PROGRAM OUTCOME OF BACHELOR OF SCIENCE

Government College Israna adheres to the syllabi for B.Sc. programme offered by the university in accordance to UGC norms. College have non-medical stream in which the subject combination offered are mathematics, physics and chemistry. As compulsory subject English language at first year level and Sanskrit at second year level in taught in order to enhance the reading, speaking, writing and reproducing skills of the students.

The programme outcomes of Bachelor of Science as follows:

1. Basic knowledge of Science: Students get acquainted with the knowledge of science which helps them to understand various events taking place in their surroundings.
2. Disciplinary knowledge and skill development:
    a. Comprehensive knowledge and understanding of major concept, theoretical principal and experimental finding in science and its sub field; including broader interdisciplinary streams such as physics, chemistry, mathematics.
    b. Ability to use modern instrumentation for advance technology.
3. Dealing with untoward incidence: The basic knowledge of science helps them to deal with the untoward incidence in the neighborhood, For example sudden explosion by chemicals, misuse of unwanted substances excessive rain or drought can be managed by basic knowledge of science.
4. Environmental protection: The environmental pollution is the main concern of the society these days. The students can aware the society about harmful pollutants, their affect on environment in general and effect on human health in particular.
5. Employability : The students can find employment in following fields:
    (i) They can opt carrier in ethno botanical study, environment conservation, preservation.
    (ii) The students can go in industries viz. Pharmaceutical, fertilizer, bio- fertilizer, organic fertilizer, textile, food ceramic, cement, petroleum, pesticides etc.
    (iii) The students can opt carrier in defense services (CDS) forest services
    (IFS), atmosphere sciences, etc.
    (iv) The students can go for ballistics, forensic, bio warfare labs, CBIR labs, DRDO, biotechnology, industrial chemistry etc.

(v) The students can go in drone technology in agriculture, remote sensing, geo mapping etc

Physics

Course Outcomes (COs)

Co 1	Classical mechanism and theory of Relativity.
Co 2	Electricity, Mechanism and Electromagnetic waves
Co 3	Properties of Matter and kinetic theory of gases
Co 4	Semi conductor senses
Co 5	Computer programming and thermodynamics
Co 6	Wave and options-I
Co 7	Statistical Physics
Co 8	Wave and options-II
Co 9	Quantum and Laser Physics
Co 10	Nuclear physics
Co 11	Solid state and Nero Physics
Co 12	Atomic and Molecular Spectroscopy

Program Specific Outcomes (PSOs)

PSO 1	It reveals the basic concepts of Mechanics for single particle as well as for system of particles, apply generalized nations techniques to understand different concepts; knowledge of frame of references and their applications to find various parameters.
PSO 2	Basic idea of Electricity and Magnetism and study the various terms in vector actions.
PSO 3	Basic knowledge of properties of matter and find various quantities using this in common life.
PSO 4	Concepts and applications of electronic devices for the development of society.
PSO 5	Basic knowledge of computer; applications with different programming; to understand the concepts of them dynamics and their applications.
PSO 6	Knowledge of light including designs of experiments and solve the complex problems related to light phenomenon.
PSO 7	To know the statistics physics for micro and macro states; different concepts of classical and quantum mechanics and their applications.

PSO 8	Find the solutions of complex form relations related to light and their use in society.
PSO 9	Knowledge of Quantum mechanical and LASER physics theoretical as well as experimentally and applications of LASER in the field of medicine, industry, military , research labs etc.
PSO 10	Understand the concepts of Nuclear physics and their applications in Nuclear accelerates and Nuclear detectors to find the power and energy for constructive purposes.
PSO 11	Knowledge of crystal structure and super conductivity and their applications; knowledge of Nano technology as well as the applications of Nano physics in automobile, Electronics, Biotechnology, material science and medicine etc.
PSO 12	Study of atomic spectrum copy using basic concepts of atomic and nuclear physics and their research based knowledge.

POS of General Higher Education Program:-

PO 1	Students at the time of graduation will be able to critical thinking:- Our ideas or decision must be accurate and clear.
PO 2	Effective Communication:- Speak, read, write and listening must be clear to every student.
PO 3	Social Interaction:- Interaction of students related to various topics is must be clear the concept.
PO 4	Effective Citizenship:- Demonstration and ability awareness for everyone is necessary.
PO 5	Ethics:- Taking decisions and responsibility for each must be clear.
PO 6	Environment and Sustainability:- Understand the issues of environmental contexts for better development.
PO 7	Self directed and life-long learning:- One should acquire the ability to engage himself/herself independent and life-long learning.

B.Sc. I Chemistry

Programme Objectives

1. To provide broad knowledge and skill in Chemistry.
2. To understand the use of Chemicals in daily life.
3. To impart the basic analytical and technical skills to work effectively in the various fields of chemistry.
4. To prevent the mis-use of chemicals by the Society
5. To prevent the harmful Effect of Chemicals used in our daily life.

Programme Specific Outcomes

1. Atomic Structure, Periodic table and atomic properties
2. Covalent Bond, Ionic Solids
3. Hydrogen Bonding and Van der Waals forces, Metallic Bond and semiconductors
4. s-Block elements, Chemistry of Noble Gases
5. p-Block elements, Boron, Carbon, Nitrogen, Oxygen and Halogen family
6. Gaseous States, Critical Phenomenon
7. Liquid and Solid States
8. Kinetics and Electrochemistry
9. Structure and Bonding, Stereochemistry of Organic Compounds
10. Mechanism of Organic Reactions, Alkanes and Cycloalkanes
11. Alkenes, Arenes and Aromaticity
12. Dienes, Alkynes, Alkyl and Aryl Halides

Course Outcomes

1. To discuss Atomic Structure, Periodic Table and Atomic Properties viz. Ionisation Energy, Electron Affinity, Electro negativity, Quantum Numbers, Electronic Configuration of the Elements
2. To study the formation of Covalent Bond, Hybridisation, Bond Energy, Bomd Length, Crystal Structure, Lattice Energy, Crystal Defects, Solvation Energy and Fajan's Rule
3. To elaborate Hydrogen Bonding, Vander Waal's forces, Metallic bond, semiconductors, Compounds of S-block Elements,

4. Noble gases, Bonding in Compounds of Noble gases
5. To discuss about p-block elements, structure, bonding and compounds of Boron, Carbon, Nitrogen and halogen family
6. To discuss Kinetic Molecular Theory of Gases, Derivation of Vander waals Equation and its applications, Critical Temperature, pressure, volume, compressibility factor
7. To elaborate Structure and properties of Liquid, Classification of Solids, Crystal systems,

   Bragg's Law
8. To understand the rate of reaction, Order of reaction, Half life period, Arrhenious equation, Electrolytic conduction, dilution law, Kohlrausch law, Degree of dissociation, Henderson-Hazel Equation
9. To understand localized and de-localized Chemical bonds, Electronic Effects, Isomerism, Configuration, E and Z, R and S Nomenclature, Conformations
10. To draw the mechanism of Organic Reactions, study of attacking reagents, Reaction Intermediates, method of preparation, nomenclature, physical properties of alkanes and cycloalkanes.
11. To study preparation and properties of Alkenes, Arenes, Aromaticity, Mechanism of Aromatic Electrophillic substitution, Activating and De-activating substituents and Orientation
12. To discuss the methods of preparation, structure, properties of Dienes, Alkynes, Alkyl and Aryl halides, S_N1 and S_N^2 mechanisms.

B.Sc II Year CHEMISTRY

Programme Objectives

1. To develop laboratory competence in relating chemical structure to spectroscopic phenomenon.
2. To demonstrate the ability to synthesize, separate and characterize compounds using published procedures, standard laboratory equipments and modern instrumentation.
3. To make aware towards the minimum use of non-biodegradable materials.
4. To make aware towards the use of biodegradable materials
5. To work effectively and safely in a laboratory environment

Programme Specific Outcomes

1. Chemistry of d-Block elements,
2. Coordination Compounds, Non-aqueous solvents
3. Chemistry of f-Block elements
4. Theory of Qualitative and Quantitative Analysis
5. Thermodynamics
6. Chemical Equilibrium, Distribution Law
7. Thermodynamics, Electrochemistry
8. Alcohols, Phenols, Epoxides
9. Ultraviolet (UV) absorption spectroscopy
10. Carboxylic Acids & Acid Derivatives
11. Infrared (IR) absorption spectroscopy, Amines
12. Diazonium Salts, Aldehydes and Ketones

Course Outcomes

1. To discuss the Classification, properties, Comparison of properties of 3d, 4d and 5d elements, Latimer and Forst diagrammes, Structure and properties of Transition element compounds

2. To study nomenclature, Isomerism and bonding in Coordination compounds, Types of Solvents, Physical properties with special reference to liq. NH_3 and SO_2.
3. To discuss about the Electronic configuration, properties of Lanthanides, actinides, Lanthanide Contraction, Separation of Np, Pu, Am fro Uranium, Trans-uranic Elements
4. To elaborate the basic and acidic radicals, their identification, Interference by acidic radicals, solubility product, common ion effects.
5. To study the types of system, Thermo-dynamic process, Heat capacity, Work, Joule-Thomson Effect
6. To discuss the Equilibrium, Law of Chemical equilibrium, Claussius-Calpeyron Equation, Nerst distribution law, degree of hydrolysis, process of Extraction
7. To study the Laws of Thermodynamics, Entropy and Enthalpy Change, Spontaneity of Reaction, Gibbs Free Energy, Collision Theory and Transition state Theory, Electrolytic and galvanic cell, S.H.E. and Nerst Equation
8. To elaborate the methods of preparation, properties of Alcohols, phenols, Epoxides, Fries, Claisen Re-arrangement, Riemer Tiemann, Kolbe's, Schotten and Baumann Reactions
9. To discuss Absorption laws, Chromophore, Auxochromes and Schifts, Calculation of wave number using Woodward Fieser rules, Application of UV-spectroscopy
10. To elaborate method of preparation, structure, bonding and properties of carboxylic acid and its derivatives, relative stability of derivatives, Esterification and hydrolysis
11. To discuss about IR spectroscopy in structure determination, Hook's law, Application of IR, separation of primary, secondary and tertiary amines, Preparation, reaction with Nitrous acid
12. To discuss the diazonnium salts and synthetic applications, synthesis of aldehydes and ketones, special reagents, condensation reactions, oxidation and reduction reactions.

B.Sc III Year CHEMISTRY

Programme Objectives

1. To motivate critical thinking and analysis skills to solve complex chemical problems ex. Data

Analysis, spectroscopy, Structure and Modelling etc.

2. To demonstrate an ability to conduct Experiments with mastery of appropriate techniques and proficiency.

3. To develop skills in quantitative modeling of chemical systems.

4. To take preventive measures during the use of hazardous chemicals.

5. To save Environment by using Green (Ecofriendly) Chemicals.

Programme Specific Outcomes

1. Metal-Ligand Bonding in Transition Metal complexes, Thermodynamics and Kinetic Aspects of metal complexes
2. Magnetic properties of Transition metal complexes, Electronic spectra of Transition metal complexes
3. Acids and Bases, Organometallic chemistry
4. Bio inorganic chemistry, Silicones and Phosphazenes
5. Quantum Mechanics-I, Physical Properties and Molecular Structure
6. Spectroscopy, Rotational, Vibrational and Raman Spectrum
7. Introduction to statistical mechanics, Photochemistry
8. Solutions, Dilute Solutions and Colligative Properties, Phase Equillibrium
9. NMR Spectroscopy
10. Carbohydrates, Organometallic Compounds
11. Organic Synthesis *via* Enolates, Heterocyclic Compounds
12. Amino Acids, Peptides& Proteins, Synthetic Polymers

Course Outcomes

1. To discuss the Crystal field theory and metal ligand bonding, Splitting octahedral, tetrahedral and square planar complexes, thermodynamic stability of metal complexes, trans effect
2. To discuss the magnetic materials, magnetic susceptibility, method of determining magnetic susceptibility, spin only formula, orbital contribution to magnetic moments, application of magnetic moment data, Selection rules for d-d transition, orgel energy level diagram
3. To study the concepts of Acids and bases, HSAB principle and its applications, Structure and bonding in organometallic compounds
4. To discuss the metal ions present in biological system, Cooperative effect, Bohr effect, Nomenclature, classification, preparation and uses of silicones, and phosphazenes
5. To discuss the Black-body radiation, Plank's radiation law, photoelectric effect, Hamiltonian operator, Hermitian operator, Optical activity, magnetic susceptibility and types of magnetism

6. To elaborate the basic features of Spectroscopy, Degrees of freedom. Rotational , Vibrational and Raman Spectrum
7. To discuss the statistical thermodynamics, thermodynamic probability, partition function and physical significance, Laws of photochemistry, fluorescence, phosphorescence and quantum yield
8. To discuss the Ideal and non-ideal solutions, Colligative properties, Applications in calculating molar masses of normal, dissociated and associated solutes in solution. Phase Rule, phase equilibria of one and two component systems
9. To discuss the NMR spectroscopy and its application in structure determination of Organic compounds
10. To study the Structure, properties, Inter conversion of Carbohydrates, Formation and chemical reactions of Organomagnesium, Organozinc and Organolithium compounds
11. To study the Organic synthesis using Enolates, Structure and method of preparation and reactions of heterocyclic compounds
12. To study the structure, nomenclature, synthesis of amino acids and proteins, synthetic polymers and their use

MATHEMATICS

ALGEBRA

CO1: Symmetric, Skew symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Cayley Hamilton theorem and its use in finding the inverse of a matrix.

CO2: Applications of matrices to a system of linear (both homogeneous and non–
homogeneous) equations.

CO3: Relations between the roots and coefficients of general polynomial equation in one variable. Transformation of equations.

CO4: Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations
(Cardon's method). Biquadratic equations and their solutions.

CALCULUS

CO5: Definition of the limit of a function. Basic properties of limits, Continuous functions and classification of discontinuities. Maclaurin and Taylor series expansions.

CO6: Asymptotes in Cartesian coordinates, intersection of curve and its asymptotes, asymptotes in polar coordinates. Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves.

CO7: Tracing of curves in Cartesian, parametric and polar co-ordinates. Reduction formulae, Rectification, intrinsic equations of curve.

CO8: Quardrature (area)Sectorial area. Area bounded by closed curves. Volumes and surfaces of solids of revolution.

SOLID GEOMETRY

CO9: General equation of second degree. Tracing of conics. Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic.

CO10: Sphere: Plane section of a sphere. Sphere through a given circle. Intersection of two spheres, radical plane of two spheres. Co-oxal system of spheres

CO11: Central Conicoids: Equation of tangent plane. Director sphere. Normal to the conicoids, Polar plane of a point. Enveloping cone of a coincoid. Enveloping cylinder of a coincoid.

CO12: Paraboloids: Circular section, Plane sections of conicoids, Generating lines. Confocal conicoid. Reduction of second degree equations.

NUMBER THEORY AND TRIGNOMETRY

CO13: Divisibility, G.C.D.(greatest common divisors), L.C.M.(least common multiple) Primes, Complete residue system and reduced residue system modulo m. Euler function, Euler's generalization of Fermat's theorem. Chinese Remainder Theorem.

CO14: De Moivre's Theorem and its Applications. Expansion of trigonometrical functions, Direct circular and hyperbolic functions and their properties.Inverse circular and hyperbolic functions and their properties. Logarithm of a complex quantity.

ORDINARY DIFFERENTIAL EQUATIONS

CO15: Geometrical meaning of a differential equation. Exact differential equations, integrating factors. Orthogonal trajectories: in Cartesian coordinates and polar coordinates. Self orthogonal family of curves.

CO16: Linear differential equations of second order: Reduction to normal form. Solution of simultaneous differential equations involving operators x (d/dx) or t (d/dt) etc. Method of auxiliary equations.

VECTOR CALCULUS

CO17: Scalar and vector product of three vectors, product of four vectors. Divergence and curl of vector point function, Cylindrical co-ordinates and Spherical coordinates. Vector integration; Line integral, Surface integral, Volume integral, Theorems of Gauss, Green & Stokes and problems based on these theorems.

ADVANCED CALCULUS

CO18: Continuity, Sequential Continuity, properties of continuous functions, Uniform continuity, chain rule of differentiability. Taylor's theorem for functions of two variables.Lagrange's method of multipliers. Surfaces: Tangent planes, one parameter family of surfaces, Envelopes.

PARTIAL DIFFERENTIAL EQUATIONS

CO19: Partial differential equations: Formation, order and degree, Equations reducible to linear equations with constant co-efficients. Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order. Cauchy's problem for second order partial differential equations.

STATICS

CO20: Composition and resolution of forces. Parallel forces. Moments and Couples. Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity. Virtual work. Forces in three dimensions. Poinsots central axis, Wrenches.

SEQUENCES and SERIES

CO21: Boundedness of the set of real numbers; least upper bound, greatest lower bound of a set, Neighborhoods. Infinite series: Convergence and divergence of Infinite Series, Infinite series: D-Alembert's ratio test, Raabe's test, Convergence and absolute convergence of infinite products.

SPECIAL FUNCTIONS AND INTEGRAL TRANSFORMS

CO22: Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their propertiesConvergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

PROGRAMMING IN C & NUMERICAL METHODS

CO23: Programmer's model of a computer, Algorithms, Flow charts, Data types, Operators and expressions, Input / outputs functions. Decisions control structure: Decision statements, Logical and conditional statements, Implementation of Loops.

REAL ANALYSIS

CO24: Riemann integral, Integrabililty of continuous and monotonic functions, The Fundamental theorem of integral calculus. Mean value theorems of integral calculus. Improper integrals and their convergence, Comparison tests, Abel's and Dirichlet's tests, Frullani's integral.

GROUPS AND RINGS

CO25: Definition of a group with example and simple properties of groups, Subgroups and Subgroup criteria, Rings, Subrings, Polynomial rings over commutative rings, Unique factorization domain.

NUMERICAL ANALYSIS

CO26: Finite Differences operators and their relations. Finding the missing terms and effect of error in a difference tabular values, Central Differences: Gauss forward and Gauss's backward interpolation formulae, Numerical Differentiation, Eigen Value Problems: Power method, Jacobi's method, Given's method, HouseHolder's method, QR method, Lanczos method.

REAL AND COMPLEX ANALYSIS

CO27: Jacobians, Beta and Gama functions, Double and Triple integrals, Dirichlets integrals, change of order of integration in double integrals. Fourier's series: Fourier expansion of piecewise monotonic functions, Properties of Fourier Co-efficients, Dirichlet's conditions.

LINEAR ALGEBRA

CO28: Vector spaces, subspaces, Sum and Direct sum of subspaces, Linear span, Linearly Independent and dependent subsets of a vector space. Finitely generated vector space, Homomorphism and isomorphism of vector spaces, Linear transformations and linear forms on vactor spaces, Vactor space of all the linear transformations Dual Spaces,

DYNAMICS

CO29: Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration. Simple harmonic motion. Elastic strings. Mass, Momentum and Force. Newton's laws of motion. Work, Power and Energy. Definitions of Conservative forces and Impulsive forces.

BCom

BUSINESS MATHEMATICS I

CO30: Logarithms, Anti-logarithms , Sequences and Series: Arithmetic & Geometric Progressions. Differentiation, Matrices and Determinants: concept of matrix, types, and algebra of matrices; properties of determinants; Compound Interest and Annuities.

BUSINESS MATHEMATICS II

CO31: Permutations and Combinations, Binomial Theorem, Linear inequalities: graphical solution of linear equalities in two variables, solution of system of linear inequalities in two variables. Linear programming-formulation of equation, pie chart, pictographs, graphs of time series or line graphs; graphs of frequency distribution: histogram, frequency polygon, ogives or cumulative frequency curves, limitations of diagrams and graphs.

Credits:

(i)Four periods each of 40 minute per week in each semester of BA/BSc.

(ii)Six periods each of 40 minute per week in first and second semester of BCom.

(iii) Practical of two hour per student per week in fourth and fifth semester of BA/BSc.