

**SARDAR PATEL UNIVERSITY
VALLABH VIDYANAGAR**



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

**PS03CFSC21
Forensic Physics**

UNIT-I

Glass: types of glass and their composition, Forensic examination of glass fractures under different conditions, determination of direction of impact: cone- fracture, rib marks, hackle marks, backward fragmentation, color and fluorescence, physical matching, density comparison, physical measurements, refractive index by refractometer, elemental analysis, interpretation of glass evidence.

Soil: formation and types of soil, composition and color of soil, particle size distribution, turbidity test, microscopic examination, density gradient analysis, ignition loss, differential thermal analysis, elemental analysis, interpretation of soil evidence, discussion on important case studies of glass and soil.

UNIT-II

Building materials: Types of cement and their composition, determination of adulterants by physical, chemical and instrumental methods, examination of brick, and analysis of bitumen & road materials, analysis of cement mortar and cement concrete & stones.

Paint: types of paint and their composition, macroscopic and microscopic studies, pigment distribution, micro-chemical analysis- solubility test, pyrolysis chromatographic techniques, TLC, colorimetry, IR spectroscopy & X-Ray diffraction, elemental analysis, interpretation of paint evidence.

Tool marks examination: Types of tool marks: compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics tracing and lifting of marks, photographic examination of tool marks and cut marks on clothes and walls etc.

UNIT-III

Restoration of erased/obliterated marks: method of making- cast, punch, engrave; methods of obliteration, methods of restoration- etching (etching for different metals), magnetic, electrolytic etc., recording of restored marks- restoration of marks on cast iron, aluminum, wood, leather, polymer etc.

Miscellaneous clue material: physical, chemical and instrumental methods of examination of strings/ropes, fibers, threads & fabrics, Wires/cables, Footprint, Lip marks, Tire marks, Bite

marks, seals, counterfeit coins, physical match of broken objects forensic examination of electrical appliances/installation.

UNIT-IV

Speaker identification and tape authentication: Voice production theory- vocal anatomy, speech signal processing and pattern recognition- basic factors of sound in speech, acoustic characteristics of speech signal, Fourier analysis, frequency & time domain representation of speech signal, analogue to digital signal and conversion, fast Fourier transform, quantization, digitization and speech enhancement, analysis of audio video signal for authenticity, introduction to the technique of pattern recognition and comparison.

Basic Texts & Reference Books:-

- 1) Criminalistics: An Introduction to Forensic Science – Richard Saferstein.
- 2) Crime Scene Management – M.S.Dahiya.
- 3) Crime Scene Management- M.S.Rao.
- 4) Forensic Science in Criminal investigation – B.R.Sharma.
- 5) Forensic Physics Manual (Directorate of Forensic Science).
- 6) Footwear Impression Evidence – Bodziak William.

PS03CFSC22

Forensic Toxicology, Pharmacology & Serology

UNIT-I

Forensic toxicology: introduction and concepts of Forensic toxicological examination and its significance.

Poisons- classification of poisoning, collection and preservation of toxicological exhibits in fatal and survival cases, signs and symptoms of poisoning, mode of action and its effect on vital functions, medico-legal and post mortem examination report/finding studies, specific analysis plan/approach to toxicological examination of poisoning samples.

Examination of poisons -metallic poisons, volatile poisons, snake venom, insects bites, poisons involving animal poisoning cases, Various Plant Poisons.

UNIT-II

Extraction techniques

Extraction, isolation and clean-up procedures- using conventional as well as modern techniques such as solid phase micro extraction techniques, separation, identification and estimation of poisons and drugs using chromatographic and Electrophoretic techniques and other instrumental techniques, significance of analytical studies with respect to forensic examination.

UNIT-III

FORENSIC PHARMACOLOGY: Forensic pharmacological studies, ingestion of drugs, absorption, distribution, metabolism, pathways of drug metabolism, drug metabolism and drug toxicity, excretion of drugs and poisons, detection of poisons on the basis of their metabolic studies, interpretation of analytical data and forming of opinion.

Interpretation of toxicological findings and preparation of reports, limitations of methods and trouble shooting in toxicological examination, disposal of analyzed samples, some cases of common and specific poisons and their importance in view of the specific scientific approach and examinations.

UNIT-IV

FORENSIC SEROLOGY: Serogenetic markers: blood groups- history, biochemistry and genetics of ABO, Rh, Mn and other systems, methods of ABO blood grouping from the blood stains and other body fluids/stains viz. menstrual blood, semen, saliva, sweat, tear, pus, vomit, hair, bone, nail, etc. blood group specific ABH substances, determination of secretor/non secretor status, Lewis antigen, Bombay.

Blood group, polymorphic enzyme typing- PGM, GLO-I, ESD, EAP,AK,ADA etc and their forensic significance, HLA typing, Role of serogenetic markers in individualization, paternity disputes etc.

Basic Texts & Reference Books:-

- 1) Forensic Toxicology manual (Directorate of Forensic Science).
- 2) Principles of Forensic Medicine including Toxicology – Nandi Apurba.
- 3) Parikh's Textbook of Medical Jurisprudence Forensic Medicine – C.K.Parikh.
- 4) Forensic Science in Criminal investigation – B.R.Sharma.
- 5) Analysis of plant poisons – Goutam M.P.

- 6) Forensic Medicine & Toxicology - R.K.Sharma.
- 7) Forensic Medicine – Guharaj P.V.
- 8) Textbook of Pharmacology – N. Mrugesh.

PS03CFSC23
Forensic Medicine

UNIT-I

Medical legal aspects of death:

Death- Definition & Types

Death from asphyxia- hanging, strangulation, throttling, suffocation and drowning (Definitions, Types, Signs and symptoms, Medico legal aspects, post-mortem findings.)

Death from starvation-Definitions, Types, Signs and symptoms, Medico legal aspects, post-mortem findings.

Infanticide and Abortion in detail.

UNIT-II

Mechanical injuries:- abrasion, bruises, laceration, incised wounds, stab wounds, defense wounds and fabricated injuries.

Regional injuries, Traffic accidents, Thermal injuries and Firearm injuries,

UNIT-III

MEDICAL JURISPRUDENCE- introduction identification of mutilated bodies, fragmentary remains and bones.

Medico legal autopsy- post mortem examination, rules of PM examination, disposal of dead body. post-mortem examination report and opinion, exhumation.

Definitions and Types of Sexual offences and Sexual Perversion.

UNIT-IV

PERSONAL IDENTIFICATION

FORENSIC ODONTOLOGY: dentition pattern, types and structure of teeth, age determination, identity of person, role on mass disaster, disease of teeth and their significance in personal identification. **FORENSIC ANTHROPOLOGY:** introduction to human anatomy, anthropology, anthropometry, somatoscopy and forensic archeology.

BONE: Identification of bone- morphological, anatomical and chemical characteristics, Osteometry and its application in determination of ancestry, race, age, sex, stature and unique features of the deceased.

Basic Texts & Reference Books:-

- 1) Principles of Forensic Medicine including Toxicology – Nandi Apurba., 7th Ed.
- 2) Parikh's Textbook of Medical Jurisprudence Forensic Medicine – C.K.Parikh.
- 3) Forensic Medicine & Toxicology - R.K.Sharma.
- 4) Forensic Medicine – Guharaj P.V.
- 5) Forensic Recovery of Human Remains – Dupras Tosha.
- 6) Written in Bones – Bahn Paul.

PS03EFSC21

Teaching & Research Aptitude & Quality Management

UNIT I

TEACHING APTITUDE

Teaching: nature, objectives, characteristics and basic requirements. Qualities and characteristics of the learner. Meaning of growth and development. Stages of development. Factors affecting teaching. Teaching tactics. Teaching strategies and learning objectives. Teaching methods (teacher centered methods, pupil centered methods). Teaching aids (audio-visual aids, blackboard, Radio, Films and television), Evaluation system: scope of evaluation, purpose of evaluation, types of evaluation.

UNIT II

RESEARCH APTITUDE

Research: meaning, characteristics and types. Steps of research: selection of a problem, Questions raised during selecting a problem, formulation and delimitation of a problem, title of research, statement of the problem, defining of the problem, preparation of research synopsis, hypothesis.

Methods of research: survey method, historical method and experimental method. Research ethics: prejudices and biases, fallacies, imaginary assumptions, contaminated facts, poorest forms of rationalization.

Research papers, conferences, workshops, seminar techniques symposium.

Thesis writing: importance and need, format of thesis report writing, style of preparing a thesis.

UNIT III

Quality management, Types of ISO/IEC/NABL:

General requirements for the competence of testing and calibration laboratories- Introduction, Scope, **Management requirements:** Organization, quality system, Document Control, review of requests, tenders and contracts, subcontracting of tests and calibration, purchasing services and supplies, service to the clients, complaints, Corrective and preventive actions, Control of records, Internal Audits,

Report writing and evidence evaluation: Components of reports and report formats in respect to crime scene and laboratory findings court testimony- admissibility of expert testimony, pre court preparations and court appearance, Examination in chief, cross examination and re-examination, ethics in forensic science.

UNIT IV

Technical requirements: general, personnel, accommodation and environmental, condition, test and calibration methods and method validation, equipments, measurement traceability, sampling, handling of test and calibration items, assuring the quality of test and calibration results and reporting results.

Laboratory Management: Laboratory information management system, validation and safety equipments.

Basic Texts & Reference Books:-

- 1) Truman's UGC Net by M.Gagan and Sagit kumar. Ed.2018
- 2) Quality Manual (NABL).
- 3) Parikh's Textbook of Medical Jurisprudence Forensic Medicine – C.K.Parikh

PS03EFSC22
Forensic Arts

UNIT-I

Introduction to forensic arts- foundation, introduction to forensic art illustration, history of forensic arts.

Composite sketches- the human face, drawing the face, hair, metal, ink, dressing of the perpetrator, findings and identifying the living.

UNIT-II

The interview and composite imagery

Facial reconstruction- skull protection and preparation for reconstruction, creating face in the 2D and 3D, creating 3D facial reconstruction on the skull

Composite reconstruction method for superimposition.

UNIT-III

Age progression- Age progression and ageing. Image assessments, enhancement, and modification.

Post mortem drawing.

UNIT-IV

Additional responsibilities, professional ethics and conduct, printing and graphics reproduction, dealing with the news media, the forensic artists in court.

Basic Texts & Reference Books:-

- 1) Face Processing – Zhaw Wenyi.

PS03CFSC24 Practical

1. Density Gradient of soil sample.
2. Comparisons of identity of small glass pieces by Floatation Method.
3. Restoration of erased identification marks.
4. Determination of refractive index of glass & liquids.
5. Physical Matching of broken pieces of different objects
6. Comparison of broken glass bangles.
7. Comparison of strings/ threads/ ropes
8. Physical/chemical analysis of paint samples.
9. Comparison of tool marks.
10. Visit for postmortem examination.
11. Race determination from bones.
12. Sex determination from bones.
13. Age determination from bones.
14. Stature determination from bones.
15. Age Determination from teeth.
16. Live Anthropometry.
17. Study of Anatomy of Human Bones.
18. Study of Somatoscopy.

PS03CFSC25 Practical

1. Detection & determination of Narcotic Drugs & Psychotropic Substances.
2. Systematic extraction & identification of acidic & basic drugs.
3. Detection of metallic poisons.
4. Analysis of samples for presence of pesticides.
5. Identification of various plant poisons (Datura, Yellow Oleander, Tobacco, Calatropis)
6. Grouping of blood stains.
7. To determine clotting time of blood.

Basic Texts & Reference Books:-

- (1) Forensic Physics, Biology, Chemistry Manual (Directorate of Forensic Science).
- (2) Forensic Toxicology Manual (Directorate of Forensic Science).

PS03CFSC26 – VIVA