter wave plate and half wave plate. Production of Circular and elliptical polarization, Optical Activity: Fresnel's Theory of optical activity. Specific rotation. Problems.

15 Hours

REFERENCE BOOKS:

- 1) Low Temperature Physics by Christian E and Siegfried H , Springer.
- 2) Thermal Engineering by S Singh, S Patil
- 3) Heat and Thermodynamics- Brij Lal and N Subramanyam, S Chand & Co, New Delhi -1985.
- 4) Heat and Thermodynamics – D S Mathur, SChand & Co, New Delhi, 5th Edition (2004).
- 5) Heat and Thermodynamics and Statistical Physics (XVII Edition) –Singhal, Agarwal and Satyaprakash.
- 6) Introduction to Thermoelectricity: H. Julian Goldsmith, Springer Science & Business Media, (2009).
- 7) Optics, Ajoy Ghatak, Tata Mc Graw Hill, 4th Edition
- 8) Introduction to Modern Optics, Ajoy Ghatak, Tata McGraw Hill Publications (2009).
- 9) Fundamentals of Physics by Halliday, Resnick and Walker, Asian Books Private Limited, New Delhi, 5th Edition, (1994)
- 10) A K Ghatak and K Thyagarajan, Contemporary Optics, Macmillan/Premium Publishing Corp(1978).
- 11) Jenkins and White, Optics, McGraw Hill Education India Pvt Ltd 4th ed(2011).
- 12) Optics, Brij Lal and Subramaniam, S Chand & Company, 22nd Edition, (1994).
- 13) Principles of Optics, B K Mathur, Gopal Printing Press, Kanpur, 6th Edition, (1996).
- 14) Geometrical Optics (I-Edition) – D.P.Acharya (Oxford & IBH Pub. Co., 1970).
- 15) Optics and Spectroscopy (VI Edition) – Murugesan, Kiruthiga and ShivaPrasad (S.Chand).
- 16) Fundamentals of Optics (V-Edition) – Khanna and Bedi (R.Chand, New Delhi).
- 17) Geometrical Optics: A. Verstraetin

Practical

Paper Code: PHYDSCP4.1

Teaching Hours: 4 Hrs / Week

Paper Title: Practical IV

Marks: Pr-40 + IA-10

Credits : 2

1. Dispersive Power of Prism
2. Determination of wavelength of monochromatic light using single slit/plane transmission grating.
3. Calibration of Spectrometer
4. Air wedge (Thickness of paper)
5. Newton's Rings : Determination of Radius of curvature of Plano Convex lens
6. Newton's Rings : Determination of RI of Water
7. Resolving Power of Telescope
8. Resolving Power of Grating
9. Resolving Power of Prism
10. Specific rotation of optically active solution using Polarimeter
11. Measurement of Sound Pollution.
12. Study of absorption of heat by various colored metal surfaces.

Note :

1. Experiments are of four hours duration.
2. Minimum of eight experiments to be performed.

References:

1. D P Khandelwal – A Laboratory Manual of Physics for Undergraduate Classes, Vikas Publications First ed (1985)
2. Advanced Practical Physics for Students – Worsnop & Flint, Methuen & Co, London.
3. An Advanced Course in Practical Physics , D Chattopadhyay, P C Rakshit, B Saha, New Central Book Agency (P) Limited, Kolkata, Sixth Revised Edition, (2002)
4. BSC, Practical Physics, CL Arora, SChand & Co, New Delhi, (2007) Revised Edition.
5. B.Sc. Practical Physics, Geeta Sanon R. Chand & Co. New Delhi

**OPEEN ELECTIVE COURSE
LENSES AND OPTICAL FIBERS**

Teaching Hours: 3 Hrs / Week
Total hours:45

Marks: Th-40+IA-10
Credits :2

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 lenes 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.

- 1) Optics, Ajoy Ghatak, Tata Mc Graw Hill, 4th Edition
- 2) Introduction to Modern Optics, Ajoy Ghatak, Tata McGraw Hill Publications (2009).
- 3) Fundamentals of Physics by Halliday, Resnick and Walker, Asian Books Private Limited, New Delhi, 5th Edition, (1994)
- 4) A K Ghatak and K Thyagarajan, Contemporary Optics, Macmillan/Premium Publishing Corp(1978).
- 5) Jenkins and White, Optics, McGraw Hill Education India Pvt Ltd 4th ed(2011).
- 6) Optics, Brij Lal and Subramaniam, S Chand & Company, 22nd Edition, (1994).
- 7) Principles of Optics, B K Mathur, Gopal Printing Press, Kanpur, 6th Edition, (1996).
- 8) Geometrical Optics (I-Edition) – D.P.Acharya (Oxford & IBH Pub. Co., 1970).
- 9) Optics and Spectroscopy (VI Edition) – Murugesan, Kiruthiga and ShivaPrasad (S.Chand).
- 10) Optical Communication And Networks. Bandyopadhyay, M. N.
- 11) Optoelectronics And Optical Fiber Sens... Maity, Asit Baran.
- 12) Textbook On Optical Fiber Communication And Its Applications By S C Gupta

SKILL SYLLABUS (PRACTICAL BASED)

DOMESTIC ELECTRICAL WIRING (SKILL ENHANCEMENT)

Teaching Hours: 04 Per week

Total Teaching Hours: 45

Marks: Pr-40+IA-10 Credits :2

Instructions:

- 1. The theory part given in each unit is to be taught qualitatively for 1 ½ hours (90 minutes).**
- 2. Experiment part of each unit should be conducted for 2 ½ hours (150 minutes)**
- 3. Drawing Block diagram for each experiment showing positions of electrical components on the board is compulsory.**
- 4. The Pattern for practical examination is given below. The answers to Viva-Voce questions (minimum 05 questions for 2 marks each) should be written in the answer sheet.**

UNIT 1

(04 Hours)

Introduction to Electricity, an Atom, electricity Electron flow, conductors, Insulators. Sources of Electricity. Electrical terms: Electromotive force, Current, Resistance, Potential difference.

Concept of AC and DC, AC current, AC voltage, generating sinusoidal voltage. SINE Wave, cycle, period, frequency, Peak value, average value, R.M.S. value.

EXPERIMENT:

Handling of all instruments (toolbox). AC voltmeter and ammeter. Identification of phase, neutral and earthing. Different types of fuses. Determination of fusing current by test. Inverter. Verification of Ohm's Law.

UNIT 2

(04 Hours)

General idea of wiring tools and their specifications. Applications of power tools in wiring. Electrical Accessories, Mounting Accessories' specifications.

Simple Electric circuit, Closed Circuit, Open Circuit and short circuit. Ohm's law Relationship between E, I and R in D.C. Circuits.

EXPERIMENT:

One lamp, one switch and two lamps, two switches with MCB.

UNIT 3

(04 Hours)

Laws of Resistance, Resistivity. Connection of Resistances: Series Circuit Parallel Circuit, Series and Parallel Circuit.

Calculation of power in AC, amperage, Voltage, Wattage, kWh, Calculation of load energy consumption.

Study of different type of switch used in domestic installations, two-way switches, D.P. Switches, Fan regulator: working and types, Dimmer.

EXPERIMENT:

To control two lamps through two switches to burn dim or one bright, indicators. Two sockets with switches. Staircase wiring (Single floor and two floor staircase).

UNIT 4

(04 Hours)

Conducting materials: Copper, Aluminum, Lead, Tin, Nickel, Chromium, silver, Zinc, Brass, Mercury. (conducting abilities, resistivities of these materials), Resistance materials: Nichrome, tungsten, Manganin, Constantan, Eureka, Carbon.

Insulating Materials: Marble, Slate, Porcelain, Mica, Rubber, Bitumen, Asbestos, Wood, Paper, cotton, Jute, Silk, P.V.C., Synthetic Materials: Resins, Plastics, Fiberglass, Bakelite, Paints, Varnishes.

EXPERIMENT:

One room wiring with 6 lights with switches.

UNIT 5

(04 Hours)

Transformer, (principle and working), types of transformers Step-up and step-down transformer: principle, design and fabrication, (Oil and Air type).

Generation and transmission of electrical power, High voltage transmission lines, Use of transformer in distribution of electrical power

EXPERIMENT:

One room wiring with 6 lights with switches, 1 fan with regulator and two sockets.

UNIT 6

(04 Hours)

Different types of wires and cables used in house wiring. Terms used in Electric Cables, Differences, current bearing capacity and advantages of these cables and wires. Conducting material used for different types of cables and wires. (Demonstration).

EXPERIMENT:

Kitchen wiring with 3 lights with switches, 1 fan with regulator, 1 exhaust fan and three sockets, heating points (fridge, mixer, oven).

UNIT 7

(04 Hours)

Earthing systems, Testing of domestic wiring and installations.

Principle and working of electrical power measuring meter.

EXPERIMENT:

One room wiring with 4 lights with switches (2 lights with two way switches). 1 fan with two-way switches.

UNIT 8

(04 Hours)

Effect of Electric Current: Heating, Magnetic, Chemical. Principle and working of water heaters, specifications, wiring diagram.

Electric Shock prevention measures, First aid. Fuses. (material specifications), Different types of control devices, principle and working, (MCB, MCCB, RCB, RCD, ELCB, RCCB, RCBO, SPD)

Filament lamps working, types. Fluorescent lamps, working and use of choke, starter, circuit diagram and uses. LED lamps. Advantages of LED bulbs over filament bulbs.

EXPERIMENT:

Bathroom wiring, 1 light, 1 heating point, 1 socket, 1 exhaust.

UNIT 9

(04 Hours)

Preparing load chart for AEH installation and selection of cables. Load Distribution for lighting circuit.

Distribution board for Heating and Power installation. Calculation of Load of different circuits and selection of size of wires, cables.

Panel Board wiring, Meter Board, Single phase service mains, accessories and wiring.

EXPERIMENT:

Panel Board Wiring (Meter Board)

UNIT 10

Site Visit and Mini Project: (09 hours)

The Student shall visit a site under construction and study details of electrical wiring used. He/she shall prepare a mini project report signed and attested, preferably by site engineer/electrician. **It will be evaluated for 10 marks by staff in charge and shall be considered as Internal Assessment Marks.**

Reference Books:

1. <https://ncert.nic.in/vocational/pdf/kvcj103.pdf>
2. Home Electrical Wiring: A Complete Guide to Home Electrical Contractor by David W Rongey
3. Residential Electrical Wiring by PD Muruges
4. Complete handbook of electrical and house wiring By Duncan, S. Blackwell
5. Electrician Theory Level 1, 2,3,4,5 (I & II Year) by NSQF
6. Electrical Wiring: An Introduction: by Satheesh Kumar
7. NSQF Level Workshop Calculation & Science Electrician I & II Year (Paperback, DC Gupta)

Scheme of Evaluation for Practical Examination

Examination duration: 04 hours

S.No	Particulars	Marks Allotted
1.	Basic formula with description, nature of graph if any & indication of unit	04
2.	Tracing of schematic ray diagram/Circuit diagram with description	04
3.	Tabulation	04
4.	Experimental skill & connection	04
5.	Record of observation and performance of experiment	08
6.	Calculation including drawing graph	06
7.	Accuracy of result with unit	02
8.	Journal assessment	04
9.	Oral performance	04
	Total	40

Question Paper pattern
First/Second/Third/Fourth Semester B.Sc. Degree Examination
PHYSICS

Time: 3 hours

Max. Marks: 80

1.		Answer any 10 sub question	10 x 2 = 20
	i.		
	ii.		
	iii.		
	iv.		
	v.		
	vi.		
	vii.		
	viii.		
	ix.		
	x.		
	xi.		
	xii.		
2.			
	(a)		5 marks
	(b)		10 marks
		OR	
3.	(a)		5 marks
	(b)		10 marks
4	(a)		5 marks
	(b)		10 marks
		OR	
5	(a)		5 marks
	(b)		10 marks

6.	(a)	5 marks
	(b)	10 marks
		OR
7.	(a)	5 marks
	(b)	10 marks
8.	(a)	5 marks
	(b)	10 marks
		OR
9.	(a)	5 marks
	(b)	10 marks

Instruction to set the question paper.

1. Question number 1 has 12 sub questions consisting of 3 questions from each unit. Each question carries two marks. Student has to answer any ten questions. Problems appropriate to three marks may be asked.
2. Question number 2 and 3 are from unit I.
3. Question number 4 and 5 are from unit II.
4. Question number 6 and 7 are from unit III
5. Question number 8 and 9 are from unit IV.
6. Sub-questions b in Q No. 2,3,4,5,6,7,8 and 9 should be numerical problems for 5 marks wherever possible. Or else a suitable 5 mark question may be asked.
7. Student has to answer either question number 2 or 3, 4 or 5, 6 or 7 and 8 or 9.
Note: In case student answered both the questions from the same unit in full or part, highest marks from any one choice has to be considered.

Question Paper Pattern
Elective Papers

Time : 02 Hours

Maximum Marks: 40

Question No : I

Answer any FIVE

2 x 5 = 10

1	02 questions from each unit	Total Marks = 10
2		
3		
4		
5		
6		

Question No: II

Answer any FIVE

3 x 5 = 15

7	02 questions from each unit	Total Marks = 15
8		
9		
10		
11		
12		

Question No: II

Answer any THREE

5 x 3 = 15

13	Minimum 01 questions from each unit	Total Marks = 15
14		
15		
16		

**Practical Examination Pattern For
DOMESTIC ELECTRICAL WIRING**

Time : 04 Hours

Maximum Marks: 40

S.No	Particulars	Marks Allotted
1.	Block diagram of experiment	05
2.	Circuit diagram with description	10
3.	Experimental skill & connection	10
4.	Working of Circuit	05
5.	Viva-voce questions (Write the answers to any 5 questions out of 9)	10
	Total	40