DEPARTMENT OF PHYSICS

COURSE CURRICULUM & MARKING SCHEME

B.Sc. PART – II & III
PHYSICS

SESSION : 2022-23

ESTD: 1958

GOVT. V.Y.T. PG AUTONOMOUS COLLEGE, DURG, 491001 (C.G.)

(Former Name – Govt. Arts & Science College, Durg)

NAAC Accredited Grade A^+, College with CPE - Phase III (UGC), STAR COLLEGE (DBT)

Phone : 0788-2212030

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Approved syllabus for B.Sc. PHYSICS by the members of Board of Studies for The Session 2022-23 the syllabus with the paper combinations is as under

B.Sc. II

Paper I **BPH03: THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS**	**Paper II** **BPH04: WAVES, ACOUSTICS AND OPTICS**
BPHL02: PHYSICS PRACTICALS LAB	

B.Sc. III

Paper I **BPH05: RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS**	**Paper II** **BPH06: SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS**
BPHL03: PHYSICS PRACTICALS LAB	

Marking Scheme for B.Sc. II YEAR

Paper No.	Title of the Paper	Marks Allotted in Theory	
		Max	Min
I	Thermodynamics, kinetic Theory and Statistical physics	50	17
II	Waves, Acoustics and optics	50	17
III	Lab course/ Practical	50	17
	Total	**150**	

02 Theory papers - 100

01 Practical - 50

Total Marks - 150

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SYLLABUS FOR: (2022–2023)

B.Sc. Part-II

Paper-I

BPH03: THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS

After completion of the course, Students will be able to:

- CO1 Associate with different laws of Thermodynamics, compare them and correlate phenomena observed in past. Explain working of Carnot's engine and derive efficiency in different situations.
- CO2 Identify thermodynamic variables and appraise various relations for gaseous system.
- CO3 Acquire a thorough knowledge of Black body radiation and laws associated with it.
- CO4 Describe Maxwellian distribution of speeds and distinguish between mean, r.m.s. and most probable speed values, Compute molecular collisions, mean free path and collision cross sections and estimate molecular diameter and mean free path.
- CO5 Interpret the statistical basis of thermodynamic probability and enlist statistical postulates of Gibb's ensemble. Derive Maxwell Boltzmann statistical laws and describe Bose Einstein and Fermi Dirac statistics through canonical partition function

UNIT-1

The laws of thermodynamics: The Zeroth law, first law of thermodynamics, internal energy as a state function, reversible and irreversible change, Carnot's cycle, carnot theorem, second law of thermodynamics. Claussius theorem inequality. Entropy, Change of entropy in simple cases (i) Isothermal expansion of an ideal gas (ii) Reversible isochoric process (iii) Free adiabatic expansion of an ideal gas. Concept of entropy, Entropy of the universe. Entropy change in reversible and irreversible processes, Entropy of Ideal gas, Entropy as a thermodynamic variable, S-T diagram, Principle of increase of entropy. The thermodynamic scale of temperature, Third law of thermodynamics, Concept of negative temperature.

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UNIT-2

Thermodynamic functions, Internal energy, Enthalpy, Helmholtz function and Gibb's free energy, Maxwell's thermodynamical equations and their applications, TdS equations, Energy and heat capacity equations Application of Maxwell's equation in Joule Thomson cooling, adiabatic cooling of a system, Van der Waals gas, Clausius-Clapeyron heat equation. Blackbody spectrum, Stefan-Boltzmann law, Wien's displacement law, Rayleigh-Jean's law, Planck's quantum theory of radiation.

UNIT-3

Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Transport phenomena in gases: Molecular collisions mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

Behaviour of Real Gases: Deviations from the Ideal Gas Equation. The Virial Equation. Andrew's Experiments on CO_2 Gas. Critical Constants.

UNIT-4

The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, statistical postulates. Concept of Gibb's ensemble, accessible and inaccessible states. Concept of phase space, γ phase space and μ phase space. Equilibrium before two systems in thermal contact, probability and entropy, Boltzmann entropy relation. Boltzmann canonical distribution law and its applications, law of equipartition of energy. Transition to quantum statistics: ' h' as a natural constant and its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator.

UNIT-5

Indistinguishability of particles and its consequences, Bose-Einstein & Fermi-Dirac conditions, Concept of partition function, Derivation of Maxwell-Boltzmann, Bose Einstein and Fermi-Dirac Statistics, Limits of B-E and F-D statistics to M-B statistics. Application of B-E statistics to black body radiation, Application of F-D statistics to free electrons in a metal.

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TEXT AND REFERENCE BOOKS:

1. B.B. Laud, " Introduction to Statistical Mechanics" (Mcmillan 1981)
2. F. Reif: " Statistical Physics" (Mcgraw-Hill, 1998).
3. K, Haung: " Statatistical Physics" (Wiley Eastern, 1988).
4. Thermal and statistical Physics: R.K. Singh, Y.M. Gupta and S. Sivraman.
5. Statistical Physics: Berkeley Physics Course, Vol. 5
6. Physics (Part-2): Editor, Prof. B.P. Chandra, M.P. Hindi Granth Academy.
7. Heat and Thermodynamics: K.W. Zeemansky.
8. Thermal Physics: B.K. Agarwal.
9. Heat and Thermodynamics: BrijLal and N. Subramanyam.
10. Heat and Thermodynamics: Dayal, Verma and Pandey.
11. A Treatise on Heat: M.N. Saha and B.N. Srivastava.

('In case, any change or modification is prescribed by Central Board of studies or Higher Education Deptt., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.')

V.C. Nominee	**Departmental Members**
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Subject Expert.....	**2. Dr.R.S. Singh**.....
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Prof. from other Dept. Of Sc. Faculty 26/7/22	**4. Mrs. Siteshwari Chandrakar**..... 26/7/22
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B. Sc. Part-II
BPH04: Paper-II WAVES, ACOUSTICS AND OPTICS

After completion of the course, Students will be able to:

CO1 Express waves in form of equation and interpret the solutions and determine values of parameters.

CO2 Appreciate the use of Fermat's Principle of extremum path to derive basic laws of optics, Investigate cardinal points for various coaxial lens systems.

CO3 Demonstrate different type of interferences and interpret interference results using Michelson interferometer and Fabry-Parot Interferometer.

CO4 Describe and demonstrate diffraction of light. Compare Fresnel half period zones with, Fraunhoffer diffractions. Evaluate Resolving powers using Rayleigh criterion.

CO5 Understand and explain working of a Laser system, Assemble various parts for its efficient working. Analyze its application in communication technology

UNIT-1

Waves in media: Speed of transverse waves on uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Waves over liquid surface: gravity waves and ripples. Group velocity and phase velocity and relationship between them. Production and detection of ultrasonic and infrasonic waves and applications.

Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection & refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging.

UNIT-2

Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications. Cardinal points of an optical system, thick lens and lens combinations. Lagrange equation of magnification, telescopic combinations, telephoto lenses. Monochromatic aberrations and their reductions; aspherical mirrors and Schmidtcorrector plates, a planatic points, oil immersion objectives, meniscus lens. Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces. (Ramsdon and Hygen's eyepieces).

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UNIT-3

Interference of light: The principle of super positions, two slit interference, coherence requirement for the sources, optical path retardations, Conditions for sustained interference, Theory of interference, Thin films. Newton's rings and Michelson interferometer and their applications its application for precision determinations of wavelength, wavelength difference and the width of spectral lines. Multiple beam interference in parallel film and Fabry-Perot interferometer. Rayleigh refractometer, Twyman-Green interferometer and its uses.

UNIT-4

Diffraction, Types of Diffraction, Fresnel's diffraction, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, Zone plates, diffraction due to straight edge, Fraunhofer diffraction due to a single slit and double slit, Diffraction at N Parallel slit, Plane Diffraction grating, Rayleigh criterion, resolving power of grating, Prism, telescope.

Polarized light and its mathematical representation, Production of polarized light by reflection, refraction and scattering. Polarization by double refraction and Huygen's theory, Nicol prism, Retardation plates, Production and analysis of circularly and elliptically polarized light. Optical activity and Fresnel's theory, Biquartz polarimeter.

UNIT-5

Laser system: Basic properties of Lasers, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion, Types of Laser: Ruby and, He-Ne laser and. Applications of laser: Application in communication, Holography and Basics of non linear optics and Generation of Harmonic.

TEXT AND REFERENCE BOOKS:

1. A.K. Ghatak, ' Physical Optics'
2. D.P. Khandelwal, Optical and Atomic Physics ' (Himalaya Publishing House, Bombay, 1988).
3. K.D. Moltev;' Optics ' (Oxford University Press)
4. Sears:' Optics '
5. Jenkins and White:' Fundamental of Optics ' (McGraw-Hill)
6. B.B. Laud: Lasers and Non-linear Optics (Wiley Eastern 1985)
7. Smith and Thomson:' Optics ' (John Wiley and Sons)

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8. Berkely Physics Courses: Vol.-III,' Waves and Oscillations '
9. I.G. Main,' Vibrations and Waves ' (Cambridge University Press)
10. H.J. Pain:' The Physics of Vibrations and Waves ' (MacMillan 1975)
11. Text Book of Optics: B.K. Mathur
12. B.Sc. (Part III) Physics: Editor: B.P. Chandra, M.P. Hindi Granth Academy.
13. F. Smith and J.H. Thomson, Manchester Physics series: optics (John Wiley, 1971)
14. Born and Wolf:' Optics '.
15. Physical Optics: B. K. Mathur and T. P. Pandya.
16. A textbook of Optics: N. Subrahmanyam, Brijlal and M. N. Avadhanulu.
17. Geometrical and Physical Optics: Longhurst.
18. Introduction to Modern Optics: G. R. Fowels.
19. Optics: P. K. Srivastav.

Name and Signatures

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Subject Expert 26/07/2022	**1. H.O.D Dr. Jagjeet Kaur Saluja**..... 26/7/22
Subject Expert.....	**2. Dr.R.S. Singh**.....
Alumni (member).....	**3. Dr. Anita Shukla**.....
Prof. from other Dept. Of Sc. Faculty 26.7.22	**4. Mrs. Siteshwari Chandrakar**..... 26/07/22
Specialist from Industry.....	**5. Dr. Abhishek Kumar Misra**.....
	6. Dr Kusumanjali Deshmukh..... 26/7/22

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Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper for UG Classes is to be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (No Multiple choice questions. No 'fill in the blank' type Questions)
3. Section B shall contain short answer type questions with the limit of 150 words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350 words.
5. The scheme of marks should be as follows :

Question Type	MM 33 (Marks x No. of Questions)	MM 34 (Marks x No. of Questions)	MM 50 (Marks x No. of Questions)	MM 75 (Marks x No. of Questions)
A (Very short Answer)	8x1 = 08	1x9 = 09	1x10 = 10	1x10 = 10
B (Short Answer)	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
C (Long Answer)	3x5= 15	3x5= 15	5x5 = 25	8x5= 40

6. The half yearly internal examinations will be held. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.

स्नातक कक्षाओं के लिए प्रश्न पत्र का प्रारूप तथा अंक विभाजन

1. स्नातक कक्षाओं के लिए प्रत्येक प्रश्न पत्र तीन खण्डों अ, ब, स में विभाजित होगा।
2. खण्ड अ में अतिलघूत्तरी प्रश्न (एक या दो वाक्यों में उत्तर) या वस्तुनिष्ठ प्रश्न होंगे। (बहुविकल्पीय प्रश्न नहीं होंगे। 'रिक्त स्थानों की पूर्ति करों ' जैसे प्रश्न भी नहीं होंगे।)
3. खण्ड ब में लघूत्तरी प्रश्न होंगे जिनका उत्तर 150 शब्दों में देना होगा।
4. खण्ड स में दीर्घ उत्तरी/निबंधात्मक प्रश्न होंगे। विद्यार्थियों को अधिकतम 350 शब्दों में सटीक उत्तर लिखना होगा।
5. प्रश्नपत्र का प्रारूप एवं अंक विभाजन निम्नानुसार होगा :

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प्रश्न का प्रकार	पूर्णांक 33 (अंक x प्रश्नों की संख्या)	पूर्णांक 34 (अंक x प्रश्नों की संख्या)	पूर्णांक 50 (अंक x प्रश्नों की संख्या)	पूर्णांक 75 (अंक x प्रश्नों की संख्या)
अतिलघूत्तरी प्रश्न	8x1 = 08	1x9 = 09	1x10 = 10	1x10 = 10
लघूत्तरी प्रश्न	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
दीर्घ उत्तरी प्रश्न	3x5= 15	3x5= 15	5x5 = 25	8x5= 40

6. अर्द्धवार्षिक आंतरिक मूल्यांकन परीक्षा आयोजित होगी। इस परीक्षा में प्रत्येक प्रश्नपत्र के प्राप्तांक का 10% वार्षिक परीक्षा के प्रत्येक प्रश्नपत्र में प्राप्त अंको के 90% के साथ जोड़ा जाएगा।

Name and Signatures

V.C. Nominee ..... **Subject Expert** ..... **Subject Expert**..... **Alumni (member)**..... **Prof. from other Dept. Of Sc. Faculty** ..... **Specialist from Industry**.....	**Departmental Members** **1. H.O.D Dr. Jagjeet Kaur Saluja**..... **2. Dr.R.S. Singh**..... **3. Dr. Anita Shukla**..... **4. Mrs. Siteshwari Chandrakar**..... **5. Dr. Abhishek Kumar Misra**..... **6. Dr Kusumanjali Deshmukh**.....

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GOVT.V.Y.T.P.G.AUTO. COLLEGE, DURG
SYLLABUS FOR: (2022–2023)
B.Sc. – II, PHYSICS

BPHL02: Lab Course

Course Outcomes:

After the completion of the course, Students are expected to understand working mechanism and factors governing Thermodynamics and Optics (both geometrical and wave). In connection of the same students are expected to

CO1 Design and resolve circuits for electronic applications.

CO2 Record data as required by the experimental objectives.

CO3 Analyse recorded data and formulate it to get desired results.

CO4 Interpret results and check for attainment of proposed objective.

LIST OF EXPERIMENTS

Minimum 16 (Sixteen) out of the following or similar experiments of equal standard:-

1. Study of Brownian motion.
2. Study of adiabatic expansion of a gas.
3. Study of conversion of mechanical energy into heat.
4. Heating efficiency of electrical kettle with varying voltage.
5. Study of temperature dependence of total radiation.
6. Study of temperature dependence of special density of radiation.
7. Resistance thermometry.
8. Thermo emf thermometry.
9. Conduction of heat through poor conductors of different geometries.
10. Experimental study of probability distribution for a two option system using a coloured dice.
11. Study of statistical distribution on nuclear disintegration data (GM counter used as a black box).
12. Speed of waves on a stretched string.
13. Studies on torsional waves in a lumped system.
14. Study of interference with two coherent sources of sound.
15. Chlandi's figures with varying excitation and loading points.
16. Measurement of sound intensities with different situation.

17. Characteristics of a microphone –loudspeaker system.
18. Designing and an optical viewing system.
19. Study of monochromatic defects of images.
20. Determining the principle points of a combination of lenses.
21. Study of interference of light (biprism of wedge film).
22. Study of diffraction at a straight edge or a single slit.
23. Study of F – P etalon fringes.
24. Use of diffraction grating and its resolving limit.
25. Resolving limit of a telescope system.
26. Polarization of light by reflection; also cos – squared law.
27. Calculation of days between two dates of a year.
28. To check if triangle exists and the type of the triangle.
29. To find the sum of the since and cosine series and print out the curve.
30. To solve simultaneous equations by elimination method.
31. To prepare a mark list of polynomials.
32. Fitting a straight line or a simple curve to a given data.
33. Convert a given integer into binary and octal systems and vi versa.
34. Inverse of matrix.
35. Spiral array.

TEXT AND REFERENCE BOOKS:

1. D. P. Khandelwal; "Optical and Atomic Physion" (Himalaya Publishing House, Bombay 1988).
2. D.P. Khandelwal; "A Laboratory annual for Undergraduate classes" (Vani Publishing House, New Delhi.).
3. S. Lipsehutz and A Poe; "Schaum's Outline of Theory and Problems of programming with fortran"(McGraq – Hill Book Company 1986).

Dixon; "Numerical analysis".

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GOVT VYT PG AUTONOMOUS COLLEGE, DURG

DEPARTMENT OF PHYSICS

Syllabus and Marking Scheme for B.Sc. FINAL YEAR

Session (2022–2023)

02 Theory papers - 100 Marks

Paper No.	Title of the Paper	Marks Allotted in Theory	
		Max	Min
I	RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS.	50	17
II	SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS	50	17
III	Lab course/ Practical	50	17
	Total	150	

02 Theory - 100 Marks
01 Practical - 50 Marks
Total Marks - 150

Name and Signatures

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DEPARTMENT OF PHYSICS

SYLLABUS FOR: (2022-2023)
B.Sc. III PHYSICS
Paper-I
RELATIVITY, QUANTUM MECHANICS, ATOMIC MOLECULAR AND NUCLEAR PHYSICS

Course Outcomes:

BPH05: Relativity, Quantum Mechanics, Atomic Molecular and Nuclear Physics.

After completion of the course, Students will be able to:

- CO1 Describe laws of special theory of relativity and deduce its consequences in various situations and apply it for Compton's shift.
- CO2 Enumerate various events leading to Origin of the quantum theory. Appreciate wave particle duality and compute wavelengths using it and develop further understanding for wave packets. Correlate uncertainty.
- CO3 Write Schrodinger wave equation and solve it for obtaining different measurable parameters for a given system.
- CO4 Apply Schrodinger equation for some higher order problems like Spectra of hydrogen, deuteron and alkali atoms and its fine structure. Explain transition rule for pure vibration and electronic vibration spectra. Estimate and evaluate spectral lines from spectroscopy and analysis the theory underlining it.
- CO5 Utilize knowledge of particle interaction with electrostatic field in their detection and discrimination. Understand and describe working of detectors.

UNIT-1

Reference systems, inertial frames, Galilean invariance propagation of light, Michelson-Morley experiment, search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition, variation of mass with velocity, mass-energy equivalence, particle with zero rest mass.

UNIT-2

Origin of the quantum theory : Failure of classical physics to explain the phenomena such as black-body' spectrum,' photoelectric effect, Compton effect, Wave-particle duality, uncertainty principle, de Broglie's hypothesis for matter waves, the concept of Phase and group velocities, experimental demonstration of matter waves. Davisson and Germer's experiment. Consequence of de Broglie's concepts, Bohr's complementary Principle,

Bohr's correspondence principle, Bohr's atomic model, energies of a particle in a box, wave packets. Consequence of the uncertainty relation, gamma ray microscope, diffraction at a slit.

UNIT-3

Quantum Mechanics: Schrodinger's equation, Statistical interpretation of wave function, Orthogonality and normalization of wave function, Probability current density, Postulatory basis of quantum mechanics, operators, expectation values, Ehrenfest's theorem, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier.

UNIT-4

Spectra of hydrogen, deuteron and alkali atoms spectral terms, doublet fine structure, screening constants for alkali spectra for s, p, d and f states, selection rules. Discrete set of electronic energies of moleculers, quantisation of vibrational and rotational energies, determination of inter-nuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy.

UNIT-5

Structure of nuclei:- Basic Properties of Nuclei: (1) Mass_(2) Radii, (3) Charge, (4) Angular Momentum, (5) Spin, (6) Magnetic Moment (μ). (6) Stability and) Binding Energy, Nuclear Models:~ Liquid Drop Model, Mass formula, Shell Model, Types of Nuclear reactions, laws of conservation, Q-value of reactions, Interaction of Energetic particles with matter, Ionization chamber, GM Counter, Cloud Chambers, Fundamental Interactions, Classification of Elementary Particles, Particles and Antiparticles, Baryons, Hyperons, Leptons, and Mesons, Elementary Particle Quantum Numbers: Baryon Number, Lepton Number, Strangeness, Electric Charge, Hypercharge and Isospin, introductory idea of discovery of Higg's Boson.

TEXT AND REFERENCE BOOK:

1. HLS. Mani and G.K. Metha: "Introduction to Modem Physics" (Affiliated East-West Press, 1989),
2. A Beiser, "Prospective of Modern Physics".
3. HE. White, Introduction to Atomic Physic"
4. Barrow, "Introduction to Molecular Physics".

5. RP. Feynman, R.B. Leighton and M Sands, "The Feynman Lectures on Physics", Vol.III (BLL Publications, Bombay, Delhi, Calcutta, Madras).
6. T.A. Littlefield and N Thorley, "Atomic and Nuclear Physics" (Engineering Language Book Society)
7. HLA. Enge, "Introduction to Nuclear Physics", (Addision-Wesly)
8. Bisenberg and Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles" (John Wiley)
9. D.P. Khandelwal, "Opties and Atomic Physics", (Himalaya Publishing House, Bombay, 1988).
10. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi, 1984.
11. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000).
12. Theoretical Nuclear Physics, J.M. Blatt & V-F.Weisskopf (Dover Pub.Inc., 1991).

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GOVT VYT PG AUTONOMOUS COLLEGE, DURG

DEPARTMENT OF PHYSICS

Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper for UG Classes is to be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (No Multiple choice questions. No 'fill in the blank' type Questions)
3. Section B shall contain short answer type questions with the limit of 150 words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350 words.
5. The scheme of marks should be as follows :

Question Type	MM 33 (Marks x No. of Questions)	MM 34 (Marks x No. of Questions)	MM 50 (Marks x No. of Questions)	MM 75 (Marks x No. of Questions)
A (Very short Answer)	8x1 = 08	1x9 = 09	1x10 = 10	1x10 = 10
B (Short Answer)	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
C (Long Answer)	3x5= 15	3x5= 15	5x5 = 25	8x5= 40

6. The half yearly internal examinations will be held. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.

स्नातक कक्षाओं के लिए प्रश्न पत्र का प्रारूप तथा अंक विभाजन

1. स्नातक कक्षाओं के लिए प्रत्येक प्रश्न पत्र तीन खण्डों अ, ब, स में विभाजित होगा।
2. खण्ड अ में अतिलघूत्तरी प्रश्न (एक या दो वाक्यों में उत्तर) या वस्तुनिष्ठ प्रश्न होंगे। (बहुविकल्पीय प्रश्न नहीं होंगे। 'रिक्त स्थानों की पूर्ति करों ' जैसे प्रश्न भी नहीं होंगे।)
3. खण्ड ब में लघूत्तरी प्रश्न होंगे जिनका उत्तर 150 शब्दों में देना होगा।

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4. खण्ड स में दीर्घ उत्तरी/निबंधात्मक प्रश्न होंगे। विद्यार्थियों को अधिकतम 350 शब्दों में सटीक उत्तर लिखना होगा।
5. प्रश्नपत्र का प्रारूप एवं अंक विभाजन निम्नानुसार होगा :

प्रश्न का प्रकार	पूर्णांक 33 (अंक x प्रश्नों की संख्या)	पूर्णांक 34 (अंक x प्रश्नों की संख्या)	पूर्णांक 50 (अंक x प्रश्नों की संख्या)	पूर्णांक 75 (अंक x प्रश्नों की संख्या)
अतिलघूत्तरी प्रश्न	8x1 = 08	1x9 = 09	1x10 = 10	1x10 = 10
लघूत्तरी प्रश्न	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
दीर्घ उत्तरी प्रश्न	3x5= 15	3x5= 15	5x5 = 25	8x5= 40

6. अर्द्धवार्षिक आंतरिक मूल्यांकन परीक्षा आयोजित होगी। इस परीक्षा में प्रत्येक प्रश्नपत्र के प्राप्तांक का 10% वार्षिक परीक्षा के प्रत्येक प्रश्नपत्र में प्राप्त अंको के 90% के साथ जोड़ा जाएगा।

V.C. Nominee	**Departmental Members**
Subject Expert 26/07/2022	**1. H.O.D Dr. Jagjeet Kaur Saluja**.....
Subject Expert.....	**2. Dr.R.S. Singh**.....
Alumni (member).....	**3. Dr. Anita Shukla**.....
Prof. from other Dept. Of Sc. Faculty	**4. Mrs. Siteshwari Chandrakar**..... 22/07/22
Specialist from Industry.....	**5. Dr. Abhishek Kumar Misra**.....
	6. Dr Kusumanjali Deshmukh.....

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SYLLABUS FOR: (2022–2023)
B.Sc. III PHYSICS
Paper-II
SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS

Course Outcomes:

BPH06: Solid State Physics, Solid State Devices and Electronics

After completion of the course, Students will be able to:

- CO1 Characterize and classify Seven Systems, apply Laue's equation/ Bragg's Law of X-ray diffraction to identify crystal planes, Associate bonding in solids with specific heat of solids laws related to it.
- CO2 Derive expression for density of states for solids, discuss kronig – penny model and distinguish Metal, Insulator and semiconductors. Classify Dia, Para and ferromagnetism. Investigate Langevin's theory of dia and para-magnetism and description of Curieweiss's law, B-H.curve and Hysteresis loss.
- CO3 Describe and classify Semiconductors, explain working of n-type and p-types, diodes and transistor junction potentials. Apply its knowledge to solve given problems based on its working.
- CO4 Apply knowledge of V-I characteristics of PN junction diode, Zener Diode, Capacitor and Inductor to understand working of half wave and Full wave rectifiers and regulation of voltage. Calculate voltage and current gain for transistor configurations.
- CO5 Construct a number system and formulate conversion mechanism mathematical operations for it. Explore Logical operations by basic gates and express combination of gates using Boolean Algebra. Appreciate Digital Circuits and its use in ICs

UNIT-1

Amorphous and crystalline solids, Elements of symmetry, Seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Brage's Law, Bonding in solids, classification. Cohesive energy of solid, Madelung constant, evaluation of Parameters, Specific heat of solids, classical theory (Dulong-Petit's law), Einstein and Debye theories, Vibrational modes of one dimensional monoatomic lattice, Dispersion relation, Brillouin Zone.

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UNIT-2

Free electron model of a metal, Solution of one dimensional Schrodinger equation in a constant potential, Density of states, Fermi Energy, Energy bands in a solid (Kronig-Penny model without mathematical details), Difference 'between Metals, Insulator and Semiconductors, Hall effect, Dia, Para and Ferromagnetism, Langevin's theory of dia and para-magnetism, Curie- Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss.

UNIT-3

Intrinsic and_ extrinsic semiconductors, Concept of Fermi level, Generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, p-n junction diode, depletion width and potential barrier, junction capacitance, I-V characteristics, 'Tunnel diode, Zener diode, Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET and MOSFET Characteristics.

UNIT-4

Half and fall wave rectifier, rectifier efficiency ripple Factor, Bridge rectifier, Filters, Inductor filter, L and 1 section filters, Zener diode, regulated power supply using zener diode, Applications of transistors, Bipolar Transistor as amplifier, h-parameter, h-parameter equivalent circuit, Transistor as power amplifier, Transistor as oscillator, principle of an oscillator and Bark Hausen's condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator

UNIT-5

Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter.

TEXT AND REFERENCE BOOK:

1. Introduction to solid state physics, C. Kittel.
2. Solid State Physics: A.J. Dekkar.
3. Electronic Circuits: Mottershead.
4. Electronic Circuits: Millman and Halkias.
5. Semiconductor Devices: SM. Sze.
6. Electronic devices: T.L. Floyd
7. Device and Circuits: J. Millman and C. Halkias.

8. Electronic Fundamental and Applications: D. Chatopadhyay and P.C. Rakshit,
9. Electricity and Magnetism: K.K. Tiwari.

('In case, any change or modification is prescribed by Central Board of studies or Higher Education Deptt., Govt. of Chhattisgarh with respect to content or distribution of marks for Undergraduate syllabi, it will be implemented accordingly.')

V.C. Nominee	**Departmental Members**
Subject Expert 20/07/2022	**1. H.O.D Dr. Jagjeet Kaur Saluja**.....
Subject Expert.....	**2. Dr.R.S. Singh**..... 26/7
Alumni (member).....	**3. Dr. Anita Shukla**.....
Prof. from other Dept. Of Sc. Faculty 26/7/22	**4. Mrs. Siteshwari Chandrakar**..... 26/7/22
Specialist from Industry.....	**5. Dr. Abhishek Kumar Misra**.....
	6. Dr Kusumanjali Deshmukh..... 26/7

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SYLLABUS FOR: (2022-23)
Class: B.Sc. III
PHYSICS

BPHL03: Lab Course

After the completion of the course, Students are expected to understand working mechanism and factors governing Electronic circuits and its application. In connection of the same students are expected to

CO1 Design and resolve circuits for electronic applications.

CO2 Record data as required by the experimental objectives.

CO3 Analyse recorded data and formulate it to get desired results.

CO4 Interpret results and check for attainment of proposed objective.

LIST OF EXPERIMENTS

MINIMUM 16 (Sixteen) out of following or similar experiment of equal standard:

1. Determination of Planck's constant.
2. Determination of e/m by using Thomson's tube.
3. Determination of e by Millikan's methods.
4. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses of electron proton)
5. Absorption spectrum of iodine vapour.
6. Study of alkali or alkali or earth spectra using a concave gra's.
7. Study of Zeeman effect for determination of Lande g-factor.
8. Analysis of given band spectrum.
9. Study of Raman spectrum using laser as an excitation source.
10. Study of absorption of alpha and beta rays.
11. Study of statistics in radioactive measurement
12. Coniometric study of crystal faces.
13. Determination of dielectric constant.
14. Hysteresis curve of transformer core.
15. Hall-probe method for measurement of magnetic field.
16. Specific resistance and energy gap of a semiconductor.
17. Characteristics of transistor.
18. Characteristics of tunnel diode.

19. Study of voltage regulation system.
20. Study of a regulated power supply.
21. Study of lissajous figures using CRO.
22. Study of VTVM.
23. Study of RC and TC coupled amplifiers.
24. Study of AF and RF oscillators.
25. Find roots of F (X)=0 by using Network-Raphson method.
26. Find roots of F (X)=0 by using secant method.
27. Integration by Simpson rule.
28. Towers of Hanoi (Nonrecursive).
29. Finding first four perfect numbers.
30. Quaddratic interpolation using Network's forward-difference formula of degree two.

C. Programming

31. To write a program for simple interest.
32. To write a program to print two numbers.
33. To write a program to print numbers in ascending order.
34. To write a program to print numbers in Descending order.
35. To write a program to insert three numbers and find out the largest one.
36. To write a program to insert an integer numbers and find out even or odd numbers.
37. To write a program for finding simple interest for three set of Capital rate, rate of percentage and years.

TEXT AND REFFERANCE BOOKS:

1. B.G.Strecj,am: "solid state electronic devices" II Edition (Prentice-Hall of India, New Delhi,1986)
2. W.D. Stanley; "Electronic devices, circuits and applications" (Prentice Hall, New jersey, USA 1988)
3. S.Lipschutsz A Poe; Schum's Outline of theory and problems of programming with Fortran" (McGraw-hall Book Co.Singapore 1986)
4. C.Dixon; "Numerical Analysis.

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Course Outcomes:

Students are familiarized with practicals based on electronics and and computer programming and they can handle the instruments which are useful in our daily life .

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Question Paper Format and Distribution of Marks for Under Graduate Examination

1. The question paper for UG Classes is to be divided into three Sections - A, B & C.
2. Section A shall contain very short answer type questions (answer in one or two sentences) or objective type questions. (No Multiple choice questions. No 'fill in the blank' type Questions)
3. Section B shall contain short answer type questions with the limit of 150 words.
4. Section C shall contain long answer/descriptive type questions. The students are required to answer precisely and the answer should not exceed the limit of 350 words.
5. The scheme of marks should be as follows :

Question Type	MM 33 (Marks x No. of Questions)	MM 34 (Marks x No. of Questions)	MM 50 (Marks x No. of Questions)	MM 75 (Marks x No. of Questions)
A (Very short Answer)	8x1 = 08	1x9 = 09	1x10 = 10	1x10 = 10
B (Short Answer)	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
C (Long Answer)	3x5= 15	3x5= 15	5x5 = 25	8x5= 40

6. The half yearly internal examinations will be held. 10% out of marks obtained by the students in each paper in internal examinations will be added to 90% of marks obtained in each paper of annual examination.

स्नातक कक्षाओं के लिए प्रश्न पत्र का प्रारूप तथा अंक विभाजन

1. स्नातक कक्षाओं के लिए प्रत्येक प्रश्न पत्र तीन खण्डों अ, ब, स में विभाजित होगा।
2. खण्ड अ में अतिलघूत्तरी प्रश्न (एक या दो वाक्यों में उत्तर) या वस्तुनिष्ठ प्रश्न होंगे। (बहुविकल्पीय प्रश्न नहीं होंगे। 'रिक्त स्थानों की पूर्ति करों ' जैसे प्रश्न भी नहीं होंगे।)
3. खण्ड ब में लघूत्तरी प्रश्न होंगे जिनका उत्तर 150 शब्दों में देना होगा।
4. खण्ड स में दीर्घ उत्तरी/निबंधात्मक प्रश्न होंगे। विद्यार्थियों को अधिकतम 350 शब्दों में सटीक उत्तर लिखना होगा।
5. प्रश्नपत्र का प्रारूप एवं अंक विभाजन निम्नानुसार होगा :

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प्रश्न का प्रकार	पूर्णांक 33 (अंक x प्रश्नों की संख्या)	पूर्णांक 34 (अंक x प्रश्नों की संख्या)	पूर्णांक 50 (अंक x प्रश्नों की संख्या)	पूर्णांक 75 (अंक x प्रश्नों की संख्या)
अतिलघूत्तरी प्रश्न	8x1 = 08	1x9 = 09	1x10 = 10	1x10 = 10
लघूत्तरी प्रश्न	2x5 = 10	2x5 = 10	3x5 = 15	5x5 = 25
दीर्घ उत्तरी प्रश्न	3x5= 15	3x5= 15	5x5 = 25	8x5= 40

6. अर्द्धवार्षिक आंतरिक मूल्यांकन परीक्षा आयोजित होगी। इस परीक्षा में प्रत्येक प्रश्नपत्र के प्राप्तांक का 10% वार्षिक परीक्षा के प्रत्येक प्रश्नपत्र में प्राप्त अंको के 90% के साथ जोड़ा जाएगा।

V.C. Nominee	**Departmental Members**
Subject Expert 26/07/2022	**1. H.O.D Dr. Jagjeet Kaur Saluja**..... 26/7/22
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