

**SARDAR PATEL UNIVERSITY  
VALLABH VIDYANAGAR**



**M.Sc. Forensic Science  
Under Credit Based Course System  
SEMESTER – I**

**PS01CFSC21  
General Forensic Science**

**UNIT-I**

**History**

Basic principles and significance, History and Development of Forensic Science, Organizational structures of Forensic Science Laboratories/institutions.

Structure of Police, Police and Forensic Scientist relationship with reference to Crime Investigation, Modus Operandi Bureau and its role in Crime Record. Prosecution and Judicial Organization

**UNIT-II**

**Crime Scene Management:**

Definition & Causation, Crime Scene, Types of Crime scene, Protection and Recording of Crime scene, Search of Physical Evidences, Preservation, Packing and Forwarding of Physical Evidences, Processing of Crime scene, Blood spattering/Pattern analysis.

Criminal: Chance Criminal, Sociology Criminal, Recidivism & Criminal Behaviour.

**UNIT-III**

**Forensic Psychology and Investigative Techniques:**

Forensic Psychiatry (insanity), Criminal Profiling, Polygraph (Lie-Detector), Narco analysis, Brain Fingerprinting, Voice Stress Analysis and Speaker Profiling, Forensic Hypnosis.

**UNIT-IV**

**Forensic Photography:**

Basic Principles and Techniques of Black and White and Color Photography, Camera and Lenses, Exposing, Development and Printing, Different types of Developers and Fixers, Modern Development in Photography, Linkage of Cameras and Film Negative, Digital Photography, Digital Water Marking and Digital Imaging, Photogrammetry, Videography, Crime Scene and Laboratory Photography, IR, UV, Photography, Radiography, Portrait Photography, Photomicrography and Microphotography.

**Basic Texts & Reference Books:-**

- 1) Criminalistics: An Introduction to Forensic Science – Richard Saferstein.
- 2) Crime Scene Management – M.S.Dahiya.
- 3) Principles of Forensic Medicine including Toxicology – Nandi Apurba.
- 4) Parikh's Textbook of Medical Jurisprudence Forensic Medicine – C.K.Parikh.
- 5) Crime Scene Photography – Robinson, Edward.
- 6) Crime Scene Management- M.S.Rao.
- 7) Forensic Science in Criminal investigation – B.R.Sharma.

## **PS01CFSC22**

### **Instrumental Methods-Physical**

#### **UNIT-I**

##### **Atomic and Molecular Spectroscopy**

Qualitative discussion of Rotational, Vibrational and Electronic Spectra, Spectra of Polyatomic Molecules, IR Spectroscopy-Raman Spectroscopy, Energy Dispersive X-ray Analysis, Wavelength Dispersive X-Ray Analysis, X-Ray Diffractions, Auger Effect.

#### **UNIT-II**

**UV and Visible Spectroscopy:** Types of Sources and Stability, Wavelength selection, Filters cells and Sampling Devices, Detectors, Resolution.

**Fluorescence and Phosphorescence Spectrophotometry:** Types of Sources, Structural factors, Instrumentation, Comparison of Luminescence and UV-VIS Absorption methods.

**IR Spectrophotometry:** Dispersive and Fourier Transform Spectrophotometry, Sample Preparation, Quantitative Analysis and Interpretation of IR Spectra.

#### **UNIT-III**

**Atomic Absorption Spectrometry:** Instrumentation and Techniques, Interference in AAS, Background Correction Methods, Quantitative Analysis.

**Atomic emission Spectrometry:** Instrumentation and Techniques, ICP-AES, Comparison of ICP vs. AAS methods, Quantitative analysis, Application.

**Nuclear Magnetic Resonance Spectroscopy:** Basic Principle, Theory, Instrumentation & Applications.

#### **UNIT-IV**

**X-Ray Spectroscopy:** Introduction, X-Ray Absorption and Fluorescence methods, X-Ray diffractions, Auger emission spectroscopy (AES), and Electron spectroscopy for Chemical Analysis.

**Radiochemical Techniques:** Basic Principle and Theory, Introduction about Nuclear Reaction and Radiation, Neutron Sources, Neutron Activation Analysis (NAA)

**Thermal analysis methods:** Basic Principle and Theory, Differential Scanning, Colorimetry and Differential Thermal Analysis, Thermogravimetry

**Raman Spectrometry:** Instrumentation, Sample Handling and Illumination, Structural Analysis.

#### **Basic Texts & Reference Books:-**

- 1) Instrumental Methods of Chemical Analysis – Gurdeep R. Chatwal.
- 2) Biophysical Chemistry: Principles & Techniques – Upadhyay. Upadhyay Nath.
- 3) Instrumental methods of Analysis – Willard Merritt Dean Settle
- 4) Principles of Instrumentation Analysis – Douglas A. Skoog
- 5) Analytical Chemistry – Gary D. Christian

## PS01CFSC23 Instrumental Methods- Biological

### UNIT-I

#### **pH and Buffer, Physiological Solution.**

**Centrifugation techniques:** Basic principle of Centrifugation Technique, Various Types of Centrifuges- Density Gradient Centrifugation, Preparative Centrifugation, Analysis of Sub Cellular Fractionation, Ultra Centrifuge- Refrigerated Centrifuges.

**Microscopy:** Basic Principles, Simple and Compound Microscope, Comparison Microscope, Phase Contrast Microscope, Stereoscopic Microscope, Polarizing Microscope, Fluorescence Microscopy, IR Microscopy, Scanning Electron Microscope(SEM), Transmission Electron Microscope(TEM).

### UNIT-II

**Immuno Chemical Techniques:** General principles, Production of Antibodies, Precipitin Reaction, Gel Immuno diffusion, Immuno- electrophoresis, and Compliment fixation, Radio Immuno assay (RIA), ELISA, and Fluorescence Immuno assay, Biosensors

**Molecular Biology Techniques:** outline of genetic manipulations, Enzyme and vector, Cloning procedure, Isolation of Specific Nucleic acid sequence- complementary DNA, Gene libraries, Colony Hybridization, Nick Translation, Oligo nucleotide Probes, Expression of genes.

### UNIT-III

**Chromatographic Techniques:** General Principles, Paper chromatography, Column chromatography, TLC, Adsorption Chromatography, Partition Chromatography, Gas chromatography, Gas-liquid Chromatography, Exclusion Chromatography, Affinity Chromatography, HPLC, HPTLC, Capillary chromatography interfacing GC with IR spectroscopy.

**Electrophoretic techniques:** General Principles, Factors affecting electrophoresis, Low voltage thin sheet electrophoresis, , High voltage electrophoresis, Sodium dodecylsulphate(SDS) polyacrylamide gel electrophoresis, Isoelectric Focusing(IEF), Isoelectrophoresis, Preparative electrophoresis, Horizontal and Vertical electrophoresis.

### UNIT-IV

**Mass Spectrometry:** Sample Flow, Ionization methods, Mass analyzer, vacuum system, data handling, Correlation of mass spectra and molecular spectra, Fourier transform mass spectrometry, tandem mass spectrometry, Inductively coupled plasma MS(ICP-MS), Ion microprobe Mass analyzer(IMMA), GCMS, LCMS, Secondary mass spectrometry, Laser Mass spectrometry, Fast atom bombardment and liquid secondary ion mass spectrometry, High performance liquid chromatography, electro spray ionization mass spectrometry.

### Basic Texts & Reference Books:-

- 1) Biochemistry – U.Satyanarayan.
- 2) Book of Biotechnology – B.D.Singh.
- 3) Immunology – P.K.Gupta.
- 4) An Introduction to Microbiology – Pelzer.
- 5) Physical Chemistry: Principles & Techniques – Upadhyay.Upadhyay Nath.

**PS01EFSC21**  
**Biostatistics**

**UNIT-I**

Types of data, Basic concepts of frequency distribution, measure of central values- Mean, median and mode, measures of dispersion, Range, Mean deviation and standard deviation, correlation and regression analysis.

**UNIT-II**

Probability: Theory, classical definition of probability. Basic terms- Events, trials, mutually exclusive events, Favorable events, Exhaustive events, etc., Baye's theorems of probability, Addition theorem, Multiplication theorem, Conditional probability and coincidence probability.

Variance- Coefficient of Variation, moment, skew-ness and kurtosis, binomial distribution, normal distribution, hyper geometric distribution,

**UNIT-III**

Correlated Measurements discriminating power- derivation, evaluation of evidence by discriminating powers, combination of independent systems, correlated attributes.

**UNIT-IV**

Transfer of evidence- likelihood ratio, probability of guilt, correspondence probabilities, direction of transfer tests of hypothesis- test of significant of attributes, Z-test of significance and coefficient of correlation, small sample test, large sample test, normal test.

**Basic Texts & Reference Books:-**

- 1) Fundamentals of Biostatistics – Khan & Khanum.
- 2) Introduction to Biostatistics & Research Methods – P.S.S. Sudar Rao.
- 3) Methods in Biostatistics – B.K.Mahajan.

## **PS01EFSC22**

### **Computer Forensic**

#### **UNIT I**

Basic Computer Organization, Input Unit, Output Unit, Storage Unit, Central Processing Unit (CPU), Control Unit, Arithmetic & Logic Unit (ALU)

Main Memory- Storage evaluation criteria, Main Memory Organization, Main Memory capacity, RAM ROM, PROM, EPROM, cache memory.

Introduction to Operating System – DOS, UNIX, WINDOWS.

#### **UNIT II**

Network Investigations – Bus topologies & Ethernet, star Topologies & Ethernet, Ring Topologies & Ethernet, OSI Model, TCP/IP, network server hardware, connectivity hardware, Maintaining & troubleshooting networks.

Overview of protocols, Hypertext Transfer Protocol (HTTP), File Management, overview of IPV6, security implications of IPV6, IPV4.

General Computer Crime, Law, Punishment & Case Studies.

#### **UNIT III**

Security – Basic Goals, tools & techniques of computer security, unauthorized access control attack methods, tools & techniques to protect server's security, wireless networks, mobile devices, directory services & remote access, Encryptions.

Digital Certificates & Digital Signatures.

#### **UNIT IV**

E-commerce & M-commerce overview, payment options, online shopping, multicasting models.

#### **Basic Texts & Reference Books:-**

- 1) Cyber Security – M.P.Gallaher.
- 2) Handbook of Digital Forensic & Investigation – Casey Eoghan.
- 3) Computer misuse: Response, Regulation & the law – Fafinski Stefan.

#### **Practicals-PS01CFSC24**

1. To perform Crime Scene Management of Indoor crime Scene.
2. To perform sketching of indoor Crime Scene.
3. To perform Crime Scene Management of outdoor crime scene.
4. To perform sketching of outdoor crime scene.
5. To reconstruct & evaluate the 3D crime scene.
6. To perform collection & packaging of physical evidences found at Crime Scene.
7. To perform searching of physical evidence at Crime Scene.
8. To perform fundamental rules for photography.
9. To perform Photography at Crime Scene.
10. To perform Videography of Crime Scene.
11. To perform Photogrammetry of Crime Scene.
12. To perform UV & IR Photography at Crime Scene.
13. To detect drug or dye using UV-Visible Spectrophotometer.
14. To analyze paint chip using FTIR.
15. To analyze hair sample using FTIR
16. To perform AAS.

#### **Practicals-PS01CFSC25**

1. To perform pH metry.
2. To perform Conductometry.
3. To separate protein / blood sample using centrifuge.
4. To study various parts & working of simple & compound microscope.
5. To isolate DNA sample using Electrophoresis.
6. To perform TLC of ink sample.
7. To analyze alcohol by GCMS.
8. To analyze drug/dye by HPLC.
9. To know TCP/IP configuration
10. To work with internet using CMD.

#### **PSO1CFSC26- VIVA**