FACULTY OF SCIENCES

SYLLABUS

FOR

B.Sc. (Hons.) Physics

(Semester I-VI)

Session: 2018-19

KHALSA COLLEGE AMRITSAR

(An Autonomous College)

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1. **Subject to change in the syllabi at any time. Please visit the College website time to time.**

SYLLABUS FOR B.Sc. (HONS.) PHYSICS (2018-19)

Semester I

Course No.	Course Title	Assessment	Max. Marks	Total Marks
BHP-101	MECHANICS-I	19	56	75
BHP -102	ELECTRICITY AND MAGNETISM-I	19	56	75
BHP -103	MATHEMATICS –I	13	37	50
BHP -104	ORGANIC CHEMISTRY-I	13	37	50
BHP -105	COMMUNICATIVE ENGLISH	13	37	50
BHP -106	ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ) –I	13	37	50
BHP -107	ਮੁੱਢਲੀ ਪੰਜਾਬੀ–I (In Lieu of Compulsory Punjabi)	13	37	50
BHP -108	PHYSICS LAB-I	13	37	50
BHP -109	ORGANIC CHEMISTRY PRACTICAL	13	37	50

Semester II

Course No.	Course Title	Assessment	Max. Marks	Total Marks
BHP-151	ELECTRICITY & MAGNETISM-II	19	56	75
BHP -152	WAVES & OSCILLATIONS	19	56	75
BHP -153	MATHEMATICS –II	13	37	50
BHP -154	ORGANIC CHEMISTRY-II	13	37	50
BHP -155	COMMUNICATIVE ENGLISH	13	37	50
BHP -156	ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ) –II	13	37	50
BHP -157	ਮੁੱਢਲੀ ਪੰਜਾਬੀ–II (In Lieu of Compulsory Punjabi)	13	37	50
BHP -158	PHYSICS LAB-II	13	37	50
BHP -159	INORGANIC CHEMISTRY PRACTICAL	13	37	50

Semester III

Course No.	Course Title	Assessment	Max. Marks	Total Marks
BHP-201	MECHANICS-II	15	60	75
BHP -202	STATISTICAL AND THERMAL PHYSICS	15	60	75
BHP -203	MATHEMATICS-III	10	40	50

BHP -204	CHEMISTRY-III	10	40	50
BHP -205	ENVIRONMENTAL STUDIES-I	10	40	50
BHP -206	INTERDISCIPLINARY COURSE ID-I	10	40	50
BHP -207	PHYSICS LAB-III	10	40	50
BHP -208	CHEMISTRY LAB-III	10	40	50
Semester IV				
BHP-251	OPTICS	15	60	75
BHP -252	ATOMIC SPECTROSCOPY	15	60	75
BHP -253	MATHEMATICS-IV	10	40	50
BHP -254	CHEMISTRY-IV	10	40	50
BHP -255	ENVIRONMENTAL STUDIES-II	10	40	50
BHP -256	INTERDISCIPLINARY COURSE ID-II	10	40	50
BHP -257	PHYSICS LAB-IV	10	40	50
BHP -258	CHEMISTRY LAB-IV	10	40	50
Semester V				
BHP-301	CONDENSED MATTER PHYSICS – I	15	60	75
BHP -302	NUCLEAR PHYSICS	15	60	75
BHP -2303	MODERN PHYSICS	15	60	75
BHP -304	MOLECULAR SPECTROSCOPY AND LASER	15	60	75
BHP -305	PHYSICS LAB-V	10	40	50
BHP -306	SEMINAR AND ASSIGNMENT	10	40	50
Semester VI				
BHP-351	PARTICLE PHYSICS	15	60	75
BHP -352	CONDENSED MATTER PHYSICS – II	15	60	75
BHP -353	ELECTRONICS	15	60	75
BHP -354	QUANTUM MECHANICS	15	60	75
BHP -355	PHYSICS LAB-VI	10	40	50
BHP -356	PHYSICS LAB-VII	10	40	50

BHP 101 MECHANICS-I

Time: 3 Hours **Total Marks:75**

(Max. Marks: 56+Internal Assessment: 19)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 11 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Co-ordinate system and Motion of a Particle: Cartesian and Spherical polar co-ordinatesystems; area, volume, displacement, velocity and acceleration in these systems. Solid angle, Symmetry principles and Laws of Conservation.

UNIT-II

Conservation of Momentum and Collisions: Internal forces and momentum conservation.Centre of mass. Elastic collisions in laboratory and center of mass systems; velocities, angles, energies in these systems and their relationships. Conservation of angular momentum and examples-shape of the galaxy, angular momentum of solar system. Torques due to internal forces, angular momentum about center of mass. Cross-section elastic scattering and impact parameter, Rutherford scattering.

UNIT-III

Inverse-Square-Law Force: Forces in nature (qualitative). Central forces, Potential energy and force between a point mass and spherical shell, a point mass and solid sphere, gravitational and electrostatic self energy. Two body problem and concept of reduced mass. Motion of a body under central force, equation of orbit in inverse-square force field. Kepler's laws and their derivation

UNIT-IV

Dynamics of Rigid Bodies: Equation of motion of a rigid body, rotational motion of a rigidbody in general and that of plane lamina. Rotation of angular momentum vector about a fixed axis. Angular momentum and kinetic energy of a rigid body about principal axis, Euler's equations. Precession and elementary gyroscope, Spinning top.

TUTORIAL : Relevant problem on the topics covered in the course.

Reference Books:

1. Mechanics-Berkeley Physics Course, Vol-I (second edition):C. Kittel, W. D. Knight, M. A. Ruderman, C. A.Helmholtz and R. J. Moyer-Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
2. Fundamentals of Physics: D. Halliday, R. Resnick and J. Walker (sixth edition)-Wiley India Pvt. Ltd.

BHP 102 ELECTRICITY AND MAGNETISM-I

Time: 3 Hours **Total Marks:75**

(Max. Marks: 56+Internal Assessment: 19)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 11 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Calculus of Vectors : Basic Ideas of Vector Calculus**,** Introduction to gradient, divergence & curl; their physical significance. Rules for vector derivatives, useful relations involving gradient, divergence & curl. Solenoidal and irrotational fields, Fundamental theorem for gradients, Gauss's and Stoke's theorems, Helmholz and Greens theorem.

UNIT-II

Electrostatics: Electric charge and its properties, Coulombs law, Principal of Superposition The electric field due to a point charge and continuous charge distributions, Electric field due to finite and infinite lines of charges. Field due to electric dipole, field lines, flux, Gauss's law and its applications, Curl of electric field. Relation between potential and electric field. Poisson's and Laplace's equations. Electric potential due to different charge distribution Wire, Ring, Disc, Spherical Sheet, Sphere, dipole etc. The energy for a point and continuous charge distribution.

UNIT-III

Electric Currents and Fields of Moving Charges Conductors in the electrostatic field,Capacitors, Current and current density, drift velocity, expression for current density vector, Equation of continuity, electrical conductivity, limitations of Ohm's conductivity**,** Multipoles and multipole moments. Equipotential surface method of electrical images. Electric field in different frames of references, Transformation of Electric Field from one inertial Frame to another, Relation between electric force in two inertial frames, Interaction between moving charges, Electric field due to moving charges.

UNIT-IV

Electric Fields in Matter : Dielectrics, Non Polar and Polar Molecules, Polarisation ofDielectric, Polarization Vector, Atomic polarizability, Dielectric Constant, Capacity of a Capacitor, Electric Susceptibility, Free and Bound Charges, Gauss Law in Dielectric, and Displacement Vector, Energy stored in Capacitor having Dielectric Medium, Energy Density of a Dielectric Medium.

TUTORIAL : Relevant problem on the topics covered in the course.

Reference Books:

1. Introduction to Electrodynamics -D.J. Griffiths, Pearson Prentice Hall, New Delhi.

2. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publications.

3. Berkeley Physics Course Vol. II (Electricity & Magnetism)- E.M.Purcell, Mc Graw hill, New York.

4. Fundamental of Physics -D. Halliday, R. Resnick and J. Walker (6th edition)-John Wiley, India Pvt. Ltd.

5. Electricity and Magnetism – A. K. Sikri, Pradeep Publications

BHP 103-MATHEMATICS –I

Time: 3 Hours **Total Marks:50**

(Max. Marks: 37+Internal Assessment: 13)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1.The question paper will consisit of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit) Section-B from Unit-I and Section-C from Unit-II.

2. The Section-A will consist of seven compulsory questions, each of one mark.

3. The Section-B & Section-C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from Section-B & Section-C. Each question carries six marks.

4. Teaching time for this paper would be six periods per week.

Unit- I

The algebra of derivatives: Continuity , differentiability for one variable, standard theorems on differentiability, Chain rule, Proof of Rolle's theorem, Langrange's mean value theorem, Cauchy's theorem and Taylor's theorem, Applications of mean value theorem, L'Hospital rule, Leibnitz theorem on higher order derivative of product of two smooth functions.

Several Variable Calculus: Function of two and three variables, Rigorous treatment of limit, continuity, and differentialbility of functions of two variables, Directional derivative, Partial derivatives, chain rule, statements of the inverse function theorem and implicit function theorem and their applications and Euler's theorem for homogenous functions.

Unit-II

Integral Calculus: Anti-derivatives, Standard techniques and formulae for antiderivatives of elementary functions. Reduction formulae, Rule of "smaller inder +1" , Partitions, Upper and Lower integrals, Riemann integrability, Conditions of existence of Riemann integrability of continuous functions and of monotone function, Beta and Gamma functions.

Text and Reference Books:

1. Eark Coddington, Theory of ordinary differential equations, 1984.
2. Tom M.Apostol, Calculus I & II, John-Willey, 1967.
3. Shanti Narayan, Differential Calculus, New Delhi, Shyam Lal,1983.
4. Shanti Narayan, Integral Calculus, Delhi, S.Chand,1968.
5. Rajinder Pal Kaur, Calculus , Ludhiana, First World Publication

BHP 104- Organic Chemistry-I

45 Hrs. **Time: 3 Hrs/week.**
Max. Marks: 37+13 (Internal Assessment)

Instructions for paper setters and students:

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section I carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section I.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 7 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT-I 10 Hrs

Stereochemistry: Molecular chirality, enantiomers/symmetry in achiaral structures, chiral centres in chiral molecules, properties of chiral molecules-optical activity, absolute and relative configuration, the Cahn-Ingold Perlog R-S notional system physical properties of enantiomers. Stereochemistry of chemical reactions that produce chiral centres, chemical reactions that produce stereoisomers, Resolution of enantiomers, chiral centres other than carbon.

UNIT-II 12 Hrs

Chemistry alkanes and alkenes: Conformations of alkanes and cycloalkanes: conformational analysis of ethane, butane, cyclohexane, monosubstituted and disubstituted cyclohexane, conformation of small, medium and large ring cycloalkanes and of polycyclic ring systems.Stereochemistry of alkenes, naming stereo isometric alkenes by the E-Z system, mechanism of hydrogenation of alkenes, stereochemistry of hydrogenation of cycloalkenes, Dehydration of alcohols and regioselectivity of these reactions. Acid catalysed dehydration of alcohols with complete mechanistic discussion, Mechanism of dehydrohalogenation of alkylhalides (E mechanism), stereoselective and antielimination in E reactions, the E Mechanism, electrophilic addition of hydrogen halides to alkenes its regioselectivity explained on the basis of mechanism, free radical addition of hydrogen bromide to alkenes, acid catalysed hydration of alkene with mechanism stereochemistry of halogen addition to alkenes and its mechanistic explanation. Hypohalous acid addition to alkenes, epoxidation of alkenes.

Alkynes: Acidity of acetylene and terminal alkenes, metal ammonia reduction of alkyne, addition of hydrogen halides and water to alkynes, with detailed discussion of mechanism of these reactions, the diels Alder reaction, orbital symmetry and the diels Adler reaction.

UNIT-III **12 Hrs**

Nucleophilic substitution and addition reaction:

(a) Functional group transformation by nucleophilic substituion, the biomolecular(SN), mechanism of nucleophilic substitution, stereochemistry of SN reactions, how SN reactions occur, steric effect in SN reactions, nucleophiles and nucleophilicity, the unimolecular (SN) mechanism of nucleophilic substitution, carbocation stability and the rate of substitution, by the SN mechanism stereochemistry of SN reactions, carbocation real arrangements in SN reactions, solvent effects, substitution and elimination as competing reactions. The SN -SN.

(b) Principles of nucleophillic addition to carbonyl groups : Hydration acetal formation, cyanohydrin formation ; reactions with primary and secondary amines, Whittig reaction, steroselective addition to carbonyl groups mechanism of halogenation, acid and base catalysed cholization, haloform reaction, aldol condensation, conjugate nucleophillic addition to unsaturated carbonyl compounds

UNIT-IV **11 Hrs**

Spectroscopy: Principles of molecular spectroscopy, electromagnetic radiation, quantized energy states, NMR(H) Spectroscopy, nuclear shielding and Chemical shift measurements chemical shift and molecular structure, interpreting proton NMR spectra, spin- spin splitting in NMR spectroscopy, patterns of spin-spin splitting, proton NMR spectra of alcohols, NMR and conformations carbons- 13 nuclear magnetic resonance, the sensitivity problem, interpretation of spectra. Infrared spectroscopy, ultraviolet–visible (UV-VIS) spectroscopy and mass spectrometry.

Text and Reference Books:

1. R.T. Morison and R.N. Boyd, Organic Chemistry.
2. I.L. Finar, Organic Chemistry, Vol. I IV ed.
3. Advanced Organic Chemistry, Reactions Mechanisms and Structure by J. March.
4. Schaum's Outlines Series Theory and Problems of Organic Chemistry by Herbert Meislick and Jacob Sharefkin
5. Problems and their solution in Organic chemistry by I.L. Finar, Modern Organic Chemistry by J.D. Robbert and M.C. Caserio.
6. Organic Chemistry by D.J. Cram and G.S. Hammond.
7. J.E. Banks, Naming Organic Compounds – Programmed Introduction to Organic Chemistry.
8. E.L. Eliel, Stereochemistry of carbon compounds.
9. W. Camp, Organic Spectroscopy.
10. F.A. Carey, Organic Chemistry.

BHP 105-COMMUNICATIVE ENGLISH
B.Sc. (Hons.) Physics and Chemistry

TIME: 3 Hrs **Max. Marks: 50**

Theory: 37

Internal Assessment: 13

Course Contents:

T.. **Reading and Comprehension Skills:**

Students will be required to read and comprehend the essays in Unit 1 and 2 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition. They will be required to answer the questions given after each essay.

T.. **Developing Vocabulary and using it in the Right Context:**

The students will be required to master "Word List" from the Chapter "Vocabulary" in the book *The Written Word.* The question will be set from the following words :

Acute, Arrogant, Apathy, Bliss, Brevity, Cease, Chronic, Dearth, Discontent, Effigy, Fastidious, Giddy, Hamper, Guile, Inauspicious, Juxtapose, Kinetic, Laudable, Meticulous, Mundane, Naive, Opaque, Peevish, Proficient, Prolific, Remedial, Strife, Verbose, Woe, Zenith.

T.. **Writing Skills**

Students will be required to write Paragraph Writing and Letter Writing as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

Suggested paper pattern:-

1. Practical Question on Paragraph Writing with internal choice as prescribed in *The Written Word* **(8 marks)**
2. Short answer type questions from Unit 1 and 2 of *Making Connections : A Strategic Approach To Academic Reading* **(12 marks)**
3. Essay type question with internal choice from Unit 1 and 2 of *Making Connections: A strategic Approach to Academic Reading* **(8 marks)**
4. Practical question on Letter Writing from *The Written Word* **(5 marks)**
5. The question will carry 08 words out of 30 prescribed words from the "Word List" in *The Written Word.* The student will attempt any four (4) out of the eight (08). **(4x1= 4 marks)**

BHP 106 ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ) **–I**

B.Sc. (Hons. – Botany, Chemistry, Mathematics, Physics, Zoology), B.Sc. Agri./Bio Tech./IT/FD/ Food Sc./BCA, BJMC B. Com. Ac. & Finance, B. Internet & Mob. Tech., B. Multimedia

ਸਮਾਂ : 3 ਘੰਟੇ ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁਲ ਅੰਕ: 50

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. **ਸਾਹਿਤ ਦੇ ਰੰਗ** (ਸੰਪਾ. ਡਾ. ਮਹਿਲ ਸਿੰਘ), ਭਾਗ ਪਹਿਲਾ (ਕਵਿਤਾ ਅਤੇ ਕਹਾਣੀ), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
2. **ਪੈਰ੍ਹਾ ਰਚਨਾ**
3. **ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ**।
4. (ੳ) **ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ :** ਉਚਾਰਨ ਅੰਗ, ਉਚਾਰਨ ਸਥਾਨ ਤੇ ਵਿਧੀਆਂ, ਸਵਰ, ਵਅੰਜਨ, ਸੁਰ।
   (ਅ) **ਭਾਸ਼ਾ ਵੰਨਗੀਆਂ** : ਭਾਸ਼ਾ ਦਾ ਟਕਸਾਲੀ ਰੂਪ, ਭਾਸ਼ਾ ਅਤੇ ਉਪ-ਭਾਸ਼ਾ ਦਾ ਅੰਤਰ, ਪੰਜਾਬੀ
   ਉਪਭਾਸ਼ਾਵਾਂ ਦੇ ਪਛਾਣ-ਚਿੰਨ੍ਹ।
5. **ਮਾਤ ਭਾਸ਼ਾ ਦਾ ਅਧਿਆਪਨ**
   (ੳ) ਪਹਿਲੀ ਭਾਸ਼ਾ ਦੇ ਤੌਰ ਉੱਤੇ
   (ਅ) ਦੂਜੀ ਭਾਸ਼ਾ ਦੇ ਤੌਰ ਉੱਤੇ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਕਿਸੇ ਕਵਿਤਾ ਦਾ ਸਾਰ ਜਾਂ ਉਸਦਾ ਵਿਸ਼ਾ ਵਸਤੂ (ਦੋ ਵਿਚੋਂ ਇੱਕ) **7 ਅੰਕ**
2. ਕਿਸੇ ਕਹਾਣੀ ਦਾ ਸਾਰ, ਉਸਦਾ ਵਿਸ਼ਾ ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ ਜਾਂ ਪਾਤਰ ਉਸਾਰੀ (ਦੋ ਵਿਚੋਂ ਇੱਕ) **7 ਅੰਕ**
3. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਤਿੰਨ ਵਿਸ਼ਿਆਂ ਵਿਚੋਂ ਕਿਸੇ ਇੱਕ ਉੱਤੇ ਪੈਰ੍ਹਾ ਲਿਖਣ ਲਈ ਕਿਹਾ ਜਾਵੇ। **4 ਅੰਕ**
4. ਪੈਰ੍ਹਾ ਦੇ ਕੇ ਉਸ ਬਾਰੇ ਚਾਰ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ **4 ਅੰਕ**
5. ਨੰਬਰ 5 ਉੱਤੇ ਦਿਤੀ ਵਿਆਕਰਣ ਦੇ ਆਧਾਰ 'ਤੇ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ **7 ਅੰਕ**
6. ਨੰਬਰ 6 ਵਿਚ ਮਾਤ ਭਾਸ਼ਾ ਦੇ ਪਹਿਲੀ ਭਾਸ਼ਾ ਅਤੇ ਦੂਜੀ ਭਾਸ਼ਾ ਵਜੋਂ ਅਧਿਆਪਨ, ਮਹੱਤਵ ਅਤੇ ਸਮੱਸਿਆਵਾਂ ਬਾਰੇ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋ ਵਿਦਿਆਰਥੀ ਨੇ ਦੋ ਦਾ ਉੱਤਰ ਦੇਣਾ ਹੋਵੇਗਾ **(4x2)=8 ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 37+13 = 50 ਹਨ।

BHP 107 ਮੁੱਢਲੀ ਪੰਜਾਬੀ–**I**
(**In Lieu of Compulsory Punjabi**)

B. A., B.A. (SS), B. A. (Hons. – English), B. Com. (Hons., R, Ac. & Finance), B. Sc. Agri./Bio-Tech./Comp. Sc./Eco./FD/Food Sc./IT/Med./NMed./ B.Sc. (Hons. – Botany, Chemistry, Mathematics, Physics, Zoology)/ B. of Mult., B. in Int. & Mob. Tech./BBA/BCA/BJMC

ਸਮਾਂ : 3 ਘੰਟੇ ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁਲ ਅੰਕ: 50

1. **ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੇ ਗੁਰਮੁਖੀ ਲਿਪੀ**
   ੳ) ਨਾਮਕਰਣ ਤੇ ਸੰਖੇਪ ਜਾਣ ਪਛਾਣ : ਗੁਰਮੁਖੀ ਵਰਣਮਾਲਾ, ਅੱਖਰ ਕ੍ਰਮ, ਸਵਰ ਵਾਹਕ (ੳ ਅ ੲ), ਲਗਾਂ ਮਾਤਰਾਂ, ਪੈਰ ਵਿਚ ਬਿੰਦੀ ਵਾਲੇ ਵਰਣ, ਪੈਰ ਵਿਚ ਪੈਣ ਵਾਲੇ ਵਰਣ, ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ।
   ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ **12 ਅੰਕ**

2. **ਗੁਰਮੁਖੀ, ਆਰਥੋਗ੍ਰਾਫੀ ਅਤੇ ਉਚਾਰਨ** : ਸਵਰ, ਵਿਅੰਜਨ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ ਅਤੇ ਉਚਾਰਣ, ਮੁਹਾਰਨੀ, ਲਗਾਂ ਮਾਤਰਾਂ ਦੀ ਪਛਾਣ । **10 ਅੰਕ**

3. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਜੋੜ** : ਮੁਕਤਾ (ਦੋ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਤਿੰਨ ਅੱਖਰਾਂ ਵਾਲੇ ਸ਼ਬਦ), ਸਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਬਿਹਾਰੀ ਵਾਲੇ ਸ਼ਬਦ, ਔਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲੈਂਕੜ ਵਾਲੇ ਸ਼ਬਦ, ਲਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਦੁਲਾਵਾਂ ਵਾਲੇ ਸ਼ਬਦ, ਹੋੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਕਨੌੜੇ ਵਾਲੇ ਸ਼ਬਦ, ਲਗਾਂਖਰ (ਟਿੱਪੀ, ਬਿੰਦੀ, ਅੱਧਕ) ਵਾਲੇ ਸ਼ਬਦ, ਸ਼ੁੱਧ-ਅਸ਼ੁੱਧ। **15 ਅੰਕ**

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪਹਿਲੇ ਭਾਗ ਵਿਚੋਂ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹੈ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਚਾਰ-ਚਾਰ ਅੰਕ ਹਨ। **(4+4+4) 12 ਅੰਕ**
2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਨੰਬਰ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ। **10 ਅੰਕ**
3. ਭਾਗ ਤੀਸਰਾ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਜਿਨ੍ਹਾਂ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। **15 ਅੰਕ**

BHP 108 PHYSICSLAB-I

Time: 3 Hours **Total Marks:50**

(Max. Marks: 37+ Internal Assessments:13)

Pass Marks: 35%

Periods 8 Periods/week

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment **15 Marks**

ii) Brief Theory **5 Marks**

iii) Viva–Voce **10 Marks**

iv) Record (Practical file) **7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. To measure the time periods of oscillation for the objects of various geometrical shapes but of same mass.
2. To study rotational motion using a flywheel and hence show that toque is proportional to angular acceleration.
3. To find the moment of inertia of an irregular body about an axis through its centre of gravity with a torsion pendulum.
4. To determine the moment of inertia of a flywheel.
5. To determine the Young's modulus by bending.
6. Determination of Poisson's ratio for rubber.
7. To verify laws of conservation of (a) linear momentum, (b) kinetic energy in elastic collisions using one dimensional collisions of hanging spheres. (c) Also determine energy transfer and coefficient of restitution.
8. To determine modulus of rigidity of copper wire by Maxwell needle experiment.
9. To determine low resistance with Carey-Foster's Bridge.
10. To determine the resistance and specific resistance of a copper wire with the help of Kelvins double bridge.
11. To find the unknown capacitance of a capacitor by flashing and quenching of a neon lamp.
12. Measurement of capacitance, determination of permittivity of a medium air and relative permittivity by de-Sauty's bridge.
13. To study the flow of water through a capillary tube as a function of pressure head using two tubes of same length but different radii.
14. To study the flow of water through a capillary tube as a function of pressure head using two tubes of different length but of same radii.
15. To study the variation in resistance of filament of a bulb with temperature.

Reference Books:

1. Practical Physics Vol. I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications.
2. Practical Physics, C.L. Arora, S. Chand & Co.

BHP 109
Organic Chemistry Practical

Max. Marks: 37+13(Internal Assessment) **Labs Hrs.: 60**

The preliminary examination of physical and chemical characteristics (physical state, colour, odor and ignition tests), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions, classification tests involving functional reactivity other than acid-base test, preparation of derivatives for given pure organic compounds.

The following categories of compounds should be analyzed.

-phenols, carboxylic acids

-carbonyl compounds - ketones, aldehydes

-carbohydrates

-aromatic amines

-aromatic hydrocarbons

Suggested Book:

Practical Organic Chemistry by F.G. Mann and B.C. Saunders

BHP 151 ELECTRICITY & MAGNETISM-II

Time: 3 Hours **Total Marks:75**

(Max. Marks: 56+Internal Assessment: 19)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 11 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

MAGNETIC EFFECTS OF ELECTRIC CURRENTS : Magnetic Effect of Electric Current, Direction of Field Lines due to current Flowing in a straight Conductor , Magnetic Field Density, Magnitude of Magnetic Flux, Magnetic and Lorentz Forces, Biot-Savart's Law, Magnetic Field Due to along Straight Conductor, Magnetic Field Intensity at point on the axis of a current loop. Variation of Field along the axis of the coil, Magnetic Field intensity inside a long Solenoid, Ampere's Circuital Law: Line Integral of Magnetic Field, Applications of Ampere's Circuital Law, Solenoid Nature of Vector Field, Properties of the Magnetic Field, Vector Potential and its expression, Surface Current Density, Changes in Magnetic Field at a current Sheet, Hall Effect, Comparison of Electrostatic Field and Magnetic Field, Transformation Equation For Electric and Magnetic Fields.

UNIT-II

MAGNETIC PROPERTIES OF MATTER : Some Important Terms associated with Magnetic Materials, Torque on current Loop, Magnetic Dipole in a Magnetic Field , Potential Energy of Magnetic Dipole, Force on Magnetic Dipole In Non-Uniform Magnetic Field, Magnetic Dipole Moment of an Atom, Expression of orbital Magnetic dipole moment of Electron, Electron Spin Magnetic Moment , Free and Bound Currents, Uniformly and Non Uniformly Magnetised Matte, Diamagnetism, Langevin's theory of diamagnetic behaviour, Paramagnetism and Langevin's Theory of Paramagnetic Susceptibility, Ferromagnetism, Domain theory of Magnetism, Analysis of magnetisation Curves : Hystersis Curve, Energy Loss Due to Hystersis and its Importance

UNIT-III

ELECTROMAGNETIC INDUCTION : Electromagnetic Induction, Faraday's Induction Experiments, Faraday's Laws of Electromagnetic Induction (Integral And Differential Forms), Lenz's law, Self Induction, Expression for Self Induction: Neumann's Formula, Self Inductance of a Solenoid and a Torodial, Energy Stored in an Inductor, Mutual Induction, Expression for Coefficient of Mutual Induction and Reciprocity theorem, Mutual Inductance of two Solenoids, Inductive Coupling of Electrical Circuits, Modification of Ampere's Law and the Displacement Current, Maxwell's Equation of Electromagnetism, Series and Parallel LCR Circuits, Average Power Associated With LCR Circuit

UNIT-IV

ELECTROMAGNETIC WAVES: Production of em waves, EM wave spectrum, EM wave equation for a medium having finite μ and ε but $\sigma = 0$, Nature of em waves, Wave equation for plane polarized em waves and their solutions, Relation between electric and magnetic field vectors an anem wave, Impedence of a dielectric to em waves, The Poynting vector and flow of energy in an em wave, Equation of continuity, EM waves for a medium having finite values of μ and ε but $\sigma \neq 0$, Solution of wave equation for a conducting medium, Skin depth, EM wave velocity and wave dispersion in a conductor, Behaviour of a medium as a conductor or dielectric, Characteristic impedance of a conducting medium to em waves, magnetic and electric energy densities, Poynting vector and Equation of Continuity for a Conducting medium, Reflection and transmission of em waves at the boundary (Normal and Oblique incidence).

TUTORIAL: Relevant problem on the topics covered in the course.

Text and Reference Books:

1. Electricity & Magnetism-T.S. Bhatia and Gurpreet Singh, Vishal Publishing Co.
2. Waves and Vibrations, T.S. Bhatia, Vishal Publishing Co.
3. Field & wave Electromagnetics by David & Cheng, Addison Wesley Publishing co
4.Electricity & Magnetism- A.K. Sikri, Pradeep Publications

BHP 152 WAVES & OSCILLATIONS

Time: 3 Hours **Total Marks:75**

(Max. Marks: 56+Internal Assessment: 19)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 11 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Simple and Damped Oscillations: Simple Harmonic Motion, energy of SHO, Compound pendulum, Torsional pendulum, Equation of SHM,Superposition of two perpendicular SHM, Lissajous figures–superposition of many SHM's, complex number notation and use of exponential series. Damped motion of mechanical and electrical oscillator, heavy damping, critical damping. Energy dissipation and energy of damped oscillator, amplitude decay, logarithmic decrement, relaxation time, Q value, comparison between Free and Damped oscillations

UNIT-II

Forced Oscillations: Differential equation of forced mechanical oscillator**,** Transient andsteady state behaviour of a forced oscillator, Variation of displacement and velocity with frequency of driving force, frequency dependence of phase angle between force and (a) displacement, (b) velocity, Power supplied to oscillator by driving force and its variation with driving force frequency, Resonance absorption and Q-value as a measure of power absorption bandwidth, Q-value as amplification factor, Forced electrical oscillator, Variation of current with frequency, Variation of power supplied with frequency of applied voltage, Q factor as amplification factor.

UNIT-III

Coupled Oscillations: Stiffness coupled oscillators, In phase and Out phase modes, normalco-ordinates and normal modes of vibration, solutions for differential equations for normal modes and exchange of energy, inductance coupling of electrical oscillators, loose, intermediate and strong coupling, energy exchange between two electrically coupled oscillators.

UNIT-IV

Wave Motion: Types of wave motion**,** The wave equation, transverse waves on a string, the string as a forced oscillator, characteristic impedance of a string, reflection and transmission of transverse waves on a string at a boundary, Energy of a progressive wave, impedance matching, standing waves on a string of fixed length, Energy of a vibrating string, normal modes and eigen frequencies. Energy in a normal mode of oscillation wave groups, group velocity, dispersive and non dispersive media, Longitudnal waves.

TUTORIAL : Relevant problem on the topics covered in the course.

Reference Books:

1. Waves and Vibrations, T.S. Bhatia, Vishal Publishing Co.
2. The Physics of Vibrations and Waves- H.J. Pain, John Wiley, Chichester, 1999
3. Vibrations and Waves in Physics- I.G. Main-Cambridge University, Cambridge, 1993.

BHP-153 MATHEMATICS –II

Time: 3 Hours **Total Marks:50**

(Max. Marks: 37+Internal Assessment: 13)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1.The question paper will consisit of three sections namely Section-A which will be from entire syllabus (equally distributed from each unit) Section-B from Unit-I and Section-C from Unit-II.

2. The Section-A will consist of seven compulsory questions, each of one mark.

3. The Section-B & Section-C will consist of five questions each. Students are to attempt any five questions in total by selecting at least two questions from Section-B & Section-C. Each question carries six marks.

4. Teaching time for this paper would be six periods per week.

Unit-I

Ordinary Differential Equation (ODEs): Definition & formation of linear ODEs, First order Linear, Linear homogenous and non- homogenous ODEs of second order,Complementary function and particular integral, Solutions of Linear differential equations with constant and variable coefficients, Solutjion by variation of parameters method.

Partial Differential Equations (PDEs): First order PDEs: Definition, origins of first order PDEs. Second order PDEs, Definition, origins of second order PDEs, Second order PDEs with application in Physics, Laplace, Wave and diffusion equation in one and two dimensions, Solutions of second order PDEs by separation of variables

Unit-II

Double Integral, Change of order of integration, Area and volume by double integral, Triple integral, change of variables, volume by triple integral, Volume as surface of revoluton, Centre of gravity and moment of intertia by double and triple integral.

Books Recommended:

1. I.N. Sneddon, Elements of Partial Differential Equations, Dover,2006.

2. Applied Mathematics for Engineers and Physicists: Pipes & Harvill, London, McGraw Hill, 1970

3. Mathematics of Physics and Modern Engineering : Sokolnikoff & Recheffer.

4. Mathematical Methods for Physicists: George Arfken, New York, Academic Press,1970.

BHP 154
INORGANIC CHEMITRY –II

45 Hrs. **Time: 3 Hrs/week.**

Max. Marks: 37+13 (Internal Assessment)

Instructions for paper setters and students:

I. Examiner will make five sections of paper namely Section-I, II, III, IV and V
II. Examiner will set total of NINE questions comprising ONE compulsory question of short answer type covering whole syllabi and TWO questions from each unit.
III. Section I carries 9 marks and is compulsory consisting of eight short answer type questions of 1.5 marks each covering the whole syllabus. The candidate will have to attempt six questions in section I.
IV. Section-II, III, IV and V of paper will consist of EIGHT questions in total having TWO questions from each unit of the syllabus and each question carry 7 Marks.
V. The students are required to attempt FIVE questions in all, taking ONE Compulsory question of section-I and one question from each section i.e. II, III, IV and V.

UNIT-I 12Hrs

Co-ordination Chemistry: Introduction, Werner's coordination theory, naming of co-ordinate complexes.Co-ordination numbers 1-12 and their stereo-chemistries.Factors affecting co-ordination numbers and stereo-chemistry

(a) Configurational Isomers

(b) Conformational isomerism, VSPER theory, molecular orbital theory applied to homoneuclear diatomic molecules and heteronuclear Diatomic molecules.

Bonding in metal complexes: Valence bond theory for co-ordinate complexes, inner and outer orbital complexes, Electro-neutrality and back bonding, limitations of V.B. theory.

Stability of coordination compounds: Introduction, Stability constant, stepwise stability constant, overall stability constant. Factors affecting the stability of metal ion complexes with general ligands, HSAB principle.

UNIT-II 12Hrs

Crystal field theory: Splitting of d-orbitals in octahedral, tetrahedral, cubic and square planer fields of ligands. Calculation of C.F.S.E. in high spin and low spin octahedral and High spin tetrahedral complexes, factors affecting the 10 Dq Value. Structural effects of crystal field splitting (Jahn-Teller distortion, variation of Ionic radii with increase in atomic number). Thermodynamics effects of C.F. splitting, variation in lattice energies, Hydration energies, Dissociation energies, Formation constants of hexammines. Site selection in spinels, Paramagnetism, diamagnetism, ferro and anti ferromagnetism. Microstates and spectroscopic terms, a calculation of spectroscopic terms for d^1 electronic configurations, L S coupling, Hund's rule for finding the ground state terms, Electronic spectral properties of Ist transition series, Orgel Diagrams for d^1 - d^{10} systems, for weak field octahedral and tetrahedral complexes, limitations of C.F.T

UNIT-III **11Hrs**

Molecular Orbital Theory: Evidence for covalent character in Bonding, MOEL diagram for octahedral and tetrahedral complexes involving bonding, charge transfer transitions.

πAcid Ligands: Definition Carbon monoxide complexes, bonding in linear MCO groups, polynuclear metal carbonyls, vibrational spectra, Reactions, carbonyl hydrides and halides. Metal-metal bonding metal-metal multiple bonding , isolable analogies, Structure of high nuclearity carbonyl clusters, counting of electrons in carbonyl clusters.

UNIT-IV **10Hrs**

Alkali metal and alkaline earth metal chelators: Macrocyclic ligands, macrocyclic effect, crown ethers and podands, coronands, cryptands, structure of 18 crown-6 complex with KNCS, ion cavity complex, effect of anion and cation type on complex structure, simultaneous complexation of metal ion and water or of two metal ions, sandwich formation, cryptands and their cation complexes, podands with aromatic donors and groups.

Text and Reference Books:

1. J.E. Huheey, Inorganic Chemistry, 3rd Ed.
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry.
3. B.E. Douglas and D.H. McDaniel, Concepts and Models of Inorganic Chemistry.
4. R. Hilgenfeld and W. Saengar, Topics in current chemistry Vol-II.

BHP 155-COMMUNICATIVE ENGLISH
B.Sc. (Hons.) Physics and Chemistry

TIME: 3 Hrs **Max. Marks: 50**
Theory: 37
Internal Assessment: 13

Course Contents:

T.. **Reading and Comprehension Skills:**

Students will be required to read and comprehend the essays in Unit 3 and 4 of the book *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition. They will be required to answer the questions given after each essay.

T.. **Developing Vocabulary and using it in the right context :**

Students will be required to study 'prefix' and 'suffix' from the chapter "vocabulary" in the book *The Written Word.* The question will be set from the following words :
Prefixes :- a-, anti-, auto-, bi-, dia-, di-, dis-, homo-, Hyper-, hypo-, mis-, non-, semi-, un-, pre-

Suffixes :- -able, -al, -cy, -dom, -fy, -hood, -ious, -ist, -ment, -ness, -ship, -some, -y, -logy.

T.. **Writing Skills**

Students will be required to learn Essay writing, Report Writing and Letter Writing as in the book *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.

Suggested paper pattern:-

1. Practical Question on Essay Writing with internal choice as prescribed in *The Written Word.* **(8 marks)**
2. Short answer type questions from Unit 3 and 4 of *Making Connections : A Strategic Approach To Academic Reading* **(12 marks)**
3. Essay type question with internal choice from Unit 3 and 4 of *Making Connections: A strategic Approach to Academic Reading* **(8 marks)**
4. Practical Question on Report Writing from *The Written Word* **(5 marks)**
5. The question will carry 4 Prefixes and 4 Suffixes (from the list given above) from the book *The Written Word.* The students will attempt any four (4) out of eight (8) **(4 marks)**

BHP 156 PUNJABI –II
ਪੰਜਾਬੀ (ਲਾਜ਼ਮੀ)

B.Sc. (Hons. – Botany, Chemistry, Mathematics, Physics, Zoology), B.Sc. Agri./Bio Tech./IT/FD/ Food Sc./BCA, BJMC
B. Com. Ac. & Finance, B. Internet & Mob. Tech., B. Multimedia

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. **ਸਾਹਿਤ ਦੇ ਰੰਗ** (ਸੰਪਾ. ਡਾ. ਮਹਿਲ ਸਿੰਘ), ਭਾਗ ਦੂਜਾ (ਵਾਰਤਕ ਅਤੇ ਰੇਖਾ-ਚਿੱਤਰ), ਰਵੀ ਸਾਹਿਤ ਪ੍ਰਕਾਸ਼ਨ, ਅੰਮ੍ਰਿਤਸਰ।
2. **ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ ਰਚਨਾ** : ਪਰਿਭਾਸ਼ਾ, ਮੁਢਲੇ ਸੰਕਲਪ।
3. **ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ**
4. **ਪੈਰ੍ਹਾ ਰਚਨਾ**
5. **ਪੈਰ੍ਹਾ ਪੜ੍ਹ ਕੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉਤਰ**
6. **ਮੁਹਾਵਰੇ ਅਤੇ ਅਖਾਣ**

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਕਿਸੇ ਲੇਖ/ਨਿਬੰਧ ਦਾ ਸਾਰ ਜਾਂ ਉਸਦਾ ਵਿਸ਼ਾ ਵਸਤੂ (ਦੋ ਵਿਚੋਂ ਇੱਕ) **(7 ਅੰਕ)**
2. ਰੇਖਾ ਚਿਤਰ : ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਸ਼ਖ਼ਸੀਅਤ ਦੇ ਗੁਣ **(7 ਅੰਕ)**
3. ਯੂਨਿਟ 3-4 ਨੰਬਰ ਉੱਤੇ ਦਿੱਤੀ ਵਿਆਕਰਣ ਦੇ ਆਧਾਰ ਤੇ ਵਰਣਨਾਤਮਕ ਪ੍ਰਸ਼ਨ **(7 ਅੰਕ)**
5. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਤਿੰਨ ਵਿਸ਼ਿਆਂ ਵਿਚੋਂ ਕਿਸੇ ਇੱਕ ਉੱਤੇ ਪੈਰ੍ਹਾ ਲਿਖਣ ਲਈ ਕਿਹਾ ਜਾਵੇ । **(4 ਅੰਕ)**
6. ਪੈਰ੍ਹਾ ਦੇ ਕੇ ਉਸ ਬਾਰੇ ਚਾਰ ਪ੍ਰਸ਼ਨਾਂ ਦੇ ਉੱਤਰ **(4 ਅੰਕ)**
7. ਨੰਬਰ 7 ਵਿਚ ਅੱਠ ਅਖਾਣ ਅਤੇ ਅੱਠ ਮੁਹਾਵਰੇ ਪੁੱਛੇ ਜਾਣਗੇ, ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਵਿਦਿਆਰਥੀ ਨੇ ਚਾਰ-ਚਾਰ ਨੂੰ ਵਾਕਾਂ ਵਿਚ ਵਰਤ ਕੇ ਅਰਥ ਸਪੱਸ਼ਟ ਕਰਨੇ ਹੋਣਗੇ। **(4+4 = 8 ਅੰਕ)**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 37+13 = 5੦ ਹਨ।

BHP 157 ਮੁੱਢਲੀ ਪੰਜਾਬੀ –II

(In Lieu of Compulsory Punjab)

B. A., B.A. (SS), B. A. (Hons. – English), B. Com. (Hons., R, Ac. & Finance), B. Sc. Agri./Bio-Tech./Comp. Sc./Eco./FD/Food Sc./IT/Med./NMed./ B.Sc. (Hons. – Botany, Chemistry, Mathematics, Physics, Zoology)/ B. of Mult., B. in Int. & Mob. Tech./BBA/BCA/BJMC

ਸਮਾਂ : 3 ਘੰਟੇ

ਥਿਊਰੀ ਅੰਕ : 37
ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ : 13
ਕੁਲ ਅੰਕ : 50

ਪਾਠ-ਕ੍ਰਮ ਅਤੇ ਪਾਠ-ਪੁਸਤਕਾਂ

1. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ** : ਧਾਤੂ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਮਧੇਤਰ, ਪਿਛੇਤਰ), ਪੰਜਾਬੀ ਕੋਸ਼ਗਤ ਸ਼ਬਦ ਅਤੇ ਵਿਆਕਰਣਿਕ ਸ਼ਬਦ **12 ਅੰਕ**

2. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਪ੍ਰਕਾਰ** :
   ੳ) ਸੰਯੁਕਤ ਸ਼ਬਦ, ਸਮਾਸੀ ਸ਼ਬਦ, ਦੋਜਾਤੀ ਸ਼ਬਦ, ਦੋਹਰੇ/ਦੁਹਰੁਕਤੀ ਸ਼ਬਦ ਅਤੇ ਮਿਸ਼ਰਤ ਸ਼ਬਦ
   ਅ) ਸਿਖਲਾਈ ਤੇ ਅਭਿਆਸ **10 ਅੰਕ**

3. **ਪੰਜਾਬੀ ਸ਼ਬਦ ਰਚਨਾ** :
   ੳ) ਇੱਕ-ਵਚਨ ਬਹੁ-ਵਚਨ, ਲਿੰਗ-ਪੁਲਿੰਗ, ਬਹੁ-ਅਰਥਕ ਸ਼ਬਦ, ਸਮਾਨ-ਅਰਥਕ ਸ਼ਬਦ, ਬਹੁਤੇ ਸ਼ਬਦਾਂ ਲਈ ਇੱਕ ਸ਼ਬਦ, ਸ਼ਬਦ ਜੋੜ, ਵਿਰੋਧਆਰਥਕ ਸ਼ਬਦ
   ਅ) ਨਿੱਤ ਵਰਤੋਂ ਦੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ : ਖਾਣ-ਪੀਣ, ਸਾਕਾਦਾਰੀ, ਰੁੱਤਾਂ, ਮਹੀਨਿਆਂ, ਗਿਣਤੀ, ਮੌਸਮ, ਮਾਰਕੀਟ/ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਧੰਦਿਆਂ ਨਾਲ ਸੰਬੰਧਿਤ।

10+5=15 ਅੰਕ

ਅੰਕ ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਭਾਗ ਪਹਿਲਾਂ ਵਿਚੋਂ ਚਾਰ ਪ੍ਰਸ਼ਨ ਪੁਛੇ ਜਾਣਗੇ ਜਿਨ੍ਹਾਂ ਵਿਚੋਂ ਤਿੰਨ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਉੱਤਰ ਦੇਣਾ ਲਾਜ਼ਮੀ ਹਨ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਚਾਰ-ਚਾਰ ਨੰਬਰ ਹਨ । **(4+4+4) 12 ਅੰਕ**

2. ਭਾਗ ਦੂਸਰਾ ਵਿਚੋਂ ਦੋ-ਦੋ ਨੰਬਰ ਦੇ ਪੰਜ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ। ਸਾਰੇ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ।
   10 ਅੰਕ

3. ਭਾਗ ਤੀਸਰਾ ਦੇ (ੳ) ਭਾਗ ਵਿਚੋਂ ਦੋ ਸਵਾਲ ਅਤੇ (ਅ) ਭਾਗ ਵਿਚੋਂ ਇੱਕ ਸਵਾਲ ਪੁਛਿਆ ਜਾਵੇਗਾ। ਹਰ ਪ੍ਰਸ਼ਨ ਦੇ ਪੰਜ-ਪੰਜ ਅੰਕ ਹਨ। **10+5=15 ਅੰਕ**

ਨੋਟ: ਇੰਟਰਨਲ ਅਸੈੱਸਮੈਂਟ 13 ਅੰਕਾਂ ਦੀ ਹੈ, ਜੋ ਕਾਲਜ ਵਲੋਂ ਨਿਰਧਾਰਿਤ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ਾਂ ਅਨੁਸਾਰ ਇਨ੍ਹਾਂ ਅੰਕਾਂ ਤੋਂ ਵੱਖਰੀ ਹੋਵੇਗੀ। ਇਸ ਪੇਪਰ ਦੇ ਕੁਲ ਅੰਕ 37+13 = 50 ਹਨ।

BHP 158 PHYSICS LAB-II

Time: 3 Hours **Total Marks: 50**
(Max. Marks: 37 + Internal Assessment: 13)
Pass Marks: 35%

8 Periods/ Week

General Guidelines for Practical Examination

I. The distribution of marks is as follows:
i) One experiment **15 Marks**
ii) Brief Theory **5 Marks**
iii) Viva–Voce **10Marks**
iv) Record (Practical file) **7 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.
2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. To study the phase relationships using impedance triangle for LCR circuit and calculate impedance.
4. Resonance in a series and parallel LCR circuits for different R–value and calculate Q–value.
5. To measure the charge sensitivity of a moving coil Ballistic galvanometer using a known capacitor.
6. To measure the self-inductance L of a given coil by Anderson Bridge method.
7. To find the value of B_H, the horizontal component of ear using a deflection & vibration magnetometer.
8. To study the variation of magnetic field with distance along the axis of coil carrying current by plotting a graph.
9. To plot a graph between the distance of the knife edge from the centre of gravity and the time period of a compound pendulum from graph find (a) acceleration due to gravity, (b) the radius of gyration and moment of inertia about an axis passing through centre of gravity.
10. To determine the acceleration due to gravity by Kater's reversible pendulum.
11. To verify the laws of vibrating string by using Meldes apparatus and to show that $\lambda/2$ is constant.
12. To measure logarithmic decrement, coefficient of damping, relaxation time and quality factor of a damped simple pendulum.

Reference Books:

1. Practical Physics Vol. I, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications.
2. Practical Physics, C.L. Arora, S. Chand & Co.

BHP 159
Inorganic Chemistry Practical

Max. Marks: 37+13(Internal Assesment) **Labs Hrs.: 60**

Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain interferring acid anions and one, the insoluble.

a) Special Tests for Mixture of Anions

(i) Carbonate in the presence of sulphate.
(ii) Nitrate in the presence of nitrite
(iii) Nitrate in the presence of bromide and iodide.
(iv) Nitrate in the presence of chlorate.
(v) Chloride in the presence of bromide and iodide.
(vi) Chloride in the presence of iodide.
(vii) Bromide and iodide in the presence of each other and of chloride.
(viii) Phosphate, arsenate and arsenite in the presence of each other.
(ix) Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.
(x) Borate in the presence of copper and barium salts.
(xi) Oxalate in the presence of fluoride.

b) Separation and Identification of Cations in Mixtures

(i) Separation of cations in groups.
(ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.

Book: Vogel's book on Inorganic Qualitative Analysis

BHP-201 MECHANICS-II

Time: 3 Hours **Total Marks: 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

Frames of References: Inertial frame of reference, Galilean transformation, Galilean Invariance of space & time intervals; Michelson Morley Experiment, Explanation of the Null Result, Postulates of Special Theory of Relativity, Lorentz transformation equations, Length contraction, Time dilation, Experimental evidence in support of time dilation, Twin paradox, Relativity of simultaneity, Relativistic formula for the composition of velocities, The velocity addition theorem

UNIT–II

Relativistic Dynamics: Variation of mass with velocity: Relativity of mass, mass energy equivalence, Relation between momentum and energy, Transformation equations for momentum and energy, Relativistic Doppler effect (longitudinal and transverse) and its confirmation.

UNIT–III

Structure of Space time: Concept of Minkowski space, geometrical interpretation of Lorentz transformations of space & time; simultaneity; contraction and dilation. Space-like, time like and light-like intervals, four vectors, concept of world lines.

UNIT–IV

Principle of Equivalence and Fictitious Forces: Principle of Equivalence, gravitational and inertial mass, gravitational mass of photons, gravitational red shift, Precession of the perihelion of Mercury. Fictitious forces, Effect of rotation of earth on ‘g’, Effects of centrifugal and Coriolis forces produced as a result of earth’s rotation. Foucault’s pendulum and its equation of motion.

TUTORIAL : Relevant problem on the topics covered in the course.

Reference Books:

1. Relativity and Electromagnetism, T.S. Bhatia, Vishal Publishing Co.

2.. Mechanics : Berkeley Physics Course Vol-I, C. Kittel, W.D. Knight, M.A. Ruderman, C.A. Helmholtz and B.J. Moyer- Tata McGraw Hill Publishing Company Ltd., New Delhi.

3. The Special Theory of Relativity, S. Banerji & A. Banerji (Prentice Hall India).

4. Introduction of to Special Relativity: R. Resnick Wiley Eastern India Pvt. Ltd.

5.TheFeymann Lectures Physics: R.P. Feymann, R.B. Leighton and M. Sands, Vol. I & II-Narosa Publishing House, New Delhi.

6."Special Relativity" A.P. French, N.W. Norton and Company Inc. , New York

BHP-202 STATISTICAL AND THERMALPHYSICS

Time: 3 Hours **Total Marks: 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

Basic ideas of Statistical Physics, Scope of Statistical Physics, Basic ideas about probability, Distribution of four distinguishable particles into compartments of equal size. Concept of macrostates, microstates, Thermodynamic Probability, Effects of constraints on the system. Distribution of n particles in two compartments. Deviation from the state of maximum probability. Equilibrium state of dynamic system. Distribution of distinguishable n particles in k compartments of unequal sizes.

UNIT–II

Phase space and division into elementary cells. Three kinds of statistics. The basic approach in three statistics. Maxwell Boltzman (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of law of distribution of molecular speeds. Need for Quantum Statistics – B.E. Statement of Planck's law of Radiation, Wien's Displacement and Stefan's law. Pressure exerted by radiations, equation of state of Photon gas, Radiation pressure and stability of massive stars, Fermi Dirac (FD) statistics. Application of FD statistics to free electron gas inside conductor, equation of state of a degenerate Fermi gas, Stability of white dwarfs, Comparison of M.B, B.E and F.D statistics, relative occupation of energy levels.

UNIT- III

Statistical Basis of Entropy : Definition of entropy, change of entropy of a system, third law of thermodynamics. Additive nature of entropy, law of increase of entropy, reversible and irreversible processes and their examples, work done in a reversible process, Examples of increase of entropy in some natural processes, entropy and disorder.Brief review of terms used in thermodynamics, Laws of Thermodynamics, Carnot's Heat Engine, Entropy changes in Carnot's cycle, Carnot's theorem, Thermodynamic temperature scale, Thermoelectric effect and its Aplications, change of entropy along a reversible path in P-V diagram, entropy of a perfect gas, equation of state of an ideal gas, Heat death of Universe.

UNIT- IV

Maxwell's Thermodynamic Relations : Perfect differentials in Thermodynamics, Derivation Maxwell Thermodynamic Relationships, Cooling produced by adiabatic expansion, adiabatic compression, adiabatic stretching of wires and thin films, change of internal energy with volume. Expression for Cp-Cv, variation of Cv with volume, Clapeyron's equation. Joule-Thomson effect and its thermodynamic treatment,Joule-Thomson effect for a Vander Waal's gas, Production of very low temperatures by adiabatic demagnetization, Concept of Negative Temperatures, Thermodynamic Potentials and Equilibrium of Thermodynamic Systems, Equation of state of an ideal gas, degrees of freedom, Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic, Mean free path (Zeroth Order).

TUTORIAL : Relevant problem on the topics covered in the course.

Reference Books:

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
3. Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
4. Heat and Thermodynamics, M.W.Zemasky and R. Dittman, 1981, McGraw Hill
5. Statistical Physics and Thermodynamics, V.S. Bhatia and T.S. Bhatia(Vishal Publishing Co.)

BHP-203 MATHEMATICS-III

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:
There will be four units, Each unit will consists of four questions. Students have to attempt two questions from each unit. Each question carries five marks. Unit I and Unit II will be set from section A and unit III and unit IV from section B.

Section-A

Complex numbers: Complex numbers and their geometrical representation, De-Moivre's theorem and its applications.

Co-ordinate Geometry: Polar and Cartesian co-ordinates, Distance formula, Section formula of a line in different forms, Angle between two lines, Intersection of two lines , Standard equation of ellipse, parabola and hyperbola.

Section-B

Infinite Series, Series of positive terms, Alternate series, Behaviour of infinite series, Cauchy's convergence criterion, D'Alembert's ration test, Cauchy's Root test, Raabe's test, Gauss test, Cauchy's integral test, Absolute and conditional convergence (Tests without proof).

Books Recommended:

1. Malik, S.C: Mathematical Analysis, Wiley Eastern Ltd. 1991.
2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics(1974).
3. Rajinder Pal Kaur, Geometry: Co-ordinate and Solid, Sharma Publication Jalandhar(2016).

BHP-204 CHEMISTRY-III

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 8 marks and is compulsory consisting of ten short answer type questions of 1 marks each covering the whole syllabus. The candidate will have to attempt eight questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 8 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT I

1. Solutions and Colligative Properties **12Hrs.**

Ideal and non–ideal solutions, methods of expressing concentrations of solutions, Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure, elevation of boiling point and depression of freezing point.

UNIT-II

2. Surface Chemistry **11 Hrs.**

Bulk phases and interfacial region, types of interfaces; Surface tension and interfacial tension.Thermodynamics of surfaces, plane interface, curved interface, Laplace and Kelvin equations, the contact angle, capillary rise and surface tension. Surface tension of solutions,Gibbs adsorption equation and its derivation from thermodynamic considerations. Surfactants, Surface films on liquids. Criteria for
spreading in liquid-liquid systems. (Wetting as contact angle and capitulary action Phenomenon solid liquid systems).

UNIT-III

3. Chemical Kinetics **7 Hrs.**

Rate of reaction, rate constant and rate laws, the order of reaction, first, second & third and zero order reactions, half-lives; determination of reaction order. Temperature dependence of reaction rates, reaction mechanism, rate-determining step approximation, steady-state approximation. Catalysis, homogeneous catalysis, autocatalysis, oscillation reactions.Enzyme catalysis, heterogeneous catalysis.

UNIT-IV

4. Liquid State **10 Hrs.**

Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquids crystal, solid and liquid. Classification, structure of nematic and cholestric phases.Thermography and sevensegment cell.

5. Colloidal State **5 Hrs.**

Definition of colloids, classification of colloids. Solids in liquids (Sol): kinetic, optical and electrical, properties, stability of colloids,protective action, Hardy Schulze law, gold number.Liquids in liquids (emulsions): Types of emulsions, preparation. Emulsifiers. general applications of colloids.

Suggested Books

ESSENTIAL:

1. Physical Chemistry by P.W. Atkins, 8th Ed., Oxford University Press, 2006 (Indian Print).
2. Physical Chemistry by T. Engel & P. Reid, 1st ed., Pearson Education, 2006.
3. Physical Chemistry by Castellan, 3rd Ed., Addison Wisley/Narosa, 1985 (Indian Print)

FURTHER READING:

1. Physical Chemistry by G. M. Barrow, 6th Ed., New York, McGraw Hill, 1996.
2. Physical Chemistry by R. J. Silbey, R. A. Albert &Moungi G. Bawendi, 4th Ed., New York: John Wiley, 2005.

BHP-205 ENVIRONMENTAL STUDIES-I(COMPULSORY)

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Theory Lectures: 1½ Hours/ Week

Section–A: (12 Marks): It will consist of five short answer type questions. Candidates will be required to attempt three questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (16 Marks): It will consist of four essay type questions. Candidates will be required to attempt two questions, each question carrying eight marks. Answer to any of the questions should not exceed four pages.

Section–C: (12 Marks): It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

1. The Multidisciplinary Nature of Environmental Studies:

- Definition, scope & its importance.
- Need for public awareness.

2. Natural Resources:

- Natural resources and associated problems:

  a) Forest Resources: Use of over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

  b) Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

  c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

  d) Food Resources: World food problems, change caused by agriculture and overgrazing,

  effects or modern agriculture, fertilizer-pesticide problem, salinity, case studies.

  e) Energy Resources: Growing of energy needs, renewable and non-renewable energy resources, use of alternate energy sources, case studies.

f) Land Recourses: Land as a resource, land degradation, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

3. Ecosystem:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystems:

a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

4. Social Issues and Environment:

- From unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns.Case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warning, acid rain, ozone layer depletion, nuclear accidents and holocause. Case studies.
- Wasteland reclamation.

- Consumerism and waste products.

- Environmental Protection Act:

  - Air (prevention and Control of Pollution) Act.
  - Water (prevention and Control of Pollution) Act.
  - Wildlife Protection Act.
  - Forest Conservation Act.

- Issues involved in enforcement of environmental legislation.

- Public awareness.

5. National Service Scheme

- **Introduction and Basic Concepts of NSS:** History, philosophy, aims & objectives of NSS; Emblem, flag, motto, song, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries.
- **Health, Hygiene & Sanitation:** Definition, needs and scope of health education; Food and Nutrition; Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan); National Health Programme; Reproductive health.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.

2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.

3. Down to Earth, Centre for Science and Environment, New Delhi.

4. Jadhav, H. &Bhosale, V. M. 1995. Environmental Protection and Laws.Himalaya Pub.

5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson

Education (Singapore) Pte. Ltd., Delhi.

6. Kaushik, A. &Kaushik, C. P. 2004. Perspective in Environmental Studies,

New Age International (P) Ltd, New Delhi.

7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.

8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.

9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex,

Amritsar

10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

BHP-206 INTERDICIPINARY COURSE ID-I

Psychology

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Section A: - Ten Questions will be set in Section A .Students are required to Attempt all the questions in about 50 words. Each question carries 2 marks. **10x2=20 Marks**

Section B: - Eight questions will be set. Students are required to attempt any five out of the eight questions in about 100 words. Each question carries 4 marks. **5x4=20 Marks**

UNIT-I

Personality

a. Knowledge of theories of personality(Eysenck, Freud, Erickson and Big Five)
b. Personality tests

Attitudes

a. Knowledge of the nature of attitudes
b. Identify the components of attitudes (cognitive, affective and behavioral)

Motivation

a. Theories of motivation (Maslow and Herzberg)
b. Differentiate between primary and secondary motivation.

UNIT-II

Goal Setting

a. Understanding Goal Setting (Locke's theory)
b. Goal-Setting Principles

Mental Imagery

a. Understanding the use Working, Impact, Contribution, Structuring of Mental Imagery in Sport
b. Maximizing the value of Mental Imagery

UNIT- III

Confidence

a. Defining confidence (Vealey)
b. Defining and Developing optimistic mind-set
c. Knowledge of self-efficacy (Bandura)

Concentration

a. Understanding concentration
b. Components, Strategies of concentration

References:-

1. Human motivation by David C. McClelland, Cambridge University Press
2. Psychology of Motivation by Denis Waitley, Nova Publishers.
3. Theories of Personality by Jess Feist, Gregory J Feist, Irwin/McGraw-Hill.
4. Attitudes and attitude change by William D. Crano, RadmilaPrislin, Psychology Press.
5. Attitudes amd attitude change by William D. Crano, RadmilaPrish, Psychology Prsess.
6. Morgan and King: Introduction to Psychology - Tata McGraw Hill.
7. Social Psychology in Sport by Sophia Jowett, David Lavallee, Human Kinetics.

BHP-207 PHYSICS LAB-III

General Guidelines for Practical Examination

Time: 3 Hours **Total Marks: 50**
(Max. Marks: 40 + Internal Assessments: 10)
Pass Marks: 35%

Periods 8 Periods/week
I. The distribution of marks is as follows:

i) One experiment: **20 Marks**

ii) Brief Theory: **5 Marks**

iii) Viva–Voce: **10Marks**

iv) Record (Practical file): **5 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. To measure an accessible (Horizontal and vertical) height using sextant.
2. To measure inaccessible height by using sextant.
3. Verify laws of probability distribution by throwing of similar coins.
4. To study adiabatic expansion of gas and hence to calculate value of γ.
5. To determine the heating efficiency of an electric kettle with varying voltage.
6. To determine Stefan's constant using Boltzmann's Law.
7. To find the coefficient of Thermal Conductivity of a bad conductor by Lee's method.
8. To plot a calibration curve of a given thermocouple (copper constantan) using a potentiometer.
9. To measure thermal expansion of crystal using interference fringes.
10. To measure the thermo e.m.f. as a function of temperature of the hot junction.
11. To study the random sampling of AC source.

Reference Books :

1. Practical Physics Vol.II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

2. Practical Physics, C.L. Arora, S. Chand & Co.

BHP-208 CHEMISTRY LAB-III

Physical Chemistry

Time: 3 Hours **Total Marks: 50**
(Max. Marks: 40 + Internal Assessment: 10)
6 Periods/week **Pass Marks: 35%**

Crystallisation:
Concept of indication of crystallisation. Phthalic acid from hot water (using fluted filter paper & stem less funnel) Acetanilide from boiling water, Naphthalene from Ethanol, Benzoic acid from water

Physical Chemistry
1. To determine the specific reaction rate of hydrolysis of ethyl acetate catalyzed by Hydrogen ions at room temperature.
2. To study the effect of acid strength on hydrolysis of an ester.

Viscosity, Surface Tension (Pure Liquids)
3. To study the viscosity and surface tension of glycerine solution in water.
4. To determine the solubility of benzoic acid at different temperatures and to determine H of the dissolution process.
5. To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/weak base.
6. To determine the enthalpy of dissolution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

BHP-251 OPTICS

Time: 3 Hours **Total Marks: 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

Interference of Light: Superposition of light waves and interference, young's double slit experiment, Distribution of intensity in young's double slit experiment, Conditions for sustained interference pattern, Coherent sources of light, Temporal and spatial coherence, Mathematical analysis of temporal coherence, Interference pattern by division of wave front, Theory of interference fringes Fresnel Biprism, thickness of thin transparent sheet Fresnel double mirror, Llyod's single mirror, Displacement of fringes,.

UNIT–II

Interference by Division of Amplitude: Change of phase on reflection, Interference in thin films due to reflected and transmitted light, colour of thin film, Need for extended source for interference by division of amplitude, Fringes of equal inclination and equal. Thickness non reflecting films, Newton's Rings and their application, Michelson Interferometer and their application, Fabry Perot interferometer and etalon. Distribution of intensity in Fabry Perot fringes. Anti reflection coatings

UNIT–III

Diffraction: Diffraction of Light, Huygen's Principle, Huygen's -fresnel Diffraction theory, half-period zones, Zone plate, Diffraction at a straight edge,Diffraction by a circular aperture, diffraction by circular disc Distinction between fresnel and fraunhoffer diffraction. Fraunhoffer diffraction at a single slit, at double slit, at rectangular and circular apertures, Effect of diffraction in optical imaging, Diffraction of N slits, dispersive power, Rayleigh Criterion for resolving power, Resolving power of telescope in diffraction grating, its use as a spectroscopic element and its resolving power, Resolving power of microscope. Resolving power of fabry-perot interferometer.

UNIT–IV

Polarization: Transverse nature of light, Polarization by reflection and refraction, Brewster's Law, Malus Law, Double refraction, Nicol Prism, Elliptically and circularly polarized light, Quarter wave and half-wave plates, production and detection of polarized light, Optical activity, specific rotation. Half shade polarimeter

TUTORIAL : Relevant problem on the topics covered in the course.

Reference Books:

1. Text book of Optics: N. Subramanayam, B. Lal and M. N. Avadhamulu

2. Fundamentals of Optics: Jenkins and White

3. Optics: Ajoy Ghatak

BHP-252 ATOMIC SPECTROSCOPY

Time: 3 Hours **Total Marks: 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

Unit-I

Introduction to Atomic Spectra: Observation of spectra, Types of spectra, Light sources, Spectral analysis, Units in spectroscopy, Bohr's Theory and Hydrogen spectrum, Explanation of Spectral series, Representation of spectral lines by terms, Energy level Diagram, Ritz combination Rule, Continuum at series limit, Evidences in favour of Bohr's Theory, Experimental confirmation of Bohr's theory, Franck-Hertz Experiment.

Unit-II

Spectra of Alkali Atoms: Different series in Alkali Spectra, Term values. The effective quantum number and the quantum defect, The Spinning electron and the vector model, The normal order of fine structure doublets, Electron Spin orbit interaction, Spin orbit interaction for Non-penetrating orbits, Doublet structure in alkali Spectra (Fine Structure), Energy level diagram of Sodium Atom, Selection rules for doublets, Intensity rules for fine structure doublets.

Unit-III

Zeeman Effect and the Paschen-Back effect: Early discoveries and developments, The vector model of one electron system in weak magnetic field. The magnetic moment of a bound electron, Magnetic interaction energy, Selection rules, Intensity rules, The Paschen-Back effect, The Paschen-Back effect of a Principal-series doublet, Selection rules for the Paschen-Back effect, the Zeeman and Paschen-Back effect of hydrogen.

Unit-IV

X-rays Spectra: Production of X-rays, Origin of X-rays from electromagnetic theory, X-ray diffraction, Bragg's law, Laue Spots, Bragg's spectrometer, Reflection and refraction of X-rays, X-ray scattering, Continuous X-ray spectrum, Characteristics absorption and emission Spectra, comparison of optical and X-ray Spectra, Moseley's law, Applications of Moseley's law.

TUTORIAL: Relevant problem on the topics covered in the course.

Text and Reference Books:

1. Introduction to Atomic Spectra by H. E. White

2. Atomic Spectra and Atomic structure by Gerhard Herzberg

3. Concepts of Modern Physics by Arthur Beiser

4. Elements of Spectroscopy by Gupta, Kumar and Sharma

BHP-253 MATHEMATICS-IV

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:
There will be four units, Each unit will consists of four questions. Students have to attempt two questions from each unit. Each question carries five marks. Unit I and Unit II will be set from section A and unit III and unit IV from section B.

Section-A

Determinants & Matries: Properties of matrices and determinants, Algebra of matrices, Eigen Values and Eigen vectors, canonical forms, Unitary, Hermitian, and Orthogonal matrices and their properties, Cayley-Hamilton theorem, Rank of a matrix, Condition of Consistency of linear systems, Introduciton to vector spaces, linear maps, basis and dimension(Excluding Theorems).

Section-B

Probability theory and distributions: Axiomatic theory of probability, probability density function, conditional probability, mathematical expectation, moments, moment generating function, Conditional and marginal distribution, special frequency distributions, Binomial, Possion, Normal, Uniform, Gamma, Beta and Exponential distribution.

Books Recommended:

1. Mathematics Hand book: M.Vygodsky, Mir, Moscow,1975.
2. Applied Mathematics for Engineers and Physicists: Pipes & Harvill, London, McGraw Hill, 1970
3. Mathematics of Physics and Modern Engineering : Sokolnikoff & Recheffer.
4. Fundamentals of Mathematica Statistics: S.C. Gupta, V.K.Kapoor.
5. Algebra: Rajinder Pal Kaur, First World Publication Ludhiana.

BHP-254 CHEMISTRY-IV

Time: 3 Hours **Total Marks:50**

(Max. Marks: 40+Internal Assessment: 10)

Total Lectures: 60 **Pass Marks: 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 8 marks and is compulsory consisting of ten short answer type questions of 1 marks each covering the whole syllabus. The candidate will have to attempt eight questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 8 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT – I

1. Energy and Electromagnetic Spectrum **5 Hrs**

Introduction, electromagnetic spectrum and Units, Regions of the spectrum, Basic features of different spectrometers, Statement of Born-Oppenheimer approximation, Degree of freedom, Frank Condon Principle, Fluorescence and Phosphorescence.

II. Ultraviolet and Visible Spectroscopy **6 Hrs**

The energy of electronic excitation, Measurement techniques, Beer-Lambert Law, Molar extinction coefficient. Different types of transition noticed in UV spectrum of organic functional groups and their relative energies. Chromophore, Auxochromes, Absorption and intensity shifts, Transition probability. Factors affecting λ_{max} , Effect of steric hindrance to coplanarity, Solvent effects.

UNIT – II

III. Infrared Spectroscopy **5 Hrs**

Vibrational energy levels, Selection rules, Force constant, Fundamental vibration frequencies, Factors influencing Vibrational Frequencies (Vibrational Coupling, Hydrogen Bonding, Electronic effect, Bond Angles, Field Effect) of different functional groups. Sampling techniques.

IV. Applications of UV and IR Spectroscopy **7 Hrs**

Applications of UV spectroscopy, Woodward Fieser rules for calculating λ_{max} of conjugated polyenes and α,ß -unsaturated carbonyl compounds. Applications of IR spectroscopy, Absorption of Common functional Groups, Interpretation of simple IR spectra, Finger print regions. Simple numerical problems based on UV and IR spectroscopy.

UNIT-III

V. Proton Magnetic Resonance spectroscopy (^{1}H NMR) 6 Hrs

The Nuclear spin, Larmor frequency, the NMR isotopes, Population of nuclear spin level, Spin and Spin lattice relaxation. Measurement techniques (CW & FT method), Solvent used. Chemical shift, Reference compounds, Shielding constant, Range of typical chemical Shifts, Simple application of chemical shifts, Anisotropic effect. Spin spin splitting, Coupling constant.

VI. Applications of NMR spectroscopy 5 Hrs

NMR spectra with various examples such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene, o-, m-, p- anisidine, o-, m-, p- nitrophenols, acetophenone. Simple numerical of structure elucidation of NMR spectroscopic data.

UNIT- IV

VII. Mass Spectrometery 5 Hrs

Basic Principles. Elementary theory. Molecular ions, isotope ions, Fragment ions of odd and even electron types, Nitrogen rule, Factors affecting cleavage patterns, Simple cleavage, Cleavages at a hetero atom, Multicentre fragmentations, Rearrangements, Diels – Alder fragmentation, Mc Lafferty rearrangement.

VIII. Applications of Mass Spectroscopy 6 Hrs

Cleavage associated with common functional groups , Aldehydes, Ketones, Cyclic and Acyclic Esters, Alcohols, Olefins, Aromatic compounds, Amines, Interpretation of the spectrum of unknown simple molecules.

Books Recommended:

1. Organic Spectroscopy By W. Kemp; Publisher- Palgrave, New York
2. D.H. Williams and I. Fleming. Spectroscopic Methods in Organic Chemistry.
3. Spectrometric Identification of Organic Compounds - R.M. Silverstein & F. X. Webster; Publisher: John Willey and Sons,Inc.
4. Introductory Problems in Spectroscopy- By R.C. Banks, E.R. Matjeha and G. Mercer; Publisher : The Benzamine / Cummings Publishing Company Inc.
5. Introduction to Spectroscopy – D. L. Pavia, G. M .Lampman, and G. S. Kriz Publisher: Brooks / Cole, a part of cengage learning

BHP-255 ENVIRONMENTAL STUDIES-II (COMPULSORY)

Time: 3 Hrs. **Max. Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

Theory Lectures: 1½ Hours/ Week

Section–A: (12 Marks): It will consist of five short answer type questions. Candidates will be required to attempt three questions, each question carrying four marks. Answer to any of the questions should not exceed two pages.

Section–B: (16 Marks): It will consist of four essay type questions. Candidates will be required to attempt two questions, each question carrying eight marks. Answer to any of the questions should not exceed four pages.

Section–C: (12 Marks): It will consist of two questions. Candidate will be required to attempt one question only. Answer to the question should not exceed 5 pages.

1. Biodiversity and its Conservation:

- Definition: Genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of Biodiversity: Consumptive use; productive use, social, ethical, aesthetic and option
- Values.
- Biodiversity of global, National and local levels.
- India as mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to Biodiversity: Habitat loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of Biodiversity: In situ and Ex-situ conservation of biodiversity.

2. Environmental Pollution:

- Definition, causes, effects and control measures of:

  a) Air Pollution

b) Water Pollution

c) Soil Pollution

d) Marine Pollution

e) Noise Pollution

f) Thermal Pollution

g) Nuclear Hazards

h) Electronic Waste

- Solid Waste Management: Causes, effects and control measures of urban and industrial
- Wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster Management: Floods, Earthquake, Cyclone and Landslides.

3. Human Population and the Environment

- Population growth, variation among nations.
- Population explosion-Family welfare programme.
- Environment and human health.
- Human rights.
- Value education.
- HIV/AIDS.
- Women and child welfare.
- Role of information technology in environment and human health.
- Case studies.
- Road Safety Rules & Regulations**:** Use of Safety Devices while Driving, Do's and Don'ts
- while Driving, Role of Citizens or Public Participation, Responsibilities of Public under
- Motor Vehicle Act, 1988, General Traffic Signs.
- Accident & First Aid**:** First Aid to Road Accident Victims, Calling Patrolling Police &

- Ambulance.

4. National Service Scheme:

- **Entrepreneurship Development:** Definition & Meaning; Qualities of good entrepreneur; Steps/ ways in opening an enterprise; Role of financial and support service Institutions.
- **Civil/Self Defense:** Civil defense services, aims and objectives of civil defense; Needs for self-defense training.

5. Field Visits:

- Visit to a local area to document environmental assets– river/forest/grassland/hill/mountain.
- Visit to a local polluted site–Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems–pond, river, hill slopes etc.
- Contribution of the student to NSS/any other social cause for service of society.

Note: In this section the students will be required to visit and write on the environment of an area/ ecosystem/vi1lage industry/disaster/mine/dam/agriculture field/waste management/hospital etc. with its salient features, limitations, their implications and suggestion for improvement.

References/Books:

1. Agarwal, K. C. 2001. Environmental Biology, Nidhi Publications Ltd. Bikaner.

2. Bharucha, E. 2005. Textbook of Environmental Studies, Universities Press, Hyderabad.

3. Down to Earth, Centre for Science and Environment, New Delhi.

4. Jadhav, H. &Bhosale, V. M. 1995. Environmental Protection and Laws.Himalaya Pub.

5. Joseph, K. and Nagendran, R. 2004. Essentials of Environmental Studies, Pearson

Education (Singapore) Pte. Ltd., Delhi.

6. Kaushik, A. &Kaushik, C. P. 2004. Perspective in Environmental Studies,

New Age International (P) Ltd, New Delhi.

7. Miller, T. G. Jr. 2000. Environmental Science, Wadsworth Publishing Co.

8. Sharma, P. D. 2005. Ecology and Environment, Rastogi Publications, Meerut.

9. Booklet on Safe Driving. Sukhmani Society (Suvidha Centre), District Court Complex,

Amritsar

10. Kanta, S., 2012. Essentials of Environmental Studies, ABS Publications, Jalandhar.

BHP-256 INTERDICIPLINARY COURSE ID-II

Geography

Time: 3 Hours **Total Marks: 50**

Theory: 30 Marks

Internal Assessment: 10 Marks

Total Lectures: 60 **Practical: 10 Marks**

Section A: - It will consist of 10 questions from the entire syllabus. All questions are compulsory. Each question will carry one mark; the total weightage being 10 marks.

(10x1=10 Marks)

Section B: - It will consist of 8 short answer questions upto100 words in length. The students will be required to attempt any 5 questions. Each question will carry 4 marks; the total weightage being 20 marks. **(5x4=20 Marks)**

Section C: - There will be a Practical file work.

Part A: Physical Geography

1. Exploring the Earth: The shape of the Earth, The Earth's movements, Day and Night, The Earth's Revolution, Dawn and Twilight, Latitude and Longitude, Longitude and Time, Standard Time and Time Zones, The International Date line.

2. The Earth's Crust: The Structure of the Earth, Classification of Rocks, (Igneous, Sedimentary and Metamorphic), Types of Mountains, Types of Plateau, Types of Plains.

3. The Oceans: The movements of Ocean currents, The Indian Ocean circulation

Part B: Weather, Climate and Vegetation

1. Weather: The Difference between Climate and Weather, The Elements of Weather and Climate, Rainfall, Pressure, Temperature and Humidity, Winds, Sunshine.

2. Climate: The Atmosphere, Insulation, Elements of Climate and Factors affecting them, Temperature, Factors affecting temperature, Precipitation, Rainfall, Monsoon.

3. Vegetation: Climatic Types and Natural vegetation, World Climatic Types.

Part C: Practical Work

1. Maps: Physical (India & World), Types of soil (India), Monsoon.

2. Maps: Vegetation (India), Rainfall (World & India), Natural calamities (last 6 months) viz. Earthquake, Flood, Cyclone, Tsunami, Land slide.

Prescribed Text:

a. Certificate Physical & Human Geography by G.C. Leong

b. Oxford India Atlas (Latest Edition)

a. Spectrum- Geography & India

BHP-257 PHYSICS LAB-IV

General Guidelines for Practical Examination

Time: 3 Hours **Total Marks: 50**
(Max. Marks: 40 + Internal Assessments: 10)
Pass Marks: 35%

Periods 8 Periods/week
I. The distribution of marks is as follows:

i) One experiment: **20 Marks**

ii) Brief Theory: **5 Marks**

iii) Viva–Voce: **10 Marks**

iv) Record (Practical file): **5 Marks**

II. There will be one sessions of 3 hours duration. The paper will have one session and will consist of 8 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

1. To determine refractive index of glass and liquid using spectrometer.
2. To determine the Cauchy's constants.
3. To study the refractive index of a doubly refracting prism.
4. To set up Newton's rings to determine wavelength of sodium light.
5. To determine the wavelength by using plane diffraction grating (Use Hg source)
6. To determine dispersive power of plane diffraction grating.
7. To determine resolving power of a telescope.
8. To determine resolving power of a grating.
9. To study the absorption spectra of iodine vapours.
10. To study the rotation of plane of polarization by using polarimeter.
11. To determine the specific rotation of sugar using Laurent's half shade polarimeter

Reference Books:

1 Practical Physics Volume-II, T.S. Bhatia, Gursharan Kaur, Iqbal Singh, Vishal Publications

2 Practical Physics, C.L. Arora, S. Chand & Co.

BHP-258 CHEMISTRY LAB-IV

Physical Chemistry

Time: 3 Hours **Total Marks: 50**

(Max. Marks: 40 + Internal Assessment: 10)

6 Periods/week **Pass Marks: 35%**

Note. The question paper will be set by the examiner based on the syllabus.

1. Refractometry: Determine refractive index of a given liquid as a criterion for its purity. (Benzene i.e. commercial) benzene + A.R. acetone).

2. Polarimetry: Determine the %age composition of an optically active solution.

3. Calorimetry:
   a) Determination of Heat of neutralization
      (i) Strong acid-strong base
      (ii) Weak acid-strong base.
   b) Determination of Heat of solution of KCl, NH_4Cl, KNO_3

4. Conductometry:
   a) Determination of cell constant.
   b) Determination of specific and equivalent conductance of electrolyte (NaCl andHCl).
   c) Precipitation titration of Na_2SO_4 vs. $BaCl_2$.
   d) Neutralization titrations NaOH vs. HCl and NaOH vs. CH_3COOH.

5. Determination of adsorption isotherm of oxalic acid on charcoal.

BHP-301 CONDENSED MATTER PHYSICS – I

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

Unit – I

Crystal structure, Symmetry operations for a two dimensional crystal, Two dimensional Bravais lattices, Three dimensional Bravais lattices, Basic primitive cells, Crystal planes and Miller indices, Diamond and NaCl structure.

Unit – II

Crystal Diffraction : Bragg's law, Experimental methods for crystal structure studies, Laue equations, Reciprocal lattices of SC, BCC and FCC, Brag's law in reciprocal lattice, Brillouin zones and its derivation in two dimensions, Structure factor and atomic from factor.

Unit – III

Free Electron Theory: Drude-Lorentz theory, Sommerfeld model, three dimensional potential well, the Fermi-Dirac distribution, density of electronic states, Fermi energy, average kinetic energy

Unit – IV

Band Theory: Formation of energy bands, Bloch theorem, Kronig-Penney model of an infinite one dimensional crystal, band structures, characteristics of moving electrons in one dimensional periodic, potential - crystal momentum, effective mass, classification of insulators, semiconductors and metals.

Books Suggested :

1. Concepts of Condensed Matter Physics, Vol. I, T.S. Bhatia and Rajesh Khatri, Vishal Publishing House
2. Introduction to Solid State Physics by C. Kittel (Wiley Eastern)
3. Elements of Modern Physics by S.H. Patil (TMGH, 1985).
4. Solid State Physics by Puri and Babbar.

BHP-302 NUCLEAR PHYSICS

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

I. Nuclear Properties: Constituents of nucleus and their intrinsic properties, Quantitative facts about nuclear mass, density, binding energy and its variation with mass number, Wave mechanical properties of nucleus ,angular momentum, parity, magnetic dipole moment and electric quadruple moment of the nucleus, properties of nuclear forces, meson theory of nuclear forces.

UNIT–Il

Il. Nuclear Models: Liquid drop model, semi-empirical mass formula, conditions of stability, experimental evidence for nuclear magic numbers, development of Shell Model, energy level scheme, predictions of the Shell model: angular momenta of nuclear ground states, parity , magnetic moment of nuclear ground states, electric quadrupole moments and nuclear isomerism.

UNIT–Ill

Ill. Radioactive Decays: Modes of radioactive decay and decay laws, units of radioactivity radioactive decay series, successive disintegration, radioactive equilibrium , radioactive dating, modes of radioactive decay, Alpha decay: Gamow's theory of alpha decay, barrier penetration as applied to alpha decay, Geiger Nuttal law, Beta decays: β-, β+ and electron capture decays, Auger electron, conditions for spontaneous emission, nature of Beta particle spectrum Neutrino hypothesis and experimental evidence for its detection, Gamma decay: Gamma emission, internal conversion, internal pair conversion.

UNIT–IV

IV. Nuclear Reactions: Types of nuclear reactions, reaction cross section, microscopic and macroscopic cross-section, conservation laws, energetics of nuclear reactions, examples of nuclear reactions, Q-value and its physical significance, threshold energy for exoergic and endoergic reactions.

Reference Books:

1. Basic Ideas and Concepts in Nuclear Physics by K. Hyde
2. Introduction to Nuclear Physics : H.A. Enge
3. Nuclear Physics : I. Kaplan (Addison Wesley)
4. Nuclei and Particles by E. Segre5. Nuclear and Particle Physics: Kulwant S. Thind, Manmohan Singh,Vijay Kumar, Leif Gerward

BHP-303 MODERN PHYSICS

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

Unit – I

Cathode Rays and Positive Rays

Electrical conduction through gases, ionization of gas, ionization current, phenomena of discharge through gases at low pressure, properties of cathode rays, determination of specific charge (e/m) of electron, Millikan's oil drop method, balanced drop method, Positive rays and particles, Thomson's experiment, positive ray parabolas, Aston's and Dempster's mass spectrographs, isotopes of hydrogen.

Unit – II

Atomic Structure of the Matter

Thomson's atom model, Rutherford's nuclear atom model, hydrogen spectrum, Bohr's theory of hydrogen atom, spectral series of hydrogen atom, atomic energy levels, Bohr's correspondence principle, successes and failures of Bohr's theory, Sommerfeld's relativistic atom model and its limitations, vector atom model, orbital angular momentum.

Unit – III

Foundation of Quantum Mechanics

Black body radiations, Wien's theory, Rayleigh Jeans law, Planck's law of radiation, Failure of classical theory to explain black body radiations, Photoelectric effect and its characteristics, Einstein's photoelectric equation, Compton scattering, Theory of Compton effect and its limitations.

Unit – IV

Wave Nature of Matter and Uncertainty Principle

The wave particle duality, de Broglie concept of matter waves, phase and group velocities, de Broglie relation for a photon and wavelength of material particles, characteristics of de Broglie waves, Bragg's law for diffraction, Davisson and Germar's experiment, G.P.Thomson's experiment, The uncertainty principle for position and momentum (x and p_x), Energy and time (E and t) and angular position-angular momentum , causality in quantum mechanics, illustrations of uncertainty principle,Gamma ray microscope. Diffraction by a single slit, applications of uncertainty principle- non existence of free electrons and existence of n,p and α particles in nucleus, zero point energy and size of hydrogen atom.

Books Suggested:

1. Quantum Physics of Atoms Molecules Solids, Nuclei & Particles: R. Eisberg and R. Resnick,
2. Elementary Modern Physics: Atam P. Arya.
3. Concepts of modern physics: A. Beiser,.

BHP-304 MOLECULAR SPECTROSCOPY AND LASER

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment : 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

Microwave and Infra-Red Spectroscopy

Types of molecules, Theory of microwave spectroscopy: rotation of molecules, rotational spectra of diatomic molecules as a rigid rotator, Intensity of spectral lines, Effect of isotopic substitution, diatomic molecule as non rigid rotator Microwave oven, technique and instrumentation of microwave spectroscopy The vibrating diatomic molecule: Energy of a diatomic molecule, simple harmonic oscillator, anharmonic oscillator, vibration frequency and force constant for anharmonic oscillator Outline of technique and instrumentation ,Applications of Infrared spectroscopy.

UNIT–II

Raman and Electronic Spectroscopy:

Nature of the Raman spectra, characteristic properties of Raman lines, Experimental arrangement for Raman spectra ,Quantum and classical theories of Raman Effect, Pure rotational Raman spectra for linear molecule, Rule of mutual exclusion, Structure determination from Raman and infra-red spectroscopy, Electronic spectra: Salient features of molecular electronic spectra, Formation of electronic spectra, Electronic spectra of diatomic molecule, Outline of technique and instrumentation of Raman spectroscopy ,Applications of Raman spectroscopy

UNIT–III

Laser Fundamentals:

Interaction of light radiations with matter: Absorption and spontaneous emission , Einstein coefficients and their relations, light amplification Concept of stimulated emission and population inversion, components of laser and lasing action, Principal pumping schemes, Fauchber Ledenberg formula, Threshold and Schawlow Tonnes condition,

UNIT–IV

Laser Systems: Types of lasers, Ruby and Nd:YAG lasers, He-Ne and CO_2 lasers construction and their working, laser beam characteristics. Applications of lasers. Holography: The underlying principle, applications of Holography

Text Reference Books:

1. Introduction to Atomic Spectra: H.E. White-Auckland McGraw Hill, 1934.
2. Fundamentals of Molecular Spectroscopy: C.B. Banwell-Tata McGraw Hill, 1986.
3. Spectroscopy Vol. I, II & III: Walker & Straughen
4. Introduction to Molecular Spectroscopy: G.M. Barrow-Tokyo McGraw Hill, 1962.
5. Spectra of Diatomic Molecules: Herzberg-New York, 1944.
6. Molecular Spectroscopy: Jeanne L McHale.
7.Optics and lasers, T S Bhatia, V K Sharma, Publishers PV's

BHP-305 PHYSICS LAB-V

Time: 3 Hours **Total Marks:50**

(Max. Marks: 40+ Internal Assessments:10)

Pass Marks: 35%

Periods 8 Periods/week

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment 20 Marks

ii) Brief Theory 5 Marks

iii) Viva–Voce 10Marks

iv) Record (Practical file) 5 Marks

II. There will be one session of 3 hours duration and the paper will consist of 10 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. No experiment is to be allotted to more than three examinee in any group.

Computer Oriented Data Analysis

1. **Basic understanding of the Microsoft Excel for data analysis and graph plotting**
2. To measure the intensity using photosensor in laser diffraction patterns of single and double slits.
3. To determine the wave-length of laser light using a plane diffraction grating.
4. Study of Solar-Cell characteristics.
5. To determine the wavelength of H-alpha emission line of Hydrogen atom.
6. To determine the absorption lines in the rotational spectrum of Iodine vapour.
7. Measurement of Planck's constant using photocell.
8. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
9. To determine the Planck's constant using LEDs of at least 4 different colour LED.
10. To determine the ionization potential of mercury.
11. To determine (i) wavelength and (ii) angular spread of He-Ne laser using plane diffraction grating.
12. Study the working of GM counter and draw the plateau curve.
13. Study the GM counter dead time.
14. Study the absorption of beta particles in aluminium sheet using GM counter absorption coefficients.
15. Study of C.R.O. as display and measuring device.
16. To measure (a) AC Voltage, and (b) Frequency of a some periodic waveforms using CRO
17. Study the variable DC power supply using CRO and obtain the graph between DC voltmeter and CRO measurements.

Reference Books:

1. Practical Physics by CL Arora S. Chand Publications
2. Practical Physics Volume II & Volume III Vishal Publications
3. Prcatical Physics by S P Singh Pragati Parkashan Meerut.

BHP-306 SEMINAR AND ASSIGNMENT

Time: 3 Hours **Total Marks:50**

(Max. Marks: 40+ Internal Assessments:10)

Pass Marks: 35%

Periods 8 Periods/week

BHP-351 PARTICLE PHYSICS

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment : 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT-I

Elementary Particles and their Properties - Historical introduction, classification of particles, fermions and bosons, particles and antiparticles, Properties of different baryons , Hyperons, Leptons and Mesons like life time, mass, spin parity and conservation law. Observation of Strange particles production and decay, Introduction to quarks and their types, Quark contents of baryons and mesons

UINT-II

Interaction of Radiation and Charged Particles With Matter: Types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, Basic resonance particles. Energy loss of electrons and positrons, Positrons annihilation in condensed media, Sopping power and range of heavier charged, derivation of Bethe-Bloch formula, interaction of gamma rays with matter.

UNIT-III

Accelerators - Accelerators, linear accelerators, Cockcroft-Walton accelerator, Van de Graff accelerator, cyclic accelerators, Cyclotron, Betatron, Synchro-cyclotron, ion sources, focussing, stability, electron synchrotron, colliding beam machines, particle beams for fixed target experiment, CERN Super Proton Synchrotron (SPS), Larger Hadron collider (LHC), Fermilab Tevatron.

UNIT-IV

Nuclear Radiation Detection - Gas-filled detectors, Proportional and Geiger-Muller counters, Scintillation detectors, Semiconductor detectors, Cherenkov effect, Electromagnetic and hadronic calorimeter, specialized detectors, solid state nuclear track detectors, bubble chambers, spark counter nuclear emulsions.

TUTOTIALS: Relevant problems on the topics covered in the course

Books:

1. Introduction to Elementary Particles by D. Griffth (Wiley-VCH)
2. Introduction to High Energy Physics by D.H. Perkins (Cambridge University Press)
3. Elementary Particles by I.S. Hughes (Cambridge University Press)

BHP-352 CONDENSED MATTER PHYSICS – II

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment : 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT – I

Lattice vibrations, One Dimensional Monoatomic Lattice, phonons, phonon momentum during elastic and inelastic scattering, Inelastic scattering of photons by phonons, Specific heat of solids, Classical Model of specific heat of solids (Dulong and Petit's Law), Einstein and Debye Models of Specific Heat of Solids

UNIT – II

Superconductivity, Persistent Currents, Effect of magnetic field on super conductor, Meisner effect, Types of Super Conductors, London's equation and penetration depth, Thermodynamics of Superconductors, BCS theory (formation of cooper pairs), ground state and energy gap.

UNIT – III

Polar and Non Polar Molecules, Dielectric Polarization, Electric displacement vector and dielectric constant, Local Electric Field, Clausius Mosotti equation, Types of polarizabilities and frequency dependence

UNIT – IV

Basic ideas of materials at nanoscale, Difference from bulk material properties, Nanoparticles, Preparation of Nano Materials, Lithographic and Non Lithographic Techniques, Characterization techniques- Scanning Tunnelling Microscopy and Atomic Force Microscopy, Fullerenes, Carbon nanotubes, Applications of nanotechnology in various fields.

Books Suggested :

1. Concepts of Condensed Matter Physics, Vol. II, T.S. Bhatia and Rajesh Khatri, Vishal Publishing House
2. Introduction to Solid State Physics by C. Kittel (Wiley Eastern)
3. Elements of Modern Physics by S.H. Patil (TMGH, 1985).
4. Solid State Physics by Puri and Babbar.

BHP-353 ELECTRONICS

Time: 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment: 15)

Total Lectures: 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

Concepts of current and voltage sources, Intrinsic and Extrinsic semiconductors, Fermi level, Charge carriers in semiconductors, p-n junction, p-n junction fabrication techniques, Depletion region, Biasing of diode, V-I characteristics, Voltage-current equation for p-n junction, Ideal diode, Static and Dynamic resistance of a Junction Diode, Transition and diffusion capacitance, Avalanche breakdown and Zener breakdown, Introduction to Zener diode and voltage regulation, Tunnel Diode, Rectification: half wave rectifier, full wave rectifiers (Centre tapped and bridge rectifiers), Efficiency, Ripple factor, Qualitative ideas of filter circuits (L-filter, Shunt capacitor filter, LC and π filters), Photonic devices (solar cell, photodiode and LED).

UNIT–II

Junction transistor : Transistor fabrication techniques, Structure and working, relation between different currents in transistors, Sign conventions, Amplifying action, Different configurations of a transistor and their comparison, CB and CE characteristics, Accurate expressions for collector current, Transistor load line analysis, Thermal runaway and heat sink, Transistor biasing and stabilization of operating point, Fixed bias, Base bias with emitter feedback, Collector to base bias, Voltage divider biasing circuit. Structure and characteristics of JFET, FET biasing: self bias and voltage divider bias, Comparison of BJT and FET, MOSFET: Enhancement and depletion type

UNIT–III

Working of CB and CE amplifier, Concept of hybrid parameters, Amplifier analysis using h-parameters, Equivalent circuits, Determination of current gain, voltage gain, Power gain, Input resistance, output resistance, overall voltage gain, FET amplifier (common source configuration and common drain configuration) and its voltage gain, Feed back in amplifiers, Different types, Voltage gain, Advantage of negative feed back, Emitter follower as negative feed back circuit. Barkausen criterion of sustained oscillations, LC oscillator (tuned collector, tuned base Hartley), RC oscillators, phase shift and Wein bridge.

UNIT–IV

Analog and digital signals, Digital circuit, Binary number system, Decimal to binary conversion, Binary to decimal conversion, Octal number system, Hexadecimal number system, Binary coded decimal code (BCD code), Basic logic gates (AND, OR, NOT) and their truth tables, Different combinations of basic logic gates and truth tables, NAND and NOR as universal logic gates, Boolean algebra.

Books Suggested:

1. Electronc Devices and Circuits-J. Milkman and C. C. Halkias(Tata Mcgraw Hill)
2. Basic Electronics and Linear Circuits by N.N. Bhargave, D.C. Kulshreshtha and S.C. Gupta.
3. Foundations of Electronics by D. Chatophadhyay, P.C. Rakshit, B. Saha and N.N. Purkit.
4. Basic Electronics by D.C. Tayal (Himalaya Pub.)
5. Principles of Electronics by V.K. Mehta & Rohit Mehta (S. Chand Publishers)

BHP-354 QUANTUM MECHANICS

Time : 3 Hours **Total Marks : 75**

(Max. Marks: 60 + Internal Assessment : 15)

Total Lectures : 60 **Pass Marks : 35%**

Note for paper setter and students:

1. **There will be five sections.**
2. **Section A carries 12 marks and is compulsory consisting of eight short answer type questions of 2 marks each covering the whole syllabus. The candidate will have to attempt six questions in section A.**
3. **Sections B, C, D and E will be set from units I, II, III & IV respectively and will consist of two questions of 12 marks each from the respective unit. The candidates are required to attempt one question from each of these sections.**
4. **Scientific calculator is allowed.**

UNIT–I

The Schrodinger Wave equation: Classical versus quantum mechanics, the wave function, matter waves, characteristics of the Schrodinger equation, one dimensional time dependent Schrodinger equation for free particle, particle under a potential V(x), time independent and time dependent part of one dimensional wave equation, three dimensional Schrodinger equation, time dependent and time independent 3D Schrodinger wave equation, physical interpretation of wave function, normalization of wave function, stationary state, conservation of probability, probability current density, conditions of admissibility of the wave function.

UNIT–II

Operator formalism in Quantum mechanics: Operators, operator algebra, commutators, linear operators, vector operators, Laplacian operator, Null operator, inverse operator, singular and non singular operator, Hermitian operator, Adjoint or Hermitian conjugate of an operator, Parity operator, Identity operator, Unitary operator, operators corresponding to different dynamical variables, angular momentum operator, operator for total energy, eigen functions and eigen values, well behaved and admissible solutions, simultaneous eigen functions and commutator algebra, commutator for position and momentum, commutator for energy and time, scalar product of states, properties of scalar product, norm of a state, expansion of arbitrary function in terms of eigen functions, completeness relation, linearly independent and dependent wave functions, Expectation value of dynamical quantities, Gaussian wave packet, Motion of wave packet or Ehrenfest Theorem, properties of Gaussian wave packet, Schwarz inequality, exact statement and proof of uncertainty principle for wave packets, Fundamental postulates of quantum mechanics.

UNIT–III

Application of Schrodinger wave equation to 1D problems: Boundary conditions at the surface of a finite potential, boundary conditions at the surface of infinite potential, Fundamental postulates of wave mechanics, Schrodinger equation for a free particle and equation of a particle subject to forces. A single step potential, one dimensional rectangular potential barrier, Quantum mechanical tunnelling effect, Application to barrier penetration α decay, One dimensional square well potential free states. Bound states, particle in one dimensional box, one dimensional square well potential of infinite depth, one dimensional square well of finite depth, linear harmonic oscillator, energy of oscillator, classical and quantum mechanical treatment, and eigen values, significance of zero point energy, uncertainty relation, and wave function, application of linear harmonic oscillator, Physical significance of quantum numbers, parity, transition between states.

UNIT–IV

Application of Schrodinger equation to three dimensional problems: Free particle in three dimensional rectangular box, wave function and degeneracy, three dimensional harmonic oscillator (Cartesian coordinates), particle in spherical symmetric potential, solution of θ, φ, R equations, spherical harmonics, Hydrogen atom, wave function of H atom, solution of θ, φ, R equations,, complete wave function, radial probability density, energy values of H atom, degeneracy, polar graphs of probability distribution function, selection rules, forbidden and allowed transitions, the rigid rotator, free axis, wave equation for rigid rotator, eigen function and eigen values, rigid rotator in fixed plane, Three dimensional harmonic oscillator.

Books Suggested

1. Quantum mechanics by Powell and Crasemann (Narosa Addison Wesley)
2. Quantum Mechanics by E. Merzbacher (Wiley)
3. Quantum mechanics by Mathews and Venketsan (Tata Mc Graw Hill)
4. Perspectives of Quantum Mechanics by S. P Kulia (New Central Book Agency)
5. Quantum Mechanics Concepts and Applications by Nouredine Zettili (John Wiley and Sons.)
6. Modern Physics by A. K. Sikri (Pardeep Publications)

BHP-355 PHYSICS LAB-VI

Time: 3 Hours **Total Marks:50**

(Max. Marks: 40+ Internal Assessments:10)

Pass Marks: 35%

Periods 8 Periods/week

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment 20 Marks

ii) Brief Theory 5 Marks

iii) Viva–Voce 10Marks

iv) Record (Practical file) 5 Marks

II. There will be one session of 3 hours duration and the paper will consist of 10 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. No experiment is to be allotted to more than three examinee in any group.

1. Measure the phase shift between current and voltage for RC and LR circuit using CRO.
2. To study the formation of Lissajous Figures and compare the frequency of oscillations produced by two oscillator.
3. Determination of frequency of A.C. mains by using electrical vibrator.
4. To measure the reverse saturation current in a pn junction diode at various temperatures and to find the approximate value of energy band gap.
5. To determine energy band gap of a given semiconductor using Four probe method.
6. To study the phase shift analysis of the LCR circuit using CRO.
7. Study the working of the thermistor.
8. To study the working of RC Circuit as integrating and differentiating circuit.
9. Study of B-H curves of various materials using C.R.O, and determination of various magnetic parameters.
10. To study the response of RC circuit at different frequencies.
11. Study the characteristics of the Light dependent resistor LDR.
12. Study the characteristics of the Photodiode.
13. Determine k/e ratio using transistor in CE mode.
14. To determine the value of e/m for the electron by long solenoid method.
15. To study the magnetic susceptibility of $FeCl_3$/$Mn(SO_4)_2$ by Quinke's method.

Reference Books:

1. Practical Physics by CL Arora S. Chand Publications
2. Practical Physics Volume III Vishal Publications
3. Prcatical Physics by S P Singh Pragati Parkashan Meerut.

BHP-356 Physics Lab-VII

Time: 3 Hours **Total Marks:50**

(Max. Marks: 40+ Internal Assessments:10)

Pass Marks: 35%

Periods 8 Periods/week

General Guidelines for Practical Examination

I. The distribution of marks is as follows:

i) One experiment 20 Marks

ii) Brief Theory 5 Marks

iii) Viva–Voce 10Marks

iv) Record (Practical file) 5 Marks

II. There will be one sessions of 3 hours duration and the paper will consist of 10 experiments out of which an examinee will mark 6 experiments and one of these is to be allotted by the external examiner.

III. Number of candidates in a group for practical examination should not exceed 12.

IV. In a single group no experiment be allotted to more than three examinee in any group.

Electronics Lab

1. Testing of resistance, pn junction, transistor, FET.
2. To study IV characteristics of PN diode, Zener and Light emitting diode.
3. Study the working of Zener diode as voltage stabilizer. Study the output as function of the input voltage and variable load resistance.
4. To study the diode as clipping and clamping element.
5. To study the half-wave and a full-wave rectifier (central tapped and Bridge rectifier) using CRO. Calculate the ripple factor and voltage regulation.
6. To study the half-wave and a full-wave rectifier (Bridge rectifier) using L section and π section filters.
7. To study common emitter (CE) characteristics of a given transistor pnp/npn and to determine various parameters.
8. To study the characteristics of a Transistor in common base (CB) npn/pnp configuration.
9. To study the output and mutual characteristics of the N-channel/P-channel Field effect transistor (FET).
10. To study the frequency response of voltage gain of a RC-coupled transistor amplifier in CE mode.
11. To design a Wien bridge oscillator for given frequency using an op-amp.
12. To design a phase shift oscillator of given specifications using BJT.
13. To study the Colpitt`s oscillator.
14. To study the Hartley oscillator.
15. Calculate the h-parameters from the common base (CB)/ common emitter (CE) transistor.
16. To verify and design AND, OR, NOT and NAND gates.

Reference Books:

1. Practical Physics by CL Arora S. Chand Publications
2. Practical Physics Volume III Vishal Publications
3. Prcatical Physics by S P Singh Pragati Parkashan Meerut.