

B.Sc (Hons) FORENSIC SCIENCE

SYLLABUS: B.Sc Ist YEAR

Paper No/Code	Title	Lectures	Marks
BFS: 101	English Language	90	70+30
BFS: 102	Inorganic Chemistry	90	70+30
BFS: 103	Basic Physics	90	70+30
BFS: 104	Introductory Forensic Science & Criminalistics	90	70+30
BFS: 105	Practical –Inorganic Chemistry		100
BFS: 106	Practical -Physics		100

BFS: 101 ENGLISH LANGUAGE

1. Letter writing
 - a. Personal letter
 - b. Business letter
 - c. Official letter
2. Précis writing and Composition
3. Paragraph Writing
4. One word substitution
5. Correction of sentences
6. Idioms and Phrases

BFS: 102 INORGANIC CHEMISTRY

1. Atomic Structure: Idea of de Broglie matter wave, Heisenberg uncertainty principle, atomic orbital's, Schrödinger wave equation, Significance of Ψ and Ψ^2 quantum numbers, Aufbau and Pauli Exclusion Principle, Hund's multiplicity rule, effective nuclear charge.
2. Hybridization and its different types, sp , sp^2 , sp^3 , sp^3d , & sp^3d^2 . Electronic configuration of elements, shapes of s , p , d , orbitals. General characteristics of Isotopes, and its types & Property. Definitions of Isotones & Isobars.
3. Chemical bonding - ionic bonding - general characterization, types of ion, packing of ion in crystals, lattice energy. Covalent bonding – general characteristics, coordinate covalent bond, valence bond approach, directional characteristics of covalent multiple bonding, sigma and pi bonds, bond length, bond order, formal charge, valence shell electron pair repulsion (VSEPR) theory of directed bonds. Hydrogen bond (theories of hydrogen bonding, valence bond treatment). Metallic bond.
4. Chemistry of s , p , d , block elements: introduction, properties, and their position in periodic table. Chemical properties of Noble gases, chemistry lanthanides and actinides.
5. Concept of coordination complexes and coordination number, Werner's theory, isomerism in coordination compounds, bonding in coordination compounds.
6. Role of some vital complexes of biological importance e.g. Blood, Saliva.

BFS: 103 BASIC PHYSICS

1. **Mechanics:** Force, conservative and non conservative force, rotational motion of inertia, expression of M.I. of regular shaped bodies. Kepler's law. Acceleration due to gravity. Simple Harmonic motion and compound pendulum. Newton's law of motion.
2. **Thermal Physics:** concept of temperature, ideal gas equation and its law. Vander Waal's equation, reversible and irreversible process, Zeroth law, first, second and third law of thermodynamics. Carnot's cycle.
3. **Electromagnetism:** Coulomb's law. Electric field, Magnetic field due to current, Gauss's theorem and its application, Ampere's law, Kirchhoff's law and their applications. Wheat-stone bridge and its sensitivity. Rectifiers, Amplifiers, semiconductor and its type of junction. Paramagnetic, diamagnetic, ferromagnetic materials and properties.
4. **Waves and Oscillations:** Resonance and its application, Doppler Effect, Photo electric effect, Electron microscope
5. **Optics:** Combination of lens and prism, direct vision spectroscope. Diffraction –the phenomenon, diffraction at a straight edge, slit and wire, Resolving power of a telescope an eye, wave front, polarization of light and Polarimetry, Optical instrument (eg. Eye, Camera, Microscope, Telescope).
6. **Atomic Physics:** Black body radiation, Planck's theory, De Broglie waves. Heisenberg's Uncertainty principle, Rutherford's atomic model. Bohr's atomic model of Hydrogen atom and atomic spectra, Schrodinger wave equation. Moseley's experiment on X-rays, diffraction of X-rays and its application, Radioactivity.

BFS: 104 INTRODUCTORY FORENSIC SCIENCE & CRIMINALISTICS

1. Forensic Science: Introduction, Definition, Principles, Laws of Forensic Science, Historical Background of Forensic Science in India, Need of Forensic Science in present scenario, Forensic Science Laboratories, their types and Divisions, Forensic Examination, Organizational set up of Forensic Science Laboratories at central and state level, Introduction of BPR&D, NICFS, CDFD, CCMB, IITR, CDTS, NCRB
2. Crime : Definition, types of crime, causes of crime, prevention of crime, Difference in blue and white collar crime, Introduction of Cyber crime, Criminal Justice System, Criminal behavior
3. Police Organization: Organizational set up of Police at central and state level, Functions of Police, Relationship of Police and Forensic Scientist, History of different para-military forces (BSF, CISF, CRPF, ITBP, Assam Rifles, SSB, NSG etc.)
4. Crime Scene : Introduction, Significance, Role of Investigator, Evaluation of crime scene, protection of crime scene, Photography of Crime scene, Tools and techniques, Significance of Photography and Videography, Introduction of Sketching, Purpose of Sketching, Making of Sketches, Types of Sketches, Methods of Sketching, Procedure of Sketching, Searching Methods, Chain of Custody types, Significance and their evaluation.
5. Modus operandi & Role of Modus operandi bureau in crime investigation. Investigation & examination of various types of cases (a) Murder (b) Rape (c) Burglary (d) Railway & Air Crashes (e) Road Accidents etc.
6. Location, Collection & Evaluation of various types of Tool Marks & Trace Evidences (Paint, Soil, Glass, Detective Dyes, GSR etc.)

BFS: 105 PRACTICAL INORGANIC CHEMISTRY

Analysis of Acidic Radicals

1. Preliminary test with dil H_2SO_4 ,
2. Preliminary test with conc. H_2SO_4 ,
3. Prepare N/10 H_2SO_4 standard solution and find out the strength or percentage of NaHCO_3 , in washing Soda
4. To estimate nitrate ion gravimetrically using nitron.
5. To prepare N/30 AgNO_3 Standard solution and find out the strength of supplied AgNO_3 solution using Potassium or ammonium thiocyanate, as intermediate solution.
6. To Prepare chrome alum
7. To prepare sodium cobalt nitrite
8. To determine the strength of supplied oxalic acid solution by titrating it against approx N/30 KMNO_4 solution.
9. Analysis of group Ist.
10. Analysis of group IInd.

BFS: 106 PRACTICALS PHYSICS

1. To determine the value of 'g' by a compound pendulum.
2. To determine the value of 'g' by a Kater's pendulum.
3. To find the Moment of Inertia of a fly wheel about its own axis of rotation OR (To find angular acceleration of a fly wheel).
4. To determine focal length of a (thin or thick) convex lens by displacement methods.
5. To determine dispersive power of glass prism.
6. To determine the focal length of a concave lens using a plane mirror and a convex lens.
7. To determine the focal length of a concave lens by concave mirror.
8. To determine the resolving power of a Telescope.
9. To determine the diameter of a thin wire by diffraction.
10. To determine the radius of curvature of convex mirror by a plane mirror method.
11. To determine the radius of curvature of convex mirror by a means of a convex lens.
12. To determine the refractive index for a flint glass prism for Sodium light, using a spectrometer.
13. To verify Newton's law of cooling.
14. To determine the Moment of Inertia of a given irregular body using a Torson pendulum.

B.Sc (HONS) FORENSIC SCIENCE

SYLLABUS: B.Sc 2nd YEAR

Paper/Code	Title	Lectures	Marks
BFS-107	Organic Chemistry	90	70+30
BFS-108	Fundamentals of Biology	90	70+30
BFS-109	Environmental Studies	90	70+30
BFS-110	Law for Forensic Scientists	90	70+30
BFS-111	Practical Organic Chemistry		100
BFS-112	Practical Biology		100

PAPER-BFS: 107 ORGANIC CHEMISTRY

1. Organic Chemistry as a chemistry of compounds and its interaction with everyday life.
2. Methods of purification and Test of purity, quantitative elemental analysis, determination of molecular masses, calculation of molecular and empirical formula, structural formula.
3. Chemistry of Bio-molecules; Introduction, Definition, Nomenclature & classification of following molecules: Carbohydrates, Amino acid, Nucleic acid, Protein & Lipids.
4. Electronic displacement: electromeric, hyper conjugative and resonance effects. Nucleophiles and Electrophiles and their importance in biological systems, characteristics and type of organic reactions, additions, eliminations, substitutions and rearrangements. Aldol condensation. Markownikoff's rule. Wurtz synthesis, pinacol-pinaclone rearrangement. Hoffmann Bromamide reaction (with their mechanisms).
5. Stereo-isomerism: geometrical isomerism and method of determining the geometry. E and Z designation of geometrical isomers, optical isomerism, specific and molar radiation, D and L designation, Walden inversion, Absolute configuration in terms of R and S notation, chirality and chiral molecules.
6. Method of preparation of the following: Aromatic hydrocarbons, halogen derivatives, nucleophilic substitution. Nitrobenzene, amines, diazonium salt and their reaction, phenyl hydrazines, sulphonic acids, aromatic alcohols, phenols, quinones. Structure, synthesis and importance of Naphthalene, anthracene and phen-anthrene – their derivatives and carcinogenicity
7. Pesticides & Insecticides: Introduction, types and their forensic application.

BFS: 108 Fundamentals of Biology

1. General Characteristics, classification and economic importance of Algae, Fungi, Lichens, Bryophytes, Pteridophytes & Gymnosperms.
2. Angiosperms: Principle of classification and nomenclature of angiosperms, Anatomy of angiosperms, Structure and development of anthers and ovules, fertilization, seed development, seed dormancy and germination.
3. Non-Chordates: General characteristics, classification and economic importance of Protozoa, Porifera, Coelenterate, Helminthes, Annelida, Arthropoda, Mollusca and Echinodermata.
4. Chordates: General characteristics, Classification and importance of Protochordata, Hemichordate, Urochordata, Cephalochordata and Cyclostomata, Amphibia, Reptilia, Aves and Mammalia.
5. Genetics: A brief history, introduction, Mendel's laws, Linkage and crossing over, Sex linked inheritance, Structural and numerical changes in chromosomes, Mutation, Multiple alleles and Gene concept.
6. Evolution: Introduction, different concepts of Origin of life, Theories of organic evolution, Theory of inheritance of acquired characters (Lamarckism). Theory of natural selection, Mutation theory and synthetic theory, Speciation and isolating mechanism, Morphological criteria for species and races. Allopathic and sympatric population. Isolating mechanism.
7. Human Physiology: Introduction of different types of physiological systems: Cardiovascular and Lymphatic system, Respiratory System, Excretory System, Digestive System, Endocrine System, Nervous System and Skeletal System

BFS: 109 ENVIRONMENTAL STUDIES

1. The multi-disciplinary Nature of Environmental Studies

- Definition, scope and importance.
- Need for public awareness.

2. Natural Resources: Renewable and Non-renewable Resources:

Natural resources and associated problems:

- (a) Forest Resources: Use and over- exploitation, deforestation: case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
 - (b) Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
 - (c) Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral Resources, Case studies.
 - (d) Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
 - (e) Energy Resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies.
 - (f) Land Resources: Land as resources, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles lectures.

3. Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.

- Food chains, food webs and ecological pyramids.

Introduction, types, characteristic features, structures and function of the following ecosystem.

- (a) Forest ecosystem, (b) Grassland ecosystem, (c) Desert ecosystem, (d) Aquatic ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries).

4. Bio-diversity and its Conservation

- Introduction- Definition: Genetic, species and ecosystem diversity.
- Biogeographical classification of India.
- Value of Bio-diversity: Consumptive use, productive use, social, ethical, aesthetic and option values.
- Bio-diversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of Bio-diversity.
- Threats to Bio-diversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of Bio-diversity: In-situ and Ex-situ conservation of Bio-diversity.

5. Environmental Pollution

- Definition, Causes, effects and control measures of: (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise Pollution, (f) Thermal pollution, (g) Nuclear hazards.
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.

6. Social Issues and The Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.

- Environmental ethics: issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies.
- Water-land reclamation
- Consumerism and waste products.
- Environmental protection act.
- Air (prevention and control of pollution) act.
- Water (prevention and control of pollution) act.
- Wildlife protection act.
- Forest conservation act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

7. Human Population and the Environment

- Population growth, variation among nations.
- Population explosion-Family Welfare programme.
- Environment and human health
- Human Rights.
- HIV/AIDS
- Women and Child Welfare.
- Role of information technology in environment and human health.

8. Field Work

- Visit of a local area of document environmental assets-River/Forest/Grassland/Hill /Mountain.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common Plants, Insects, Birds.
- Study of simple Ecosystems-Pond, River, Hill slopes, etc.

BFS: 110 LAW FOR FORENSIC SCIENTISTS

1. Criminal Procedure code, constitution of courts , hierarchy of courts and their powers
2. lok adalats , lok Ayukts and Juvenile courts, examination- in – chief, cross-examination re-examination .Evidence in Enquiries and Trials , Expert Witness (291-93).
3. Constitution of India- Preamble, Fundamental Rights Article 20,21,22.
4. Indian evidence Act- Section 32,45,46,47,57,58,60,73,135,136,137,138.
5. Indian Penal code Sections Pertaining Offence against property and Offence against person.
6. Narcotic Drugs & Psychotropic Substances Act, Drugs & Cosmetics Act, Explosive Substances Act, Dowry Prohibition Act, Prevention of Food Adulteration Act, Prevention of corruption Act, Arms Act, Wild life Protection Act, I.T.Act 2000.

BFS: 111 PRACTICALS ORGANIC CHEMISTRY

1. Preliminary examination of organic compound
2. Detection of elements
 - (a) Nitrogen, Sulphur, Halogen
 - (b) Test for functional group
 - (c) Carboxylic acid
 - (d) Phenol
 - (e) Carbohydrate
 - (f) Aldehydes
3. To do the sublimation of the given organic compound
4. To purify the given organic compound by the method of sublimation.
5. To prepare α -Amino acid.
6. To prepare Pthalimide
7. To prepare Benzoic acid

BFS: 112 PRACTICAL BIOLOGY

1. To study the given specimen of Algae, Fungi, lichen, Bryophyte, Pteridophyte, Gymnosperm and Angiospermic Plants
2. To identify the given specimen of Protozoa, Porifera, Coelenterate, Helminthes, Annelida, Arthropoda, Mollusca, Amphibia, Reptiles, Aves etc.
3. To determine the blood group of fresh blood.
4. To prepare Haemin crystals.
5. To estimate the amount of the Haemoglobin by haematometer.
6. To examine of saliva stain.
7. To study the presence of diatoms in the given samples.
8. To study the different parts of alimentary canal.
9. To study the different parts of the respiratory track.
10. To study the different parts of the human heart.
11. To study the different parts of the central nervous system.

B.Sc (HONS) FORENSIC SCIENCE

SYLLABUS B.Sc 3rd YEAR

Paper No/Code	Title	Lectures	Marks
BFS-113:	Physical Chemistry	90	70+30
BFS-114:	Fundamentals of Mathematics & Statistics	90	70+30
BFS-115:	Fundamentals of Computer Science	90	70+30
BFS-116:	Instrumentation & Investigation Technique	90	70+30
BFS-117:	Practical - Physical Chemistry		100
BFS-118:	Practical – Forensic Science		100

BFS: 113 PHYSICAL CHEMISTRY

1. Acid and Bases: Physical properties and structure of water, solvent properties of water, ionic product of water and the pH scale, ionization of acid and bases, salt hydrolysis, pH changes in acid base titrations (weak and strong), acid base indicators, common ion effect, Hasselbalch Henderson equation, buffer solutions, buffer index, buffer capacity, solubility product and its application in analysis.
2. Electrochemistry: Conductance- Faraday's law of electrolysis, conductivity and its measurement, equivalent and molar conductance, Kohlrausch's law of independent migration of ions, variation of equivalent conductivity with concentrations of weak and strong electrolytes.
3. Chemical Kinetics: Order of reaction (including fractional and negative orders), molecularity, rate laws, differential forms (integrated forms up to second order), experimental methods for determination of order of a reaction, Lindemann mechanism.
4. Adsorption and Catalysis: Homogeneous and Heterogeneous catalysis, adsorption, physical adsorption and chemisorptions, various types of adsorption isotherms, nature of adsorbed state, kinetics of catalytic decomposition, promoters and inhibitors.
5. Thermodynamics: Zeroth law of Thermodynamics, First law of Thermodynamics, internal energy (E), enthalpy (H), equivalency of heat and work (Joule's experiment), relation between C_p and C_v , calculation of W , E and H for expansion of ideal and real gases under isothermal and adiabatic condition for reversible and irreversible processes including free expansion. Enthalpies of formation, bond energy, bond dissociation energy and resonance energy (calculation from thermo-chemical data), Enthalpies of solution, integral and differential enthalpies of neutralization, Enthalpies of ionization and Enthalpy of ions. Second law of Thermodynamics: Various statement of the law, concept of entropy (S), and Thermodynamic scale of temperature efficiency of Carnot's cycle. Third law of Thermodynamics: Statement of third law including the concept of residual entropy, calculation of entropy for reversible and irreversible processes, Gibbs free energy (G) and Helmholtz free energy (A), Gibbs Helmholtz equation, Maxwell's relations thermodynamic equation of state, compressibility and expansion coefficient.
6. Colligative Properties: Dilute solutions, Lowering vapor pressure, Raoult's and Henry's Laws as limiting Laws and their derivations. Elevation of boiling point and depression of freezing point, calculation of molecular weight, molecular weight of a polymer by osmotic pressure.

BFS: 114 FUNDAMENTALS OF MATHEMATICS & STATISTICS

1. Matrix: Definition of special kinds of matrices, sum of matrices, multiplication of matrices, adjoint of matrices, inverse of matrices, determinants, solution of simultaneous equations by matrices. Rank of matrices, complex matrices, Eigen value and Eigen vectors. Vector Calculus: Interpretation of vectors and scalars, Gradient, Divergence and curl of vector and their physical interpretation.
2. Differential Calculus: Partial differential- Jacobian, expansion of functions one and several variables, extrema of functions of two and several variables, Asymptotes. Integral calculus : integration as inverse of differentiation, indefinite integrals of standard forms.
3. Statistics: Introduction, Basic concept of frequency distribution. Measures of central values-Mean, Mode and Median. Measures of dispersion- Range, Mean deviation and standard deviation. Coefficient of Variation, Moment, Skew-ness and Kurtosis, Corelation and Regression analysis.
4. Testing of Hypothesis – Null hypothesis, alternative hypothesis- type I and type II errors, level of significance, critical region.
5. Test of significant of attributes, Z- test significance and coefficient of correlation, Small sample test, T- test, Chi- square test. F Test for equality of variance, large sample test and Normal Test.
6. Theory, classical definition of probability, Basic terms- Events, Trials, Mutually exclusive events, Favorable events, Exhaustive events etc.

BFS: 115 FUNDAMENTALS OF COMPUTER SCIENCE

1. History and development of computers-mini, personal and super computers.
2. General awareness of computer hardware, CPU and other peripheral device (input output and auxiliary storage device).
3. Basic operating system concept-MS Dos and Windows.
4. Knowledge of computer system, software and programming language, machine language, assembly language, and higher level language. Awareness of software packages like lotus and other scientific application packages.
5. Cyber Crimes: Introduction, stand alone computer crimes- Printing of Counterfeit Currency and other documents. Computer Scanners, Imaging Software (Photoshop, Photo paint etc.), Software Piracy, Data Recovery.

BFS: 116 INSTRUMENTATION AND INVESTIGATION TECHNIQUES

1. Crime Detection Devices: UV, IR, X-Rays, their nature and applications, Detective Dyes, Neutron Radiography, Speed Detection Devices
2. Tools: Basic Kits, Investigator's Kit, Tools used in Mobile laboratory.
3. Microscopy: Definition, Types of Microscopes and their Forensic Significance
4. Chromatography: Definition, Types of Chromatography and Forensic Applications with reference to TLC, Preparation of TLC Plate.
5. Documents: Definition, Importance, Nature, Problems and preliminary examination.
6. Ballistics: Definition of Ballistics, Forensic Ballistics, Types of Forensic Ballistics, Firearms, History of Firearm, Classification of Modern Firearms, Ammunition and its composition, GSR and its examination.
7. Fingerprints Examination: History & Development, Fundamental Principles, Types of Fingerprints, Classification of Fingerprints, Fingerprint characteristics,
8. Recent Advanced Techniques used in Forensic Science : Lie Detection, Voice Identification, DNA Profiling, Narco Analysis, Brain Fingerprinting.

BFS: 117 PRACTICALS PHYSICAL CHEMISTRY

1. To determine the solubility product of a salt (KCl or NaCl) at room temperature.
2. Determination of concentration or amount of Oxalic acid by titration with potassium permanganate (KMnO_4)
3. To determine the molecular weight of urea cryoscopically.
4. To determine the solubility of an organic acid (oxalic acid) in water at room temperature.
5. To determine the solubility product of calcium hydroxide using common ion effect of sodium hydroxide or of any other strong alkali.
6. To determine the adsorption of aqueous acetic acid by activated charcoal and to study the adsorption isotherm.
7. To determine the solubility of (KNO_3) by solubility method.
8. To determine the heat of solution of the given salt in water by calorimeter.
9. To determine the heat of hydration of anhydrous copper sulphate.
10. To determine the Ph values of a given solution by indicating method (using buffer solution of known Ph).

BFS: 118 PRACTICAL FORENSIC SCIENCE

1. To study the different searching methods at scene of crime.
2. Collection and Packaging of physical clues at the scene of crime
3. Preliminary examination of questioned documents.
4. To identify the given blood sample, saliva stains, milk samples, Urine samples
5. To identify the given soil samples, Glass and Paints
6. To identify the given firearms, bullet samples
7. To compare the given samples of bangles, clothes and threads.
8. To identify the given fingerprint pattern types.
9. To compare the given fingerprints, classify the fingerprints by ten digit classification.
10. To develop and examine the latent fingerprint by physical methods and chemical methods