Draft Rules & Syllabus
for

Bachelor of Physical Science

Semester I

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week			Total Credits	Remarks
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		One credit refers to one hour teaching in theory, Tutorial
1	BSCPS101	Physics-I	60	20	20	100	20	10	20	50	3	1	2	6	
2	BSCPS102	Chemistry-I	60	20	20	100	20	10	20	50	3	1	2	6	
3	BSCPS103	Mathematics-I	60	20	20	100	-	-	-		5	1	-	6	
4	BSCFC104	Communicative English	60	20	20	100	-	-	-	-	4	-	-	4	
5	BSCFC105	Communicative Hindi	60	20	20	100	-	-	-	-	4	-	-	4	
		Total	300	100	100	**500**	40	20	40	**100**	19	3	4	26	**600**

Semester II

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week			Total Credits	Remarks
			Theory				Practical				L	T	P		
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks					One credit refers to one hour teaching in theory, Tutorial
1	BSCPS 201	Physics-II	60	20	20	100	20	10	20	50	3	1	2	6	
2	BSCPS 202	Chemistry-II	60	20	20	100	20	10	20	50	3	1	2	6	
3	BSCPS 203	Mathematics-II	60	20	20	100	-	-	-		5	1	-	6	
4	BSCFC 204	Environmental Science	60	20	20	100	-	-	-	-	4	-	-	4	
5	BSCFC 205	Enterpreneurship Development	60	20	20	100		--	---		4	-	-	4	
		Total	300	100	100	**500**	40	20	40	**100**	19	3	4	26	**600**

Semester III

No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week			Total Credits	Remark
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		
1	BSCPS301	Physics-III	60	20	20	100	20	10	20	50	4	0	2	6	
2	BSCPS302	Chemistry-III	60	20	20	100	20	10	20	50	4	0	2	6	
3	BSCPS303	Mathematics-III	60	20	20	100	20	10	20	50	5	1	0	6	
4	BSCFC304	Aptitude –I	60	20	20	100	-	-	-	-	3	1	-	4	
5	BSCFC305	Computer Application	60	20	20	100	-	-	-	-	3	1		4	
		Total	300	100	100	500	60	30	60	150	19	3	4	26	650

One credit refers to one hour teaching in theory, Tutorial

Scheme for Semester-IV

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week			Total Credits	Remarks
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		One credit refers to one hour teaching in theory, Tutorial
1	BSCPS401	Physics-IV	60	20	20	100	20	10	20	50	4	0	2	6	
2	BSCPS402	Chemistry-IV	60	20	20	100	20	10	20	50	4	0	2	6	
3	BSCPS403	Mathematics-IV	60	20	20	100	20	10	20	50	5	1	0	6	
4	BSCFC404	Internet Fundamentals And Web Tools	60	20	20	100	-	-	-	-	3	1	-	4	
5	BSCFC405	Aptitude-II	60	20	20	100	-	-	-	-	3	1		4	
	Total		300	100	100	500	60	30	60	150	19	3	4	26	650

SEMESTER-V

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week			Total Credits	Remarks
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		One credit refers to one hour teaching in theory, Tutorial
1	BSCPS501	Physics-V	60	20	20	100	20	10	20	50	4	0	2	3	
2	BSCPS502	Chemistry -V	60	20	20	100	20	10	20	50	4	0	2	6	
3	BSCPS503	Maths-V	60	20	20	100	20	10	20	50	5	1	0	6	
4	BSCPS504	Hindi Language (Bhasha Kaushal aur Sanchar Sadhan)	60	20	20	100	-	-	-	-	3	1	-	4	
5	BSCPS505	Visual Basic	60	20	20	100	-	-	-	-	3	1		4	
		Total	300	100	100	500	60	30	60	150	19	3	4	26	650

SEMESTER VI

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Hours per week			Total Credits	Remarks
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		One credit refers to one hour teaching in theory, Tutorial
1	BSCPS601	Physics –VI English Language and Aspects of Development	60	20	20	100	20	10	20	50	4	0	2	6	
2	BSCPS602	Chemistry - VI	60	20	20	100	20	10	20	50	4	0	2	6	
3	BSCPS603	Maths -V I	60	20	20	100	20	10	20	50	5	1	0	6	
4	BSCPS604	English Language and Aspects of Development	60	20	20	100	-	-	-	-	3	1	-	4	
5	BSCPS605	DBMS	60	20	20	100	-	-	-	-	3	1		4	
		Total	300	100	100	500	60	30	60	150	19	3	4	26	650

Semester-I
BSCPS101 Physics-I

Unit-I
Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. Ordinary Differential Equations:1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients. Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of asystem of particles. Centre of Mass.

Unit-II.
Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

Unit-III
Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Unit-IV
Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.

Unit-V
Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion – Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, η and $\Box$by Searles method. Special Theory of Relativity: Constancy of speed of light. Postulates of Special. Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

Reference Books:

- University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison- Wesley
- Mechanics Berkeley Physics course,v.1: Charles Kittel, et. Al. 2007, Tata McGraw- Hill.
- Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
- Engineering Mechanics, Basudeb Bhattacharya, Oxford University Press
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

BPC101 Physics-I - PRACTICALS

LIST OF PRACTICALS

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.

2. To determine the Height of a Building using a Sextant.

3. To determine the Moment of Inertia of a Flywheel.

4. To determine the Young's Modulus of a Wire by Optical Lever Method.

5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

6. To determine the Elastic Constants of a Wire by Searle's method.

7. To determine g by Bar Pendulum.

8. To determine g by Kater's Pendulum.

9. To determine g and velocity for a freely falling body using Digital Timing   Technique

10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g.

BSCPS102 Chemistry-I

UNIT I

Atomic Structure:

- *Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.*

- What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and $\psi 2$, Schrödinger equation for hydrogen atom. Radial and angular parts of the hydogenic wavefunctions (atomic orbitals) and their variations for $1s$, $2s$, $2p$, $3s$, $3p$ and $3d$ orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to $1s$ and $2s$ atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms).

- Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.

UNIT II

Chemical Bonding and Molecular Structure

- *Ionic Bonding:* General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability.

- Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding:

- VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.

- Concept of resonance and resonating structures in various inorganic and organic compounds.

MO Approach:

- Rules for the LCAO method, bonding and antibonding MOs and their characteristics for *s-s*, *s-p* and *p-p* combinations of atomic orbitals, nonbonding combination 10 of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of *s-p* mixing) and heteronuclear diatomic molecules such as CO, NO and NO+. Comparison of VB and MO approaches.

Section B: Organic Chemistry-1

UNIT III

Fundamentals of Organic Chemistry

- Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.
- Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles.
- Reactive Intermediates: Carbocations, Carbanions and free radicals.
- Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

Stereochemistry

- Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis – trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

UNIT IV

Aliphatic Hydrocarbons

- Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Alkanes:

- (Upto 5 Carbons). *Preparation:* Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. *Reactions:* Free radical Substitution: Halogenation.

UNIT V

Alkenes:

- (Upto 5 Carbons) *Preparation:* Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic
- hydrogenation) and trans alkenes (Birch reduction). *Reactions:* cis-addition (alk. KMnO4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.

Alkynes:

- (Upto 5 Carbons) *Preparation:* Acetylene from CaC2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.
- *Reactions:* formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alk. KMnO4.

Reference Books:
- Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education India, 2006.
- Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. Organic Chemistry, John Wiley & Sons (2014).
- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New
- Delhi (1988).
- Eliel, E.L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000.
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.

BSCPS102 Chemistry-I

- PRACTICAL

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.

2. Estimation of oxalic acid by titrating it with $KMnO_4$.

3. Estimation of water of crystallization in Mohr's salt by titrating with $KMnO_4$.

4. Estimation of Fe (II) ions by titrating it with $K_2Cr_2O_7$ using internal indicator.

5. Estimation of Cu (II) ions iodometrically using $Na_2S_2O_3$.

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two

   extra elements)

2. Separation of mixtures by Chromatography: Measure the Rf value in each case

(combination of two compounds to be given)

   12

(a) Identify and separate the components of a given mixture of 2 amino acids (glycine,

aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography

(b) Identify and separate the sugars present in the given mixture by paper chromatography.

BSCPS103- Mathematics-I

Unit-I : Differential Calculus

- Limit and Continuity (ε and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation,
- Euler's theorem on homogeneous functions.
- Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves.
- Parametric representation of curves and tracing of parametric curves, Polar
- coordinates and tracing of curves in polar coordinates.
- Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and
- Cauchy's forms of remainder, Taylor's series, Maclaurin's series of sin x, cos x, ex,
- log (l+x), (l+x)m, Maxima and Minima, Indeterminate forms.

Unit-II: Differential Equations

- First order exact differential equations. Integrating factors, rules to find an integrating
- factor. First order higher degree equations solvable for x, y, p. Methods for solving
- higher-order differential equations. Basic theory of linear differential equations,
- Wronskian, and its properties. Solving a differential equation by reducing its order.
- Linear homogenous equations with constant coefficients, Linear non-homogenous
- equations, The method of variation of parameters, The Cauchy-Euler equation,
- Simultaneous differential equations, Total differential equations.
- Order and degree of partial differential equations, Concept of linear and non-linear
- partial differential equations, Formation of first order partial differential equations,
- Linear partial differential equation of first order, Lagrange's method, Charpit's
- method. Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

Unit-III: Real Analysis

- Finite and infinite sets, examples of countable and uncountable sets. Real line,
- bounded sets, suprema and infima, completeness property of R, Archimedean
- property of R, intervals. Concept of cluster points and statement of Bolzano-
- Weierstrass theorem.
- Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences.
- Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof). Definition and examples of absolute and conditional convergence.
- Sequences and series of functions, Pointwise and uniform convergence. Mn-test, Mtest. Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.

Unit-IV Algebra

- Definition and examples of groups, examples of abelian and non-abelian groups, the group Zn of integers under addition modulo n and the group U(n) of units undermultiplication modulo n. Cyclic groups from number systems, complex roots of unity,circle group, the general linear group GLn (n,R), groups of symmetries of (i) anisosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, thepermutation group Sym (n), Group of quaternions.Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group, examples of subgroups including the center of a group. Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups. Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems, Zn the ring of integers modulo n, ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions.
- Subrings and ideals, Integral domains and fields, examples of fields: Zp, Q, R, and C. Field of rational functions.

UNIT V: Matrices, Analytical Geometry and Integral Calculus

- R, R2, R3 as vector spaces over R. Standard basis for each of them. Concept of Linear, Independence and examples of different bases. Subspaces of R2, R3.
- Translation, Dilation, Rotation, Reflection in a point, line and plane. Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.
- Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four.
- Matrices in diagonal form. Reduction to diagonal form upto matrices of order 3.
- Computation of matrix inverses using elementary row operations. Rank of matrix.

- Techniques for sketching parabola, ellipse and hyperbola. Reflection properties of parabola, ellipse and hyperbola.
- Classification of quadratic equations representing lines, parabola, ellipse and hyperbola.
- Spheres, Cylindrical surfaces. Illustrations of graphing standard quadric surfaces like cone, ellipsoid.
- Integration by Partial fractions, integration of rational and irrational functions.
- Properties of definite integrals. Reduction formulae for integrals of rational, trigonometric, exponential and logarithmic functions and of their combinations.
- Areas and lengths of curves in the plane, volumes and surfaces of solids of revolution. Double and Triple integrals.

Books Recommended

1. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
2. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) P. Ltd., 2002.
3. R.P. Grimaldi, *Discrete Mathematics and Combinatorial Mathematics*, Pearson Education, 1998.
4. P.R. Halmos, *Naive Set Theory*, Springer, 1974.
5. E. Kamke, *Theory of Sets*, Dover Publishers, 1950.
6. John B. Fraleigh, *A First Course in Abstract Algebra*, 7th Ed., Pearson, 2002.
7. M. Artin, *Abstract Algebra*, 2nd Ed., Pearson, 2011.
8. Joseph A Gallian, *Contemporary Abstract Algebra*, 4th Ed., Narosa, 1999.
9. G.B. Thomas and R.L. Finney, *Calculus*, 9th Ed., Pearson Education, Delhi, 2005.
10. H. Anton, I. Bivens and S. Davis, *Calculus*, John Wiley and Sons (Asia) Pvt. Ltd., 2002.

BSCFC104 Communicative English

Unit I: Vocabulary Building
1a. Prefixes and Suffixes
1b. Conversion
1c. Compounding
1d. Analogy
2. One-Word Substitutes
3. Words Often Confused
4. Synonyms and Antonyms
5. Phrasal Verbs

Unit II: Grammar - 1
1. Types of Verbs
2. Subject-Verb Agreement

Unit III: Grammar - 2
1. Meanings of Modals
2. Tense (Present and Past) and Aspect
3. The Several Possibilities for Denoting Future Time
4. Articles and Prepositions

Unit IV: Listening Skills
1. The Importance of Listening
2. Types of Listening
3. Barriers/Obstacles to Effective Listening
4. Strategies for Effective Listening

Unit V: Reading Skills
1. Skimming
2. Scanning

BSCFC105 Communicative Hindi

Unit-I	हिन्दी भाषा
	1. स्वतंत्रता पुकारती (कविता) – जयशंकर प्रसाद
	2. पुष्प की अभिलाषा (कविता) – माखनलाल चतुर्वेदी
	3. वाक्य संरचना और अशुद्धियां (संकलित)
Unit-II	हिन्दी भाषा
	1. नमक का दरोगा (कहानी) – प्रेमचंद
	2. एक थे राजा भोज (निबंध) – डॉ. त्रिभुवननाथ शुक्ल
	3. पर्यायवाची, विलोम, एकार्थी, अनेकार्थी एव शब्दयुग्म शब्द (संकलित)
Unit-III	हिन्दी भाषा
	1. भगवान बुद्ध (निबंध) – स्वामी विवेकानंद
	2. लोकतंत्र एक धर्म है (निबंध) – डॉ. सर्वपल्ली राधाकृष्णन
	3. नहीं रूकती है नदी – हीरालाल बाछोतिया
	4. पल्लवन
Unit-IV	हिन्दी भाषा
	1. अफसर (निबंध) – शरद जोशी
	2. हमारी सांस्कृतिक एकता (निबंध) – रामधारी सिंह दिनकर (एक भारत श्रेष्ठ भारत के अन्तर्गत)
	3. संक्षेपण (संकलित)
Unit-V	नैतिक मूल्य
	1. नैतिक मूल्य परिचय एवं वर्गीकरण (आलेख) – डॉ. शशि राय
	2. आचरण की सभ्यता (निबंध) – सरदार पूर्णसिंह
	3. अंतर्ज्ञान और नैतिक जीवन (लेख) – डॉ. सर्वपल्ली राधाकृष्णन
	4. अप्प दीपो भव (लेख) – स्वामी श्रद्धानंद

UNIT-I
Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors(statement only).

UNIT-II
Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, chargedconductor. Electric potential as line integral of electric field, potential due to a pointcharge, electric dipole, uniformly charged spherical shell and solid sphere. Calculationof electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

UNIT-III
Magnetism:
Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.

UNIT-IV
Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials. Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

UNIT-V
Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Reference Books:
- Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education..
- Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ.Press.
- Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.   12
- D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

BCS201 Physics-II
PRACTICAL

List of Practicals

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer:
(i) Measurement of charge and current sensitivity
(ii) Measurement of CDR
(iii) Determine a high resistance by Leakage Method
(iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem

BSCPS202 Chemistry-II

UNIT 1

Physical Chemistry-1

Chemical Energetics

- Review of thermodynamics and the Laws of Thermodynamics.

- Important principles and definitions of thermochemistry. Concept of standard state

- standard enthalpies of formations, integral and differential enthalpies of solution and dilution.

- Calculation of bond energy, bond dissociation energy and resonance energy from

- Thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation.

  Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

UNIT 2

Chemical Equilibrium:

- Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔGo, Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases.

Ionic Equilibria:

- Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases,

- pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Organic Chemistry-2

- Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

UNIT 3

Aromatic hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl and Aryl Halides

Alkyl Halides (Upto 5 Carbons)

- Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions.
- *Preparation:* from alkenes *and* alcohols.
- *Reactions:* hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's
- Ether synthesis: Elimination vs substitution.

Aryl Halides

- *Preparation:* (Chloro, bromo and iodo-benzene case): from phenol,
- Sandmeyer & Gattermann reactions.
- *Reactions (Chlorobenzene):* Aromatic nucleophilic substitution (replacement by –OH group)
- Effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3).
- Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

UNIT IV

Alcohols, Phenols and Ethers (Upto 5 Carbons)

Alcohols: *Preparation:* Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

- *Reactions:* With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acidic dichromate, conc. HNO3). Oppeneauer oxidation
- *Diols:* (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) *Preparation:* Cumene hydroperoxide method, from diazonium salts.

Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.

UNIT V

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic):

- Formaldehye, acetaldehyde, acetone and benzaldehyde
- *Preparation:* from acid chlorides and from nitriles.
- *Reactions* – Reaction with HCN, ROH, $NaHSO_3$, NH_2-G derivatives. Iodoform test. Aldol
- Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.

Reference Books:

- Graham Solomon, T.W., Fryhle, C.B. & Dnyder, S.A. *Organic Chemistry,* John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry,* Orient Longman, New Delhi (1988).
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry,* S. Chand, 2010.
- Barrow, G.M. *Physical Chemistry* Tata McGraw-Hill (2007).
- Castellan, G.W. *Physical Chemistry* 4th Ed. Narosa (2004).
- Kotz, J.C., Treichel, P.M. & Townsend, J.R. *General Chemistry* Cengage Learning India Pvt. Ltd., New Delhi (2009).
- Mahan, B.H. *University Chemistry* 3rd Ed. Narosa (1998).
- Petrucci, R.H. *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

PRACTICALS

Section A: Physical Chemistry

Thermochemistry

1. Determination of heat capacity of calorimeter for different volumes.

2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

3. Determination of enthalpy of ionization of acetic acid.

4. Determination of integral enthalpy of solution of salts (KNO3, NH4Cl).

5. Determination of enthalpy of hydration of copper sulphate.

6. Study of the solubility of benzoic acid in water and determination of ΔH.

Ionic equilibria pH measurements

a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.

b) Preparation of buffer solutions:

(i) Sodium acetate-acetic acid

(ii) Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

Section B: Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.

2. Criteria of Purity: Determination of melting and boiling points.

3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.

(a) Bromination of Phenol/Aniline

(b) Benzoylation of amines/phenols

(c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Reference Books

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.

- Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

- Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry,* R. Chand & Co.: New Delhi (2011).

BSCPS203 Mathematics-II

UNIT-I
Vector Calculus
- Differentiation and partial differentiation of a vector function. Derivative of sum, dot product and cross product of two vectors. Gradient, divergence and curl.

UNIT-II
Theory of Equations
- General properties of polynomials, Graphical representation of a polynomials, maximum and minimum values of a polynomials, General properties of equations,
- Descarte's rule of signs positive and negative rule, Relation between the roots and the coefficients of equations.
- Symmetric functions, Applications symmetric function of the roots, Transformation of equations. Solutions of reciprocal and binomial equations. Algebraic solutions of the cubic and biquadratic. Properties of the derived functions.

UNIT-III
Number Theory
- Division algorithm, Lame's theorem, linear Diophantine equation, fundamental theorem of arithmetic, prime counting function, statement of prime number theorem,
- Goldbach conjecture, binary and decimal representation of integers, linear congruences, complete set of residues.
- Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Möbius inversion formula, the greatest integer function, Euler's phi-function.

Probability and Statistics
- Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, discrete distributions: uniform, binomial, Poisson, continuous distributions: uniform, normal, exponential.
- Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables.

UNIT-IV
Mathematical Finance
- Basic principles: Comparison, arbitrage and risk aversion, Interest (simple and compound, discrete and continuous), time value of money, inflation, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), comparison of NPV and IRR. Bonds, bond prices and yields. Floating-rate bonds, immunization.
- Asset return, short selling, portfolio return, (brief introduction to expectation, variance, covariance and correlation), random returns, portfolio mean return and variance, diversification, portfolio diagram, feasible set, Markowitz model (review of Lagrange multipliers for 1 and 2 constraints).

Mathematical Modeling
- Applications of differential equations: the vibrations of a mass on a spring, mixture problem, free damped motion, forced motion, resonance phenomena, electric circuit problem, mechanics of simultaneous differential equations.
- Applications to Traffic Flow. Vibrating string, vibrating membrane, conduction of heat in solids, gravitational potential, conservation laws.

Boolean Algebra
- Definition, examples and basic properties of ordered sets, maps between ordered sets, duality principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sublattices, products and homomorphisms.
- Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials, Quinn-
- McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.

UNIT-V
Transportation and Game Theory
- Transportation problem and its mathematical formulation, northwest-corner method, least cost method and Vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem.
- Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies, graphical solution procedure.

Graph Theory
- Definition, examples and basic properties of graphs, pseudographs, complete graphs,
- bi-partite graphs, isomorphism of graphs, paths and circuits, Eulerian circuits,
- Hamiltonian cycles, the adjacency matrix, weighted graph, travelling salesman's
- problem, shortest path, Dijkstra's algorithm, Floyd-Warshall algorithm.

Books Recommended:
1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows,* 2nd Ed., John Wiley and Sons, India, 2004.
2. F. S. Hillier and G. J. Lieberman, *Introduction to Operations Research,* 9th Ed., Tata McGraw Hill, Singapore, 2009.
3. Hamdy A. Taha, *Operations Research, An Introduction,* 8th Ed., Prentice-Hall India, 2006.
1. David M. Burton, *Elementary Number Theory* 6th Ed., Tata McGraw-Hill Edition, Indian reprint, 2007.
2. Richard E. Klima, Neil Sigmon, Ernest Stitzinger, *Applications of Abstract Algebra with Maple*, CRC Press, Boca Raton, 2000.
3. Neville Robinns, *Beginning Number Theory,* 2nd Ed., Narosa Publishing House Pvt. Limited, Delhi, 2007.

BSCFC204 ENVIRONMENTAL STUDIES

Unit-I : Natural Resources: Definition, scope and importance. Need for public awareness. Brief description of;
1. Forest recourses: Use and over-exploitation. Deforestation; timber extraction, mining, dams. Effect of deforestation environment and tribal people
2. Water resources: Use and over–utilization. Effects of over utilisation of surface and ground water. Floods, drought.
3. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
4. Food resources: World food problems, Effects of modern agriculture; fertilizer-pesticide, salinity problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
5. Land resources: Land as resources, land degradation, man induced landslides, soil erosion and desertification

Unit-II: Ecosystems, Biodiversity and its conservation
1. Concept of an ecosystem
2. Structure and function of an ecosystem
3. Producers, consumers and decomposers
4. Food chains, food webs and ecological pyramids
5. Characteristic features of the following ecosystems:-
6. Forest ecosystem, Desert ecosystem, Aquatic ecosystem.
7. Value of biodiversity: Consumptive use, productive use. Biodiversity in India.
8. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts.
9. Endangered and endemic species of India
10. Conservation of biodiversity

Unit-III: Environmental Pollution
1. Definition
2. Causes, effects and control measures of :-
3. Air pollution
4. Water pollution
5. Soil pollution
6. Noise pollution
7. Solid waste management; Measures for safe urban and industrial waste disposal
8. Role of individual in prevention of pollution
9. Disaster management: Drought, floods and cyclones

Unit-IV: Social Issues and the Environment
1. From Unsustainable to Sustainable development

2. Water conservation, rain water harvesting, watershed management.
3. Climate change, global warming, ozone layer depletion,
4. Environment protection Act
5. Wildlife Protection Act, Forest Conservation Act

Unit-V : Human Population and the Environment
1. Population explosion, impact on environment.
2. Family welfare Programme.
3. Environment and human health.
4. Women and Child Welfare.
5. Value Education.
6. Role of Information Technology in Environment and humanhealth.

Reference Books:
1.Environmental Studies by Dr.M.Satyanarayana, Dr. M.V. R.K.Narasimhacharyulu, Dr.G. Rambabu and Dr.V.VivekaVardhani, Published by Telugu Academy, Hyderabad.
2.Environmental Studies by R.C.Sharma, Gurbir Sangha, published by Kalyani Publishers.
3.Environmental Studies by Purnima Smarath, published by Kalyani Publishers

BSCFC205 ENTREPRENEURSHIP DEVELOPMENT

Unit-I:
Entrepreneurship: Entrepreneur characteristics – Classification of Entrepreneurships – Incorporation of Business – Forms of Business organizations –Role of Entrepreneurship in economic development –Start-ups.

Unit-II:
Idea Generation and Opportunity Assessment: Ideas in Entrepreneurships – Sources of New Ideas – Techniques for generating ideas – Opportunity Recognition – Steps in tapping opportunities.

Unit-III:
 Project Formulation and Appraisal : Preparation of Project Report –Content; Guidelines for Report preparation – Project Appraisal techniques –economic – Steps Analysis; Financial Analysis; Market Analysis; Technical Feasibility.

Unit-IV:
Institutions Supporting Small Business Enterprises: Central level Institutions: NABARD; SIDBI, NIC, KVIC; SIDIO; NSIC Ltd; etc. – state level Institutions –DICs- SFC- SSIDC- Other financial assistance.

Unit-V:
Government Policy and Taxation Benefits: Government Policy for SSIs- tax Incentives and Concessions –Non-tax Concessions –Rehabilitation and Investment Allowances.

Reference Books:
1. Arya Kumar, Entrepreneurship, Pearson, Delhi, 2012.
2. Poornima M.CH., Entrepreneurship Development –Small Business Enterprises, Pearson, Delhi,2009
3. Michael H. Morris, ET. al., Entrepreneurship and Innovation, Cen gage Learning, New Delhi, 2011
4. Kanishka Bedi, Management and Entrepreneurship, Oxford University Press, Delhi, 2009
5. Anil Kumar, S., ET.al., Entrepreneurship Development, New Age International Publishers, New Delhi, 2011
6. Khanka, SS, Entrepreneurship Development, S. Chand, New Delhi.

III SEMESTER

BSCPS301 Physics-III

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS301	Physics-III	6 (4-0-2)	60	20	20	20	30	150	3 hr	3 hr

OBJECTIVE
To explain students about theories of Ideal Gas, Real Gas: Van der Waals gas.
To explain laws of entropy and thermodynamics, Different versions of the second law and Thermodynamic relationships. Statistical Physics statistical basis of thermodynamics.

UNIT-I

Kinetic Theory of Gases: Ideal Gas: Kinetic model, deduction of Boyle's law, interpretation of temperature, estimation of rms speeds of molecules. Brownian motion, estimate of the Avogadro number. Law of Equipartition of energy, specific heat of monatomic gas, extension to di- and tri-atomic gases, behavior at low temperatures. Adiabatic expansion of an ideal gas, applications to atmospheric physics. Real Gas: Van der Waals gas, Equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants; gas and vapour. Joule expansion of ideal gas and Vander Waals gas, Joule coefficient, estimates of J-T cooling.Liquefaction of gases: Boyle temperature and inversion temperature. Principle of regenerative cooling, liquefaction of hydrogen and helium. Refrigeration cycle, meaning of efficiency.

UNIT II

Thermodynamics: The laws of thermodynamics: The Zeroth law, various indicator diagrams, works done by and on the system, first law of thermodynamics, internal energy as a state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics, Different versions of the second law, practical cycles used in internal combustion engines. Entropy, principle of increase of entropy. The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero; third law of thermodynamics.Thermodynamic relationships: Thermodynamic variables: extensive and intensive, Maxwell's general relationships, application to Joule – Thomson cooling and adiabatic cooling in a general system,

Clausius-Clapeyron Latent heat equation. Thermodynamic potentials and equilibrium of thermodnamical systems, relation with thermodynamical variables. Cooling due to adiabatic demagenetization, Production and measurement of very low temperatures.

UNIT III

Statistical Physics: The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, probability distribution and its narrowing with increase in number of particles. The expressions for average properties. Constrains, accessible and inaccessible states, distribution of particles with a given total energy into a discrete set of energy states.Some universal laws: The μ space representation, division of μ space into energy states and into phase cells of arbitrary size, applications to one-dimensional harmonic oscillator and free particles. Equilibrium between two systems in thermal contact, bridge with macroscopic physics. Probability and entropy, Boltzmann entropy relation. Statistical interpretation of second law of thermodynamics. Boltzmann canonical distribution law and its applications; Rigorous form of equipartition of energy.

UNIT IV

Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines. Black Body Radiation :Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Spectral distribution of Black Body radiation. Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment. Interpretation of behaviour of specific heats of gases at low temperature .

UNIT V

Quantum Statistics: Transition to quantum statistics; "h" as a natural constant and its implications, cases of particle in a one dimensional box and one-dimensional harmonic oscillator. Indistinguishability of particles and its consequences, Bose- Einstein and Fermi-Dirac conditions; applications to liquid helium, Free electrons in a metal, and photons in blackbody chamber. Fermi level and Fermi energy. Transport Phenomena : Transport phenomena is gases; Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

COURSE LEARNING OUTCOMES
It will help students to understand the theories of Ideal Gas, Real Gas: Van der Waals gas.
Laws of entropy and thermodynamics, Different versions of the second law and Thermodynamic relationships.
Transition to quantum statistics, Statistical Physics statistical basis of thermodynamics.

Reference Books:

1.Heat and Thermodynamics by Brijlal and Subramanayam.

2. Introduction to Statistical Mechanics by B.B. Laud

3. Statistical Mechanics by K. Haung.

4. Statistical Mechanics by R.K.Patharia.

5. Statistical Mechanics by Satyaprakash

BSCPS301 Physics-III

Practical

Subject Code	Subject Name	Credits	Maximum marks Allotted					Total	Duration of Exam.	
			Theory			Practical			Theory	Practical
			End Sem	Mid Sem	Assi gn.	End Sem	Term work			
BSCPS 301	Physics-III	2				20	30			3 hr

List of Practical:

1. Study of conversion of mechanical energy into eat

2. Heating efficiency of electrical kettle with varyhing voltages.

3. Study of temperature dependence of spectral density of radiation

4. Resistance thermometry

5. Thermo-emf thermometry

6. Conduction of heat through poor conductors of different Geometries.

7. Experimental study of probability distribution for a two-option system using a coloured dice.

8. Study of statistical distributions on nuclear disintegration data.

BLS302 CHEMISTRY-III

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted									Credit			Total Credits
			Theory				Practical						L	T	P	
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks					
1	BLS302	Chemistry-III	60	20	20	100	20	10	20	50	4	0	2	6

OBJECTIVES:

Objective of these papers is to explain students about fundamentals and laws of thermodynamics and concept of heat and work.

To explain Entropy, Chemical equilibrium and buffers; properties of elements of transition series, Coordination Compounds, Oxidation and Reduction.

To give knowledge about Electromagnetic spectrum, Nomenclature, structure and bonding of Alcohol and Phenols

UNIT I

Physical Chemistry

Thermodynamics-1 Definition of thermodynamic terms: System, surrounding, Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law: Joule Thomson coefficient.

Calculation of w, q, dU and dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Thermochemistry: Standard state, standard enthalpy of formation: Hess's Law of heat summation and its application. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization.

Second Law of Thermodynamics- Need for the law, different statements of the law, Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature.

UNIT II

Thermodynamics-II (a) Concept of entropy: Entropy as a state function, entropy as a function of P&T, entropy change in physical change, Clausius inequality, entropy as criteria of spontaneity and equilibrium.

Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz functions, Gibbs

function (G) and Helmholtz function(A) as a thermodynamic quantities, A and G as a criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change.

(b) Chemical equilibrium Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chateliers's principle ,Clapeyron equation and Clausius- Clapeyron equation, applications.

(c) Buffers: Mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts.

UNIT III

Inorganic Chemistry

Chemistry of elements of I transition series: Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds such as carbides, oxides and sulphides. Complexes illustrating relative stability of their oxidation states General characteristics, oxidation states, magnetic behaviour, spectral properties and stereochemistry

Chemistry of Elements of Second and Third Transition Series: General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

UNIT-IV

(a) Coordination Compounds: Werner's coordination theory and its experimental verification, EAN Concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds,VBT of transition metal complexes.

(b) Oxidation and Reduction: Use of redox potential data, analysis of redox cycle, redox stability in H_2O: Frost, Latimer and Pourbaix diagram. Principle involved in the extraction of elements.

UNIT-V

Organic Chemistry

 (a) Alcohols: Classification and nomenclature. Monohydric alcohols: nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, acidic nature, reactions of alcohols. Dihydric alcohols: nomenclature, pinacole-pinacolone rearrangement. Trihydric alcohols-nomenclature and methods of formation, chemical reactions of glycerol

(c) Phenols: Nomenclature, structure and bonding. Prepration of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols: resonance stabilization of phenoxide ion. Reactions of phenols: electrophillic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Riemer- Tiemann reaction

COURSE LEARNING OUTCOMES:

It will help students to understand practical aspects of Laws of Thermodynamics, chemical equilibrium and preparation and application of different Buffer solutions.Students will be able to understand oxidation states, magnetic behaviour, spectral properties and stereochemistry of elements of Transition Series.It will enhance understanding of properties and application of absorption spectrum and UV absorption spectroscopy.Structure and bonding, physical properties and prepration of Alcohol and Phenols

Reference Books

1. Unified Chemistry M. N. Tondan B.Sc. III SEM

2. Unified Practical Chemistry M. N. Tondan B.Sc. II Year

3. Unified Chemistry B.Sc. III SEM Yugbodh Publication

4. Unified Practical Chemistry B.Sc. II Year

5. Organic Chemistry Mukherjee

BLS302 Chemistry-III

PRACTICAL

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								Credit			Total Credits
			Theory				Practical				L	T	P	
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks				
1	BLS302	Chemistry-III					20	10	20	50			2	2

List of Practical

- Calibration of the fractional weights, pipettes and burettes. Preparation of standard solutions. Dilution of 0.1 M to 0.001 M solutions.
- Quantitative analysis -Volumetric analysis.
- Determination of acetic acid in commercial vinegar using NaOH.
- Determination of alkali content- antacid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permagnometry.
- Estimation of hardness of water by EDTA
- Gravimetric analysis:
- Barium as barium sulphate
- Organic Chemistry Laboratory Techniques
- Thin layer chromatography
- Determination of Rf values and identification of organic compounds.
- Separation of green leaf pigments (spinach leaves may be used).
- Preparation and separation of 2,4-dinitrophenylhydrazones of acetone, 2-butanone, hexane-2 and 3-one using toluene and light petroleum (40:6).
- Separation of a mixture of dyes using cyclohexane and ethylacetate (8:5:1.5). B. Paper chromatography: Ascending and Circular Determination of Rf values and identification of organic compounds
- Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid, leucine and glumatic acid. Spray reagent ninhydrin.
- Separation of a mixture of DL-alanine, glycine and L-lucine using nbutanol: acetic acid: water (4:1:5). Spray reagent ninhydrin.
- Separation of monosaccharides- a mixture of D-galactose and Dfructose using n-butanol: acetone: water (4:1:5). Spray reagent-aniline hydrogen pthalate.

BSCPS303 MATHEMATICS-III

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS 303	Mathematics-III	6(5-1-0)	60	20	20	-	-	100	3 hr	3 hr

OBJECTIVES

To explain students about Calculas, Theorems on limits of sequences, absolute and conditional convergence. Differential Equations-methods and properties

To explain Laplace transformations, Homogenous linear ordinary differential equations and linear differential equations

UNIT I

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion . Series of non-negative terms. Comparison test, Cauchy's integral test, Ratio test. Raabe's test ,logarithmic test. Leibnitz's theorem. Absolute and conditional convergence.

UNIT II

Continuity of functions of one variable, sequential continuity. Properties of continuous functions. Uniform continuity. Chain rule of differentiability. Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives. Limit and continuity of functions of two variables.

UNIT III

Series Solution of Differential Equations-Power series Method, Bessel's Equation Bessel's function and its properties, recurrence and generating relations. Legendre's.

UNIT IV

Laplace transformations, Linearity of the Laplace transformation, Existence theorem of Laplace transforms, Laplace transforms of derivatives and integrals. Shifting theorem . Differentiation and integration of transforms. Inverse Laplace transforms, Convolution theorem. Applications of Laplace transformation in solving linear differential equations with constant coefficients.

UNIT V

Homogenous linear ordinary differential equations, linear differential equations of second order. Transformation of the equation by changing the dependent variable and the independentVariable, Method of variation of parameters, Ordinary simultaneous differential equations.

COURSE LEARNING OUTCOMES

This paper will help students to understand application parts of Calculas, Theorems on limits of sequences, Absolute and conditional convergence. Differential Equations-methods and properties and Laplace transformations and linear differential equations

Recommended Text Books:

1. Calculus differential equation & Mechanics by Thakur,Shrivastava, Chandel & Rathore ;Ram Prasad Sons, Bhopal

2. Calculus differential equation & Mechanics by Dr. H.K. Pathak ; Shiksha Sahitya Prakashan, Meerut.

BSCFC304 APTITUDE-I

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								credit			Total Credits
			Theory				Practical							
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P	
1	BSCFC304	Aptitude - I	60	20	20	100					3	1		4

Objective: The aim of this course is to ensure that students are synthesizing the material, understanding key concepts, and making abstract connections through testing of a comprehensive nature.

Unit-1: **General Intelligence & Reasoning:** Analogy, Blood Relation, Classification, Coding-Decoding, Direction and Distance, Matrix, Non-verbal reasoning, puzzles, series.

Unit-2: General Awareness: Current affairs, Govt. Project & Scheme, Basic science and symbols, sports awareness, economics, new innovations, people in news.

Unit-3 : English Comprehension: Error spotting, one word substitution, phrases and idioms, reading comphrension, sentence correction, spelling correction.

Unit-4 : Quantitative Aptitute-I: Algebra, averages, data interpretation, interest, menusration, number systems, percentage.

Unit-5: Quantitative Aptitute-II: Ratio and proportion, problem on age, simplification, speed, distance and time, trigonometry.

Learning Outcome: Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.

Reference Books :

1. Quantitative Aptitude for Competitive Examination by Pearson edition.

2. Qunatitative Aptitude and Reasoning by R.V. Parveen.

3. Quantitative Aptitude by R. S. Agrawal

4. A Comprehensive grammar of english by G. N. Verma

5. For New and Knowledge – The Hindu, Times of India and Economics Times.

BSCFC 305 COMPUTER APPLICATIONS

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								credit			Total Credits
			Theory				Practical				L	T	P	
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks				
1	BSCFC305	Computer Applications	60	20	20	100					3	1		4

OBJECTIVE

To explain students about basics of computer, memory devices in computer, MS DOS, windows, MS word, Excel and power point.

UNIT-I:

Basics of Computers **:**Definition of a Computer - Characteristics and Applications of Computers Block Diagram of a Digital Computer – Classification of Computers based on size and working Central Processing **UNIT** – I/O Devices.

UNIT II

Primary, Auxiliary and Cache Memory – Memory Devices. Software, Hardware, Firmware and People ware – Definition and Types of Operating System – Functions of an Operating System – MS-DOS – MS Windows – Desktop, Computer, Documents, Pictures, Music, Videos, Recycle Bin, Task Bar – Control Pane.

UNIT III

Features of MS-Word – MS-Word Window Components – Creating, Editing, Formatting and Printing of Documents – Headers and Footers – Insert/Draw Tables, Table Auto format – Page Borders and Shading – Inserting Symbols, Shapes, Word Art, Page Numbers, Equations – Spelling and Grammar – Thesaurus – Mail Merge

UNIT IV:

Features of PowerPoint – Creating a Blank Presentation - Creating a Presentation using a Template - Inserting and Deleting Slides in a Presentation – Adding Clip Art/Pictures -

Inserting Other Objects, Audio, Video - Resizing and Scaling of an Object – Slide Transition – Custom Animation

UNIT-V

MS-Excel: Overview of Excel features – Creating a new worksheet, Selecting cells, Entering and editing Text, Numbers, Formulae, Referencing cells – Inserting Rows/Columns – Changing column widths and row heights, auto format, changing font sizes, colors, shading.

COURSE LEARNING OUTCOMES
Students will be able to understand practical aspects of basics of computer, functions of operating systems, memory devices in computer, MS DOS, windows, MS word, table preparation, page set up, Excel and power point.

Reference Books:
1. Fundamentals of Computers by ReemaThareja, Publishers : Oxford University Press, India
2. Fundamentals of Computers by V.Raja Raman, Publishers : PHI
3. Microsoft Office 2010 Bible by John Walkenbach, Herb Tyson, Michael R.Groh and FaitheWempen, Publishers : Wiley

IV SEMESTER
BSCPS401 Physics-IV

Subject Code	Subject Name	Credits	Maximum marks Allotted					Total	Duration of Exam.	
			Theory			Practical			Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS401	Physics-IV	6(3-1-2)	60	20	20	20	30	150	3 hr	3 hr

OBJECTIVE
To explain about characteristics of waves, Group velocity, Noise and Music, different theories of Geometrical Optics, Aberration in images, Interference of light; The principle of superposition, Fresnel Diffraction.

UNIT I
Waves: Waves in Media; Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical measurements. Waves over liquid surface; gravity waves and ripples. Group velocity and phase velocity, their measurements. Superposition of waves, Linear homogeneous equations and the superposition principle, idea of nonlinear waves, non-validity of superposition principle and consequences. Standing waves, Standing waves as normal modes of bounded systems, examples, harmonics and the quality of sound, examples. Chladni's figures and vibrations of a drum. Production and detection of ultrasonic and infrasonic waves and applications.

UNIT-II
Acoustics: Noise and Music , The human ear and its responses , limits of human audibility, intensity and loudness, bel and decibel, the musical scales, temperament and musical instrument. Reflection, refraction and diffraction of sound; Acoustic impedance of a medium, percentage reflection and refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging. Applied acoustics : Transducers and their characteristics. Recording and reproduction of sound, various systems, measurements of frequency, waveform, intensity and velocity. The acoustics of halls, reverberation period, Sabine's formula.

UNIT-III
Geometrical Optics: Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications. General theory of image formation: cardinal points of an optical system, general relationships for thick lens and lens combinations, Lagrange equation of magnification, telescopic combinations, telephoto lenses and eyepieces. Aberration in images: Chromatic aberrations, achromatic combination of lenses in contact and separated lenses. Monochromatic

aberrations and their reductions; aspherical mirrors and Schmidt corrector plates, aplanatic points, oil immersion objectives, meniscus lens. Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces.

UNIT-IV
Interference: Interference of light; The principle of superposition, twoslit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Rayleigh refractometer and other applications. Localised fringes; thin films, interference by a film with two non-parallel reflecting surfaces, Newton's rings. Haidinger fringes (Fringes of equal inclination). Michelson interferometer, its application for precision determination of wavelength, wavelength difference and the width of spectral lines. Intensity distribution in multiple beam interference, Fabry-Perot interferometer and etalon.

UNIT-V
Fresnel Diffraction : Fresnel half period zones, plates, straight edge, rectilinear propogation. Fraunhoffer Diffraction: Diffraction at a slit, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscope. Outline of phase contrast microscopy. Diffraction & Polarization : Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating, reflection grating and blazed gratings. Concave grating and different mountings. Resolving power of a grating and comparison with resolving powers of prism and of a Fabry-Perot etalon. Double refraction and optical rotation: Refraction in uniaxial crystals, its electromagnetic theory. Phase retardation plates, double image prism. Rotation of plane of polarization, origin of optical rotation in liquids and in crystals

COURSE LEARNING OUTCOMES
It will help students to understand about To explain about charecterstics of waves, Group velocity, Noise and Music, different theories of Geometrical Optics, Aberration in images, Interference of light; The principle of superposition, Fresnel Diffraction.

TEXT/ REFERENCE BOOKS
1. Waves and Oscillations by S. P. Puri.
2. Waves and Oscillations by Brijlal and Subramanayam.
3. Vibration and Waves by I.G.Main
4. The Physics of Vibration and Waves by H.J.Tain (MacMillan 1975)
5. Optics by A.K.Ghatak

BSCPS401 Physics-IV

Practical

Subject Code	Subject Name	Credits	Maximum marks Allotted					Total	Duration of Exam.	
			Theory			Practical			Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS401	Physics-IV	2	-	-	-	20	30	50		3 hr

Practicals:

1. Study of interference using biprism.

2. Study of diffraction at straight edge.

3. Use of diffraction grating and it's resolving limit.

4. Resolving power of telescope.

5. Polarization by reflection.

6. Study of optical rotation.

7. Refractive index and dispersive power of prism using spectrometer.

8. Speed of waves on a stretched string

9. Measurement of sound intensities with different situation

10. Characteristics of a microphone & loudspeaker system.

BLS402 Chemistry-IV

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								credits			Total Credits
			Theory				Practical				L	T	P	
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks				
1	BLS402	Chemistry-IV	60	20	20	100	20	10	20	50	4	0	2	2

OBJECTIVE

To explain students about Phase equilibrium Statement, Solid solutions, Liquid-liquid mixtures.
To explain about baics of electro chemistry, Migration of ions, Electrolytic and Galvanic cells; Chemistry of Lanthanides Elements; Chemistry of Actinides
Objective of this course is to explain about Nomenclature, structure, synthesis of Aldehydes and ketones, Carboxylic Acids and Synthesis of acid chlorides, esters and amides

Physical Chemistry
UNIT I

Phase equilibrium Statement and the meaning of the terms: phase component and the degree of freedom, derivation of the Gibbs phase rule. Phase equilibria of one component system: water, CO_2 and S system. Phase equilibria of two component system: solid liquid equilibria, simple eutectic: Bi-Cd, Pb-Ag system, desiliverisation of lead.

Solid solutions: compound formation with congruent melting point (Mg-Zn) and incongruent melting point,(NaCl-H2O) (FeCl3-H2O) and (CuSO4-H2O) system. Freezing mixtures, acetone-dry ice.

Liquid-liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system azeotropes: HCl-H2O and ethanol water systems.

UNIT-II

Electrochemistry Electrical transport- conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of specific conductance and equivalent conductance with dilution.

Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number: Definition and determination by Hittorf method and moving boundary method. Nernst equation, derivation of cell E.M.F and single electrode potential, standard hydrogen electrode-reference electrodes-standard electrode potential, sign conventions, electrochemical series and its

significance. Electrolytic and Galvanic cells, reversible and irreversible cells. Conventional representation of electrochemical cells.

UNIT III

Inorganic chemistry

Chemistry of Lanthanides Elements: electronic structure, oxidation states, ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds. Chemistry of Actinides: General features and chemistry of actinides, chemistry of sepatration of Np, Pu and Am from U, Similarities between the later actinides and later lanthanides.

Organic Chemistry

UNIT IV

Aldehydes and ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes and ketones from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophillic additions to carbonyl group with particular emphasis on benzoin, aldol perkin and knovenagel condensations..Wittig reaction, Mannich reaction.

UNIT V

Carboxylic Acids: Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids, reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction.

Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: Methods of formation and chemical reactions of halo acids, hydroxyl acids, malic, tartaric and citric acids.

COURSE LEARNING OUTCOMES

1. It will help students to understand about Phase equilibrium Statement, Solid solutions, Liquid-liquid mixtures.
2. Students will be able to understand basics of electro chemistry, Migration of ions, Electrolytic and Galvanic cells; Chemistry of Lanthanides Elements; Chemistry of Actinides
3. Students will be able to understand about Nomenclature , structure, synthesis of Aldehydes and ketones, Carboxylic Acids and Synthesis of acid chlorides, esters and amides

References books

1. Unified Chemistry M. N. Tondan B.Sc. IV SEM
2. Unified Practical Chemistry M. N. Tondan B.Sc. II Year
3. Yugbodh Publication Unified Chemistry B.Sc. IV SEM
4. Yugbodh Publication Unified Practical Chemistry B.Sc. II Year

BLS402 Chemistry-IV

PRACTICAL

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								credits			Total Credits
			Theory				Practical							
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P	
1	BLS402	Chemistry-IV					20	10	20	50			2	2

List of Practical

Qualitative analysis
1. Identification of an organic compound through the functional group analysis,determination of melting point and preparation of suitable derivatives.
2. Determination of transition temperature of given substance by thermometric, dialometric method (e.g.) ($MnCl_2 \times 4H_2O$/$SrBr_2 \times 2H_2O$).

Phase equilibrium
1. To study the effect of solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquid (e.g., phenol water system) and to determine the concentration of that soluble in phenol water system.
2. To construct the phase diagram of two component (e.g., diphenyl amine benzophenone) by cooling curve method.

Thermochemistry
To determine the enthalpy of neutralization of weak acid/weak base versus strong acid/ strong base and determine the enthalpy of ionization of the weak acid/ base.

Inorganic chemistry-Quantitative Volumetric Analysis
1. Estimation of ferrous and ferric by dichromate method.
2. Estimation of copper using thiosulphate.

BSCPS403 Mathematics-IV

Subject Code	Subject Name	Credits	Maximum marks Allotted					Total	Duration of Exam.	
			Theory			Practical			Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS403	Mathematics-IV	6(5-1-0)	60	20	20	-	-	100	3 hr	-

OBJECTIVE

To explain about Partial differentiation, Maxima, minima and saddle points of functions of two variables, Partial Differential equations of the first order, Complex numbers as ordered pairs, Group-Automorphisms and inner automorphism

UNIT I

Partial differentiation. Change of variables. Euler's Theorem on homogeneous function, Taylor's theorem for functions of two variables. Jacobians, Envelopes, Evolutes.

UNIT II

Maxima, minima and saddle points of functions of two variables. Beta and Gamma functions. Double and triple integrals. Dirichlet's integrals.

UNIY III

Partial Differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than general methods. Charpit's general method of solution, Partial differential equations of second and higher orders. Homogeneous and non- Homogeneous equations with constant coefficients. Partial differential equations reducible to equations with constant coefficients.

UNIT IV

Complex numbers as ordered pairs. Geometric representation of Complex numbers, Continuity and differentiability of Complex functions. Analytical function, Cauchy Riemann equation, Harmonic function, Mobius transformations, fixed point, cross ratio.

UNIT V

Group-Automorphisms, inner automorphism. Group of Automorphism, Conjugacy relation and centraliser. Normaliser. Counting principle and the class equation of a finite group. Cauchy's theorem for finite abelian groups and non abelian groups. Ring homomorphism. Ideals and Quotient Rings

COURSE LEARNING OUTCOMES

Students will be able to understand Partial differentiation, Maxima, minima and saddle points of functions of two variables, Partial Differential equations of the first order, Complex numbers as ordered pairs, Group-Automorphisms, inner automorphism and Group of Automorphism

REFERENCE BOOKS:

1. Advanced Calculus, Partial Differential Equations, Complex Analysis And Abstract Algebra By Thakur,Shrivastava, Chandel & Rathore ;Ram Prasad Sons, Bhopal

2. Advanced Calculus, Partial Differential Equations, Complex Analysis And Abstract Algebra By Dr. H.K. Pathak ; Shiksha Sahitya Prakashan, Meerut.

BSCFC 404 Internet Fundamentals and Web Tools

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted									credits			Total Credits
			Theory				Practical								
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P		
1	BSCFC404	Internet Fundamentals And Web Tools	60	20	20	100					3	1			4

OBJECTIVE

To explain about fundamental of internet, Web Site Address, Searching the Internet, basics of Emails, Web Applications, Web Terminologies and Basic HTML.

UNIT-I: Fundamentals of Internet : Networking Concepts, Data Communication – Types of Networking, Internet and its Services, Internet Addressing – Internet Applications – Computer Viruses and its types – Browser –Types of Browsers.

UNIT-II: Internet applications: Using Internet Explorer, Standard Internet Explorer Buttons, Entering a Web Site Address, Searching the Internet – Introduction to Social Networking: twitter, tumblr, Linkedin, facebook, flickr, skype, yelp, vimeo, yahoo!, google+, youtube, WhatsApp, etc.

UNIT-III : E-mail : Definition of E-mail - Advantages and Disadvantages – UserIds, Passwords, Email Addresses, Domain Names, Mailers, Message Components, Message Composition, Mail Management,Email Inner Workings.

UNIT IV: WWW- Web Applications, Web Terminologies, Web Browsers,URL– Components of URL, Searching WWW – Search Engines and Examples

UNIT-V: Basic HTML: Basic HTML – Web Terminology – Structure of a HTML Document – HTML, Head and Body tags – Semantic and Syntactic Tags – HR, Heading, Font, Image and Anchor Tags –Different types of Lists using tags – Table Tags, Image formats – Creation of simple HTML Documents.

COURSE LEARNING OUTCOME

Students will be able to understand prac tical aspects of internet, Web Site Address, Searching the Internet, basics of Emails, Web Applications, Web Terminologies and Basic HTML.

Reference Books:
1. In-line/On-line : Fundamentals of the Internet and the World Wide Web, 2/e – by Raymond Greenlaw and Ellen Hepp, Publishers : TMH

BSCFC 405 Aptitude - II

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted								credit			Total Credits
			Theory				Practical							
			End Sem	Mid Sem. MST	Quiz, Assignment	Total Marks	Lab Work	Assignment /Quiz/Term paper	End Sem	Total Marks	L	T	P	
1	BSCFC405	Aptitude II	60	20	20	100					3	1	-	4

Objective: The aim of this course is to introduce to student the basic concepts related of Aptitude which can form foundation to understanding advanced concepts in managing an organization.

Unit-1 General Intelligence & Reasoning: Word formation, Arranging words in Logical order or Dictionary order, Venn diagram, Missing Number, Forecasting, Blood Relation, verbal reasoning.

Unit-2 General Awareness: Static general knowledge, Biology, Chemistry, Physics + Space Science, Computer & Mobile Technology, Diseases, Pollution & Nutrition, people in news, Govt. Project & Scheme News reading.

Unit-3 English comprehension: Spelling, Fill in the blank, Word replacement, Error spotting, one word substitution, phrases and idioms, reading comprehension, sentence correction.

Unit-4 Quantitative Aptitude-I: Classification, data interpretation, compound interest, menusration, number systems, percentage, probability Problem in age.

Unit-5 Quantitative Aptitude-II: Simplification, speed, distance and time, trigonometry, mixture problem, geometry- Squares, cuboid, Problem in triangle.

Learning Outcome: Students will be able to apply quantitative aptitude, logical reasoning, English comprehension and trigonometrya understand and solve the problems.

Reference Books:

1. Quantitative Aptitude for Competitive Examination by Pearson edition.

2. Quantitative Aptitude and Reasoning by R.V. Parveen.

3. Quantitative Aptitude by R. S. Agrawal

4. A Comprehensive grammar of english by G. N. Verma

Department of science

Subject Code	Subject Name	Credits	Maximum marks Allotted					Duration of Exam.		
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS 501	**PHYSICS-V**	6(4-0-2)	60	20	20	30	20	150	3 hr	3 hr

Pattern:

The question paper will consist of 8 questions. Out of Which Candidate have to attempt any 5 questions . Each question will Carry two parts 'A'(6 marks) and ' B'(6 marks) both are compulsory .One question will have 12 marks

Syllabus

Theory:

Unit-1 Theory of Relativity:

Reference systems, inertial frames, Galilian Invariance and conservation laws, propagation of light, Michelson-Morley experiment; search for ether. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass - energy equivalence, particle with zero rest mass. Origin of Quantum Theory: Failure of classical physics to explain the phenomena such as a black-body spectrum, photoelectric effect , Ritz combination principle in spectra. stability of an atom,Planck's radiation law, Einstein's explanation of photoelectric effect. Bohr's quantization of angular momentum and its application to hydrogen atom, limitations of Bohr's theory.

Unit-2 Quantum Mechanics: Wave-particle duality and uncertainty principle; de Broglie's hypothesis for matter waves; the concept of wave and group velocities, evidence for diffraction and interference of particles, experimental demonstrations of matter waves. Consequence of de Brogile's concepts; quantization in hydrogen atom; energies of a particle in a box, wave packets, Heisenberg's uncertainty relation for p and x, its extension to energy and time. Consequence of the uncertainty relation; gamma ray microscope, diffraction at a slit, particle in a box, position of an electron in a Bohr's orbit, Schrödinger's equation. Postulates of quantum mechanics; operators, expectation values, transition probabilities, applications to a particle in one and three dimensional boxes, harmonic oscillator, reflection at a step potential, transmission across a potential barrier.

Unit-3 Atomic Physics: Solution of Schrodinger equation for Hydrogen atom; natural occurrence of quantum numbers-n, l and m, the related physical quantities. Spectra of hydrogen, deuteron and alkali

atoms spectral terms, doublet fine structure. screening constants for alkali spectra for s,p,d and f states, selection rules, Singlet and triplet fine structure in alkaline earth spectra. L-S and J-J couplings.

Weak Spectra: Continuous X-ray spectrum and its dependence on voltage, Duane and Hundt's law. Characteristic X-rays. Moseley's law; doublet structure of X-ray spectra. X-ray absorption spectra.

Unit-4 Molecular Spectra : Discrete set of electronic energies of molecules, quantization of vibrational and rotational energies, determination of internuclear distance, pure rotational and rotation-vibration spectra Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Spectroscopy : Raman Effect, Stokes and anti-stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman Spectroscopy. Spectroscopic techniques: Sources of excitation, prism and grating spectrographs for visible, UV and IR, absorption spectroscopy, double beam instruments, different recording systems.

Unit-5 Nuclear Physics: Interaction of charged particles and neutrons with matter, working of nuclear detectors, G-M counter, proportional counter,scintillation counter, cloud chamber, spark chamberand emulsions technique. Structure of nuclei, basic properties (I, μ, Q and binding energy), deuterium binding energy, p-p and n-p scattering and general concepts of nuclear forces. Beta decay, range of alpha particle, Geiger-Nuttal law. Gamow's explanation of alpha decay, beta decay, continuous and discrete spectra. Nuclear reactions, channels, compound nucleus, direct reaction (concepts).Shell model, Liquid drop model, Nuclear fission and fusion (concepts), energy production in stars by p-p and carbon - nitrogen cycles (concepts).

Practicals:

1. Determination of Planck's constant.

2. Determination of e/m using Thomson's method.

3. Determination of e by Millikan's method.

4. Study of spectra of hydrogen and deuterium (Rydberg constant and ratio of masses electron to proton.

5. Absorption spectrum of iodine vapour.

6. Study of alkali or alkaline earth spectra using concave grating.

7. Study of Zeeman effect for determination of Lande g-factor.

8. Study of Raman spectrum using laser as an excitation source.

9. Determination of percentage of absorption of light by photometer

Reference Books:

1. Quantum Physics of Atoms, Molecules, Solids, Nuclear and Particles by Eisenberg and Resnik, John Wiley and sons.

2. Quantum Mechanics by Satya Prakash

3. Atomic Physics by J.B.Raja

4. Modern Physics by R. Murugeshan, K. Shiva Erasath

5. Introduction to Atomic Physics by H.E. White

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Subject Code	Subject Name	Credits			Maximum marks Allotted								Duration of Exam.	
					Theory				Practical				Theory	Practical
			End Sem	Mid Sem	Assign.	Total	Lab Work	Term work	End sem	Total				
BSCPS 502	Chemical Kinetics , Spectroscopy and state of matter	6	60	20	20	100			50	150			3 hr	3hr

Course – BSc(Physical science)　　　　　**Subject Code – BSCPS 502**

Semester – V　　　　　**Subject – Chemical Kinetics , Spectroscopy and state of matter**

Physical Chemistry

UNIT I

Spectroscopy - I

(a) Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

(b) Rotational spectrum of diatomic molecules. Energy levels of a rigid rotator (semi classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotator, isotope effect.

(c) Raman spectrum, concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, application of Raman spectrum.

Spectroscopy - II

(a) UV Spectroscopy : Electronic excitation, elementary idea of instrument used, Applications to structure determination of organic molecules. Woodward-Fieser rule for determining max of , -unsaturated carbonyl compounds.

(b) Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

UNIT -II

(a) Solutions, dilute solutions and colligative properties-I Ideal and non ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solutions- colligative properties. Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurements, determination of molecular weight from osmotic pressure.

(b) Solutions, dilute solutions and colligative properties-II Elevation of boiling point and depression of freezing point. Thermodynamic derivation of relation between molecular weight and elevation of boiling point and depression in freezing point. Experimental methods of determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solute.

UNIT III (inorganic Chemistry)

Oxidation and Reduction

Electrode potential, electrochemical series and its applications, Principles involved in the extraction of the elements. .

Acids and Bases Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concept of acids and bases. Hard and Soft Acids and Bases (HSAB) Classification of acids and bases as hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness, Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Gravimetric Analysis Principles of gravimetric estimation, supersaturation, co-precipitation, post-precipitation and Ash treatment with respect to the estimation of Ba, Zn and Cu.

Water Analysis Hardness, types of hardness-Temporary, permanent and total hardness, acidity and alkalinity, BOD, COD and DO.

Non-aqueous Solvents Physical properties of a solvent, types of solvents and their general characteristics, Reactions in non aqueous solution with refrence liquid NH_3 and Liquid so_2

UNIT IV (Organic Chemistry)

Electromagnetic Spectrum Absorption

Spectra Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law); molar absroptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome, Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. U.V. spectra of conjugated enes and enones.

Infrared (I.R.) absorption spectroscopy – molecular vibrations, Hooke's law, selection rules, intensity and position of I.R. bands, measurement of I.R. spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of I.R. spectra of simple organic compounds.

UNIT V

Organic Compounds of Nitrogen:

Preparation of nitroalkanes and nitroarenes, Chemical reactions of nitroalkanes. Mechanisms of nuclephilc substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid. Halonitroarenes: reactivity, Structure and nomenclature of amines, physical properties, Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines.

Amine salts as phase-transfer catalysts, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrities), reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines, electrophilic aromatic substituton in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling.

Reference books

1. Unified Chemistry M. N. Tondan B.Sc. V SEM
2. Unified Practical Chemistry M. N. Tondan B.Sc. III Year
3. Yugbodh Publication Unified Chemistry B.Sc. V SEM
4. Yugbodh Publication Unified Practical Chemistry B.Sc. III Year
5. P. S. Kalsi Soectroscopy of organic compounds
6. Bioinorganic Bioorganic Chemistry : Herman Dugas
7. Practical Chemistry : Vogel

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Department of science B.Sc. V Sem

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS503	Mathematics V	6(5-1-0)	70	20	10	-	-	100	3 hr	-

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions and carry 10 marks. Remaining five questions carry 12 marks each, one from each of the five units of the syllabus and will have internal choice. These five questions will have two parts A & B, Candidates are required to answer all questions.

Syllabus

Unit -1: Riemann integral, Integrability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorems of integral calculus, Partial derivatives and differentiability of real-valued functions of two variables.

Unit -2: Schwarz and Young's theorem, Implicit function theorem, Fourier series of half and full intervals, Improper integrals and their convergence, Comparison test, Abel's and Dirichlet's tests, Frullani's integral, Integral as a function of a parameter.

Unit -3: Definition and examples of vector spaces, subspaces, Sum and direct sum of subspaces. Linear span, Linear dependence, independence and their basic properties. Basis, Finite dimensional vector spaces, Existence theorem for basis, Invariance of the number of elements of a basis set, Dimension, Dimension of sums of vector subspaces.

Unit -4 Linear transformations and their representation as matrices, The Algebra of linear transformations, The rank- nullity theorem, Eigen values and eigen vectors of a linear transformation, Diagonalisation. Quotient space and its dimension.

Unit -5: Binary Relations, Equivalence Relations, Partitions and Partial Order Relation . Graphs, Multigraphs, Weighted Graphs, Paths and Circuits, Shortest Paths. Trees and their properties.

Reference Books:

1. REAL ANALYSIS, LINEAR ALGEBRA AND DISCRETE MATHEMATICS by THAKUR,SHRIVASTAVA, CHANDEL & RATHORE ;RAM PRASAD SONS, BHOPAL

2. Real analysis , Linear algebra and Discrete Mathematics by Dr. H.K. Pathak ; Shiksha Sahitya Prakashan, Meerut.

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS504	HINDI (BHASHA KAUSHAL EVAM SANCHAR SADHAN)	6(5-1-0)	70	20	10	-	-	100	3 hr	-

इकाई - 1

1. भारतीय संस्कृति

2. भारतीय समाज व्यवस्था

3. सभ्यता एव संस्कार

4. वैश्विक चेतना

5. समन्वयीकरण (भारतीय एव अंतर्राष्ट्रीय सदंर्भ में)

इकाई - 2

1. धर्म

2. न्याय

3. दर्शन

4. नीति

5. साहित्य

इकाई - 3

1. संचार संसाधन : सम्पर्क के नए क्षितिज

2. समाचार पत्र

3. भारतीय प्रेस परिषद्

4. रेडियो

5. दूरदर्शन

इकाई - 4

1. सिनेमा

2. रंगमंच

3. सगींत

4. चित्र, मूर्ति, स्थापत्य कला

5. शिल्प कला

इकाई - 5

1. कम्प्यूटर

2. दूरभाष: विज्ञान की सौगात

3. मत्रं (कहानी): प्रेमे चदं

4. मातृभूमि (कविता): मैथिलीशरण गुस

6. साहित्यकार का दायित्व: डॉ. प्रेम भारती

संदर्भ पुस्तक – मध्यप्रदेश हिन्दी ग्रंथ अकादमी भोपाल द्वारा प्रकाशित पुस्तक

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS 505	Visual Basic	2	35	10	5	-	-	50	3 hr	3 hr

UNIT 1: Introduction to VB.NET: Event Driven Programming, NET as better Programming Platform, NET Framework, NET Architecture, The Just-In-Time Compiler, NET Framework class library

UNIT 2: VB.NET Development Environment: Creating Applications, Building Projects, Using simple components, Running VB.NET applications

UNIT 3: Mastering VB Language: Data, Operators, Conditionals and Loops, Procedures, Error Handling, Classes and Objects.

UNIT 4: Windows Applications in VB .NET: Windows Forms, Text Boxes, Buttons, Labels, Check Boxes, and Radio Buttons, List Boxes, Combo Boxes, Picture Boxes, Scrollbars, Splitters, Timer Menus, Built-in Dialogs, Image List, Tree Views, List Views, Toolbars, Status Bar and Progress bars.

UNIT 5: Object Oriented Programming in VB .NET: Class and Object, Properties, methods, Constructors and Destructors, Method overloading, Inheritance, Access modifiers Overloading and Overriding, Interfaces, Polymorphism.

Suggested Reading:

Starting Out with Visual Basic 2012, 6th Edition. Gaddis. Addison-Wesley. ISBN: **978-0133128086**.

Department of Science

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS 601	**PHYSICS-VI**	6(4-0-2)	60	20	20	30	20	150	3 hr	3 hr

Pattern:

The question paper will consist of six questions. Question no. 1 will have 10 objective type questions and carry 10 marks. Remaining five questions carry 12 marks each, one from each of the five units of the syllabus and will have internal choice. These five questions will have two parts A & B, Candidates are required to answer all questions.

Syllabus

Theory:

Unit-1 Overview: Crystalline and glassy forms, liquid crystals, glass transition. Crystal structure: Periodicity, lattices and bases, fundamental translation vectors, unit cell, Wigner-Seitz cell, allowed rotations, lattice types, lattice planes. Common crystal structures. Laue's theory of X-ray diffraction, Bragg's law, Laue patterns. Bonding: Potential between a pair of atoms; Lennard-Jones potential, concept of cohesive energy, covalent, Vander Waal, ionic and metallic crystals Magnetism: Atomic magnetic moment, magnetic susceptibility, Dia, Para and Ferromagnetism, Ferro magnetic domains. Hysteresis.

Unit-2 Thermal properties: Lattice vibrations, simple harmonic oscillator, second order expansion of Lennard-Jones potential about the minimum, vibrations of one dimensional monoatomic chain under harmonic and nearest neighbour interaction approximation. Concept of phonons, density of modes (1-D). Debye model; Lattice specific heat low temperature limit, extension (conceptual) to 3-D. Band Structure: Electrons in periodic potential; nearly free electron model (qualitative), energy band, energy gap, metals, insulators, semiconductors. Motion of electrons: Free electrons, conduction electrons, electron collisions, mean free path, conductivity and Ohm's law. Density of states. Fermi energy, Fermi velocity, Fermi-Dirac distribution.

Unit-3 Semiconductors: Semiconductors ; Intrinsic-semiconductors, electrons and holes, Fermi Level , Temperature dependence of electron and hole concentrations. Doping: impurity states, n and p type semiconductors, conductivity, mobility, Hall Effect, Hall Coefficient. Semiconductor devices: Metal-semiconductor junction, p-n junction, majority and minority carriers, diode, Zener and tunnel diodes, light emitting diode, transistor, solarcell. Power supply: Diode as a circuit element, load line concept, rectification, ripple factor, Zener diode, voltage stabilization, IC voltage regulation. Transistors : Characteristics of a transistor in CB, CE and CC mode, graphical analysis of the CE configuration, low frequency equivalent circuits, h-parameters, bias stability, thermal runaway.

FETs: Field effect transistors, JFET volt-ampere curves, biasing JFET, ac operation of JFET, source follower. MOSFET, biasing MOSFET, FET as variable voltage resister.

Unit-4 Amplifiers- I: Small signal amplifiers ; General Principle of operation, classification, distortion, RC coupled amplifier, gain frequency response , input and output impedance, multistage amplifiers. Amplifier- II: Transformer coupled amplifiers, Equivalent circuits at low, medium and high frequencies, emitter follower, low frequency common source and common drain amplifier, Noise in electronic circuits. Oscillators: Feedback in amplifiers, principle, its effects on amplifiers, characteristics. Principle of feedback amplifier, Barkhausen criteria, Hartley, Colpitt and Wein bridge oscillators.

Unit-5 Laser: Laser system: Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients. Spontaneous and induced emissions, conditions for laser action, population inversion. Types of Lasers (gas and solid state), Pulsed lasers and tunable lasers, spatial coherence and directionality, estimates of beam intensity, temporal coherence and spectral energy density.

Practicals:

1. Characteristic of a transistor.

2. Characteristic of a tunnel diode.

3. Hysteresis curve a transformer core.

4. Hall probe method for measurement of resistivity.

5. Specific resistance and energy gap of a semiconductor.

6. Study of voltage regulation system.

7. Study of regulated power supply.

8. Study of Lissajos figures using a CRO.

9. Study of VTVM.

10. Study of RC coupled amplifiers

11. Analysis of a given band spectrum.

12. Study of crystal faces.

13. Study of laser as a monochromatic coherence source

Reference Books:

1. Introduction to Solid State Physics C. Kittel

2. Micro Electronics J- Millman and A. Grabel

3. Electronic Devices and Circuits : Millman Halkias

4. Laser and Nonlinear Optics by B.B. Laud

5. Laser by Svelte

(Board of studies)   **(Academic Council)**   **(Registrar)**

Seal

Department of Science B.Sc. VI Sem.

Subject Code	Subject Name	Credits	Theory				Practical				Duration of Exam.	
			End Sem	Mid Sem	Assign.	Total	Lab Work	Term work	End sem	Total	Theory	Practical
BSCPS 602	Quantum Chemistry, Bioinorganic and Organometalic compound	6	60	20	20	100	20	10	20	50	3 hr	3hr

Course – BSc(life science)   **Subject Code – BSCLS 602**

Semester – VI   **Subject – Quantum Chemistry, Bioinorganic and Organometalic compound**

UNIT – I

Physical Chemistry :

Introductory Quantum Mechanics: Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (without derivation) their solution of overall solution and its defects, Compton effect, de-Broglie's hypothesis, the Heisenberg's uncertainty principle, Hamiltonian Operator.

UNIT – II

Elementary Quantum Mechanics:

Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO – H2 + ion, calculation of energy levels from wave functions, physical picture of bonding and anti-bonding wave functions, concept of σ, σ*, π, π* orbitals and their characteristics, Hybrid orbitals – sp, sp3 , sp2 , calculation of coefficients of A.O's used in sp and sp2 hybrid orbitals and interpretation of geometry. Introduction to valence bond model of H2, comparison of M.O. and V.B. models.

Inorganic Chemistry :

UNIT –III

Organometallic Chemistry Definition, nomenclature and classification of organometallic compounds, Preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Snl. Metal carbonyls: 18 electron rule, preparation, structure and nature of bonding in the mononuclear carbonyls**.**

Silicones and Phosphazenes

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin, Biological role of alkali and alkaline earth metal ions with special reference to Ca2+ .

UNIT – IV Organic Chemistry :

Organometallic Compounds

Organomagnesium compounds : the Grignard reagents, formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

Organosulphur Compounds Nomenclature, structural formation, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and Sulphaguanidine**.**

Hetrocyclic Compounds Introduction : Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution, Mechanism of nucleophilic substitution reaction in pyridine derivatives, Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six membered heterocycles, Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis, Mechanism of electrophilc substitution reactions of indole, quinoline and isoquinoline.

UNIT –V

Synthetic Polymers

Addition or chain-growth polymerization, Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers, Condensation or step growth-polymerization,

Polyesters, plyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes, Natural and synthetic rubbers, Elementary idea of organic conducting polymers.

Synthetic Dyes

Colour and constitution (electronic Concept), Classification of dyes, Chemistry and synthesis of Methyl orange, Congo red, Malachite green, crystal violet, phenolphthalein, fluorescein, Alizarin and Indigo.

B.Sc. – V sem (PRACTICAL)

Inorganic Chemistry :

Instrumentation:

Colorimetry

(a) Job's method

(b) Mole-ratio method Adulteration – Food stuffs.

Effluent analysis, water analysis Solvent

Extraction Separation and estimation of Mg(II) and Fe(II) Ion Exchange Method Separation and estimation of Mg(II) and Zn(II)

Organic Chemistry :

Synthesis of Organic Compounds

(a) Acetylation of salicylic acid, aniline, glucose and hydroquinone, Benzoylation of aniline and phenol (b) Aliphatic electrophlic substitution Preparation of iodoform from ethanol and acetone

(c) Aromatic electrophilic substitution Nitration Preparation of m-dinitrobenzene Preparation of p-nitroacetanilide Halogenation Preparation of p-bromoacetanilide Preparation of 2, 4, 6-tribromophenol (d) Diazotization/coupling Preparation of methyl orange and methyl red

(e) Oxidation Preparation of benzoic acid from toluence

(f) Reduction Preparation of aniline from nitrobenzene Preparation of m-nitroaniline from m-dinitrobenzene

Physical Chemistry

Colorimetry:

1. To verify Beer – Lambert Law for KMnO4/K2Cr2O7 and determining the concentration of the given solution of the substance from absorption measurement.

Reference books

1. Unified Chemistry M. N. Tondan B.Sc. VI SEM
2. Unified Practical Chemistry M. N. Tondan B.Sc. III Year
3. Yugbodh Publication Unified Chemistry B.Sc. VI SEM
4. Yugbodh Publication Unified Practical Chemistry B.Sc. III Year
5. Advanced Inorganic Chemistry: F. A. Cotton
6. Peter Atkins Inorganic Chemistry

Department of Science B.Sc. VI Sem.

Subject Code	Subject Name	Credits	Maximum marks Allotted					Total	Duration of Exam.	
			Theory			Practical			Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS603	Mathematics -VI	6(5-1-0)	70	20	10	-	-	100	3 hr	-

Pattern: The question paper will consist of six questions. Question no. 1 will have 10 objective type questions and carry 10 marks. Remaining five questions carry 12 marks each, one from each of the five units of the syllabus and will have internal choice. These five questions will have two parts A & B, Candidates are required to answer all questions.

Syllabus

Unit -1: Definition and examples of metric spaces. Neighbourhoods. Limit points. Interior points. Open and closed and interior. Boundary points. Subspace of a metric space. Cauchy sequences. Completeness, Cantor's intersection theorem, Contraction principle. Real numbers as a complete ordered field. Dense subsets. Baire Category sets. Closure theorem. Separable, first and second countable spaces.

Unit -2: Continuous functions. Extension theorem. Uniform continuity. Compactness, Sequential compactness. Totally bounded spaces, Finite intersection property. Continuous functions and compact sets. Connectedness

Unit -3: Solution of Equations: Bisection. Secant, Regula Falsi. Newton, Method. Roots of second degree Polynomials, Interpolation, Lagrange interpolation, Divided Differences, Interpolation formulae using Differences, Numerical Quadrature, Newton-Cote's Formulae, Gauss Quadrature Formulae.

Unit -4: Linear Equations: Direct Methods for Solving Systems of Linear Equations (Guass elimination, LU Decomposition. Cholesky Decomposition), Iterative methods (Jacobi. Gauss - Seidel Reduction Methods). Ordinary Differential Equations: Euler Method, Singlestep Methods, Runge-Kutta's Method, Multi-step Methods, Milne-Simpson Method. Methods Based on Numerical Integration, Methods Based on numerical Differentiation.

Unit -5 ELEMENTARY STATITICS Measures of dispersion-range, inter quartile range, Mean deviation, Standard deviation, moments, skewness and kurtosis. Probability, Continuous probability, probability density function and its applications (for finding the mean, mode, median and standard deviation of various continuous probability distributions) Mathematical expectation, expectation of sum and product of random variables. Theoretical distribution- binomial, Poisson distributions and their properties and use, Moment generating functions.

Reference Text Books:

1. Metric space numerical analysis and optional by Thakur,Shrivastava, Chandel & Rathore ;Ram Prasad Sons, Bhopal

2. Metric space numerical analysis and optional by Dr. H.K. Pathak ; Shiksha Sahitya Prakashan, Meerut.

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS604	ENGLISH LANGUAGE AND ASPECTS OF DEVELOPEMENT	6(5-1-0)	70	20	10	-	-	100	3 hr	-

Unit 1

1. William Wordsworth : "The World is Too Much With Us"

2. K. Aludiapillai : "Communication Education and Information Technology"

3. "Democratic Decentralisation"

4. S. C. Dubey : "Basic Quality of Life"

5. Sister Nivedita : "The Judgment Seat of Vikramaditya"

6. JuliunHuxley : "War as a Biological Phenomenon"

7. Robert Frost : "Stopping by Woods on a Snowy Evening"

8. Ruskin Bond : "The Cherry Tree"

Unit II Short Essay of about 250-300 words

Unit III Translation of a short passage from Hindi to English

Unit IV Drafting CV, writing e-mail message for official purpose

Unit V Language Skills :

One-word substitution, homonyms, homophones, words that confuse, Punctuation, Idioms

Note : Scheme of Marks

Unit I

- This will include 5 objective type questions based on text and language skills. (1x5=5 marks)
- This will also include short-answer questions from text. One question will be asked from each lesson (total 8 questions) and 5 have to be attempted (3x5 = 15 marks)

Subject Code	Subject Name	Credits	Maximum marks Allotted						Duration of Exam.	
			Theory			Practical		Total	Theory	Practical
			End Sem	Mid Sem	Assign.	End Sem	Term work			
BSCPS605	DBMS	2	35	10	5	-	-	50	3 hr	

UNIT- I

INTODUCTION TO DATABASE SYSTEM

Introduction To Database Systems Purpose of Database System,View Of Data,Characteristics of Database Approach, Architecture for a Database System, Advantages and Disadvantages Of DBMS, Database Users and Administrator, Database Design and ER Model , Data Model Classification.

UNIT-II

RELATIONAL DATABASE

Structure of Relational Database Database Schema, Key, Relational Operations Formal Relational Query Languages .

UNIT-III

RELATIONAL DATABASE DESIGN

Features of Good Database Design, Universal Relation, Anomalies in A Database

Atomic Domain and 1NF ,Functional Dependency Theory, Decomposition Using Functional Dependency Algotithm for Decomposition, Decomposition Using Multivalue Dependency More Normal Forms, Database Design Process.

UNIT-IV

DATABASE STORAGEAND QUERYING

Basic Concepts Of Indexing and Hashing Query Processing , Measures Of Query Cost , Query Processing for Select, Sort Join Operations. Basics of QueryOptimization, Transformation of Relational Expression Estimating Statistics of Expression, Choice of Evaluation Plan .

UNIT-V

TRANSACTION MANAGEMENT

Transaction Concepts, Features of Database Transaction. Concurrency Control inDatabase - Lock Base, Time Stamp Base, Validation Base Protocols Database Recovery System .

TEXT & REFERENCE BOOKS:

- *SILVERSCHATZ KORTH AND SUDARSHAN-DATABASE SYSTEM CONCEPTS, 6THED. TATA MC-GRAW HILL.*

- *RAGHU RAMA KRISHNAN-DATABASE MANAGEMENT SYSTEMS, 2NDED. TATA MC-GRAW HILL*

- *RAJESH NARANG – DATABASE MANAGEMENT SYSTEM,2ND ED.PHI*
- *R. ELMASRI ET. AL "FUNDAMENTALS OF DATABASE SYSTEMS". 3RD EDITION – ADDISON WESLEY, (INDIAN REPRINT), NEW DELHI.*

- *C.J.DATE, DATA BASE SYSTEMS*, Vol I & II