



**DR. BABASAHEB AMBEDKAR MARATHWADA  
UNIVERSITY,  
AURANAGABAD**

**Syllabus**

**Of**

**B.Sc. FORENSIC SCIENCE  
III Year  
V/VI SEMESTER**

**Effective from Academic Year  
2011-2012 onwards**

## **Paper I: Applied Forensic Science**

**15 lectures per Unit**

### **Unit I : Global History & Development of Forensic Science & Other National Agencies**

Global perspective in the field of forensic science: - history, development, education and training. Organizational setup of forensic science lab and other national & international agencies: - FSL, CFSL, GEQD, FPB, NICFS, CID,CBI, Central Detective Training Schools, NCRB, NPA, Mobile Forensic Science Laboratories, IB, CPO, FBI, CIA, CSI, DAB, DEA, Bureau of Alcohol, Tobacco and Firearms. Understanding the role and duties of criminal investigators, qualification of a forensic scientist. Ethical Issues in Forensic Science: - defining ethics, professional standards for practice of criminalistics, code of conduct for expert witnesses, sanction against expert for unethical conduct. Laboratory sections. Various analytical and specialized tools of investigation.

### **Unit II : Quality Management System**

General requirements for standardization and calibration of laboratories: - Introduction, scope and need of standardization. Quality management requirements: - Testing and calibration procedures, total quality assurance, quality control, quality planning, Resulting and report writing. Quality Audit:-Internal & External Audit, Accreditation & certification, NABL, ISO, IEC, BIS, ASCLD/LAB, ABC, IAI. Laboratory management procedures: - Lab information management system, validation of equipments and safety protocols.

### **Unit III : Procedural Criminal Law & Policing System**

Scientific Report writing: - Components of reports and report format relating to Crime Scene and Laboratory findings. Stages in criminal proceedings: - FIR, Investigation, prosecution and trial stage. Remand and bail processes. Crimes under Special and Local laws: - Crimes under Dowry Prohibition Act, Crimes under Immoral Traffic Act, Specific offences under the Indian Penal Code (Homicide, sexual offences, offences against property). Classification of offences: Cognizable and Non cognizable offence, bailable and non bailable offences, compoundable and non-compoundable offences. Role of media, Role & Functions of Police.

### **Unit IV: Crime Scene Management, Reconstruction & Crime Scene Analysis**

Components of Crime Scene Management – Information management, manpower, technology & logistics management, role of crime scene managers and first responding officers, educational background & hierarchy. Understanding crime scene security, contamination control, documentation protocols and maintaining health & safety procedures. Crime Scene Reconstruction:- defining crime scene reconstruction, nature & stages of crime scene reconstruction, reconstruction based on blood spatter patterns, shooting range of firearm projectile and gunshot residue, linking cases by MO and Signatures. Defining Crime Scene Analysis, interpretation of exhibits, role of a crime scene analyst, theory & principles of analysis, arguments and ethics in crime scene analysis and data interpretation.

### **Unit V: Questioned Documents**

Functions of a Forensic Document Examiner: - Required training and education. Collection protocols of writing standards and process of comparison. Various writing features and their estimation. General and individual characteristics of handwriting.

Identification of writer of anonymous writings. Application of Forensic Stylistics/Linguistics in the identification of writer. Examination of built-up documents and determination of sequence of strokes. Determination of age of documents by examining various factors. Identification and comparison of typescripts: - Identification of typist, various types of printing processes, printing and machine defects, and alterations in typed text. Various types of typewriting devices: - examination of typewriters with proportional letter spacing, electronic typewriters, dot matrix, inkjet & laser printers, machines used for printing security documents, cheques, and currency notes, etc. Photocopy & photocopier examination: - photocopier identification, visual photocopy examination, photocopy forgery. Paper & watermark examination: - Paper size and thickness, paper opacity, colour and brightness, understanding watermarks. Examination of alterations, erasures, overwriting, additions and obliterations. Decipherment of secret writings, indentations & charred documents. Physical comparison of documents, examination of seal rubber & other mechanical impressions. Examination of counterfeit currency notes, Indian Passports/Visas, Stamp Papers, Postal Stamps etc. Examination of fake credit cards and electronic documents.

### **Unit VI: Forensic Medicine**

Global Medical Jurisprudence, Legal Procedure in India: - Police inquest, Magistrate's inquest, Coroner's inquest, Oath and affirmation. Documentary evidence: - Medical certificates, medical reports, dying declaration. Understanding laws and ethics of medical practice. Medico legal aspects of death: - Diagnosis of death- somatic & molecular, early and intermediate changes following death, late changes after death- putrefaction, autolysis, bacterial action, factors affecting these changes. Determination of time since death, including by histopathological methods. Medico legal investigation of sexual offences, including examination of victims and suspects. Medico legal aspects of death:- causes of death such as asphyxia, electrocution, thermal trauma, heat burns, starvation, natural death, sudden death, death by accident. Medico legal aspects of wounds: -medical and legal definition of wounds, types of mechanical and regional injuries, aging of wounds, difference between suicidal, homicidal and accidental wounds.

### **PRACTICALS**

1. Calibration of various instruments
2. Various safety methods
3. Report writing and interpretation
4. Scientific Report Writing
5. Presentation of expert evidence in a mock courtroom
6. Blood Spatter Analysis
7. Range of firing
8. Reconstruction of various types of crime scene
9. Identification of Handwriting General and individual characteristics.
10. Detection of various type of forgery.
11. Identification of Indented and Invisible writing.
12. Identification of typescripts and printing matter.

### **PROJECT STUDY**

### **FIELD VISIT / INDUSTRIAL VISIT**

## **PRACTICALS**

1. Calibration of various instruments
2. Various safety methods
3. Report writing and interpretation
4. Scientific Report Writing
5. Presentation of expert evidence in a mock courtroom
6. Blood Spatter Analysis
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8. Reconstruction of various types of crime scene
9. Identification of Handwriting General and individual characteristics.
10. Detection of various type of forgery.
11. Identification of Indented and Invisible writing.
12. Identification of typescripts and printing matter.

## **PROJECT STUDY**

## **FIELD VISIT / INDUSTRIAL VISIT**

**List of Books:**

1. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E).
2. Willard Merritt, Dean & Settle; Instrumental Methods of Analysis, 7th Ed., CBS Pub. & Distributors, New Delhi (1986)
3. Tewari R K, Sastry P K and Ravikumar K. V; Computer Crime & Computer Forensics, Select Pub. New Delhi. (2003)
4. V.D. Dudeja; Cyber Crimes & Law Vol. 2, Common Wealth
5. Nanda, B.B. and Tewari, R.K. (2001): Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi.
6. James, S. H. and Nordby, J. J. (2003) Forensic Science: An introduction to scientific and investigative techniques CRC Press, USA.
7. Guharaj, P. V., Chandran M. R. (2006) Forensic Medicine, 2<sup>nd</sup> Ed., Universities Press (India) Pvt. Ltd., Hyderabad.
8. Di Maio J. M. Vincent, Dana S. E. (2006) Handbook of Forensic Pathology, VIVA Books Pvt. Ltd., India.
9. Parikh C. K. (1999) Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology. Sixth Ed., CBS Publishers & Distributors Pvt. Ltd., India.
10. Barnett (2001): Ethics in Forensic Science.
11. O'Hara & Osterburg: Introduction to Criminalistics, 1949, The MacMillan Co., 1964.
12. Osterburg: Crime Laboratory.
13. Saferstien: Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc. USA.
14. Saferstein: Criminalistics, 1976, Prentice Hall Inc., USA.
15. Nickolas : Scientific Criminal Investigation
16. Deforest, Gansellen & Lee: Introduction to Criminalistics.
17. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
18. Kirk: Criminal Investigation, 1953, Interscience Publisher Inc. New York.
19. Indian Penal Code 1860.
20. Dowry Prohibition Act
21. Immoral Traffic Act
22. Criminal Procedural Code

## Paper II - Applied Forensic Chemistry

15 lectures per Unit

### Unit –I : Separation and detection technique

**Gas chromatography:** Theoretical principles, instrumentations and technique, columns, stationary phases, detectors, Forensic applications.

**HPLC:** Review of theory, Instrumentation, Technique, column, detectors, LC-MS, Forensic applications.

**Atomic Absorption Spectroscopy-** Introduction, Basic principles, Instrumentation and Techniques, Forensic applications.

**Flame spectrometry-** Principle, Instrumentation and working, Forensic applications.

**Inductive Coupled Plasma Spectroscopy -** Principles and Instrumentation, Forensic applications.

**Thermal methods-**TGA, DTA, DSC.

### Unit-II: Forensic Toxicology

Introduction and concept of forensic toxicological examination and its significance

**Poisons:** (Plant Poison, Animal Poison, Metallic Poison) classification of poisons, types 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, excretion of poisons, detection of poisons on the basis of their metabolic studies, interpretation of analytical data and forming of opinion.

### Unit-III: Miscellaneous

**Polymers-**Introduction-General idea of structures, types, tacticity, polymerization processes with examples, radical and ionic mechanism of polymerization, characteristic properties of polymers, Structure, preparation and applications of Polyethylene (types and Ziegler-Natta process), Teflon, PVC, Polystyrene,

**General idea of plasticizers, stabilizers, fillers, Epoxy Resins, Feviseal.**

**Plastics-** Classification of plastics, application of plastics. **Rubber-** types of rubber, vulcation of rubber, synthetic rubbers, **Fibres (synthetic fibres)**-classification, properties, polyamides-Nylon, polyesters-Terylene or Dacron.

**Fibre reinforced plastics-** types, properties, applications. **Glass fibre reinforced plastics-** properties, applications.

**Relevant provisions of:**

1. The Poisons Act, 1919, and Section 284 of IPC, 1860 (Negligent conduct with respect to poisonous substance).
2. Explosives Act 1984, (Definition, Powers of Central Govt. and Licensing Authority, Offences and Penalties) and Section 286 of IPC, 1860, (Negligent conduct with respect to explosive substance),
3. Explosive Substances Act 1908, (Definition, Offences and Penalties).

#### **Unit-IV: Narcotic Drug and Psychotropic Substances**

Analysis of Narcotic Drugs and Psychotropic Substances, Drug effects, drug Hazards, Tolerance and dependence of drugs, Problems of drug addiction, Identification of drug addict, Drug addicts and crimes, Classification of Narcotics and other drugs, Analytical techniques for identification of drugs. Types of Pharma drugs, Steroids, Forensic Pharmacological studies, Ingestion of drugs ,absorption, distribution, metabolism, pathways of drug metabolism, drug metabolism and drug toxicity, excretion of drugs.

#### **Unit-V: Study of Analysis of Beverages**

Introduction, Definition of alcohol and illicit liquor, Alcoholic and non-alcoholic beverages and their composition, Proof spirit, absorption, de-toxication and excretions of alcohol, problems in alcohol cases and difficulties in diagnosis, Alcohol and prohibition, Consequences of drunken driving, Analytical techniques in the analysis of alcohol and other articles. Case study.

#### **Unit-VI : Miscellaneous**

**Arson:** chemistry of fire, investigation and evaluation of clue material, analysis of arson exhibits by instrumental methods: Management of Arson cases,

**Food adulteration:** Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material cases.

#### **Relevant provision of:-**

1. Prevention of Food Adulteration Act 1954 (Definition, Power of Food Inspector, Offences and Penalties),
2. Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation, Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties),
3. Prevention of Illicit Trafficking in NDPS Act 1985 (Detention of a Person Under the Act),
4. Drugs Control Act 1940 (Definition, Power of Chief Commissioner Under the Act),
5. Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics, Offenses and Penalties),
6. Arson cases.

#### **PRACTICALS**

1. Identification of food adulteration.-vegetable oil, Cold drinks etc. (2 nos).
2. Quantitative or qualitative study of drug opiates. (2 nos).

3. Examination of fire arson cases by GC, TLC. (1 nos).
4. Detection and determination of various adulterants in alcohol, by colour tests.(Qualitative analysis) (2 nos.).
5. Chemical analysis of explosive materials.(Gun powder)- Colour test, Microscopic examination. (2 nos).
6. Analysis of alcohol from blood (quantitative by GC). (2 nos).
7. Extraction methods of drugs, Poisons. (2 nos).
8. Colour Tests for identification of poisons, drugs. (2 nos).
9. Plant, animal, Metallic poison analysis. (2 nos.).
10. Polymer Testing.
11. Separation of Sampling Material by TLC (drugs, poison etc.) (2 nos).
12. Study of Steroids (separation by TLC).
13. Examination of chemicals used in Trap cases by UV-visible spectroscopy. (2 nos).
14. Examination of other metal.

### **Reference books**

1. Instrumental Method of Chemical Analysis. Chatwal & Anand, Himalya Publication.
2. S. N. Tiwari, Analytical Toxicology, Govt. of India publications, New Delhi 1987
3. Brown P. R., Advance in Chromatography.
4. Introduction of Forensic Science in Crime Investigation by Dr. (Mrs.) R. Krishnamurthy.
5. Howard: Forensics Analysis by Gas Chromatography.
6. Yinon: Forensic Application of Mass Spectroscopy 1994.



7. Prakash M. et.al; Methods in Toxicology Anmol Publication, New Delhi (1998)
8. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi (1999)
9. Balraj S. Parmar et.al; Pesticide Formulation, CBS Publishers, New Delhi (2004)
10. Casarett & Doll Toxicology, The basic Science of Poisons
11. Curry A. S., Poison Detection in Human Organs 1976
12. Curry : Analytical Method in Human Toxicology 1986.
13. Lee and Gaensslem.: Advances in Forensic Science (Vol. 2) Instrumental Analysis.
14. Settle F. A.: Handbook of Instrumental Technique for Analytical Chemistry, Prentice Hall 1997.
15. Serope Kalpakjian, Steven R Schmid. "Manufacturing Engineering and Technology". International edition. 4th Ed. Prentice Hall, Inc. 2001. [ISBN 0-13-017440-8](#).
16. Hans-J. Koslowski. "Dictionary of Man-made fibers". Second edition. Deutscher Fachverlag. 2009.
17. Borrow: Molecular Spectroscopy 1980.
18. Willard H. H. et. al : Instrumental Methods of Analysis 1974.
19. Moonesens A. A. et. al. : Scientific Evidence in Criminal Cases 1973.
20. Lundquist and Curry: Methods of Forensic Sciences 1963.
21. Holfmann, F. G., Hand book of drug and alcohol abuse.
22. Arena Poisoning, Chemistry Symptoms and treatment,
23. Analysis of Plant Poisons, Dr. M P Goutam.
24. Drug Abuse Handbook, Karch.s.
25. Constitution of India
26. Indian Evidence Act.
27. Criminal Procedure code.
28. Indian Penal Code.
29. Bare Acts with short notes on the following : 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

### **Paper III: Applied Forensic Physics**

#### **15 lectures per Unit**

#### **Unit – I: Causes and Investigation of Vehicular Accidents- an overview**

Automobile accidents- Introduction, sources of information, eye witnesses, Tire and other mark, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, curved scuffmarks, Time and distance, reaction time, Photography and plans; Rail Accidents- Investigation of rail crash: criminal and safety investigation, Investigation principles, Best Practices: rail company tests, inspection of driving cab, examination of electrical/electronic/technological system and their failure. Necessary equipments required for forensic examination.

#### **Legal Aspect:**

1. Relevant Provisions of Motor Vehicle Act, 1939 (Offenses and Penalties).
2. Relevant Provisions of Railway Act, 1989, (Offenses and Penalties).
3. Relevant Provisions of Indian Penal Code, 1860, (Sections 337 (causing hurt), 304 A (causing death due to negligence) and 279 (rash and negligent driving)).

### **Unit – II: Experimental Techniques**

Forensic Photography; Introduction, 35 mm film / Digital SLR camera, Digital photo imaging, ISO number, Exposure Index, Photo imaging evidence; angle, scale, depth of field, light, ambient light, color temperature, flash/ strobe. Crime scene investigation report writing. Magnetic Measurement; (magnetic susceptibility). Electric Measurements; (Hall voltage, Resistivity measurement & FET characteristics), Radiation Detection; Geiger Muelier counter, Optical fiber communication system, Piezoelectricity and piezoelectric measurements.

### **Unit – III: Exterior Ballistics**

Introduction, General consideration, Parabolic trajectory of a bullet, Vacuum trajectory and calculation of remaining velocity, Air resistance, Bullet drop, Wind deflection, Gyroscopic drift, Twist versus stability, Canting, Shooting up/ down, Velocity of falling shot and falling bullet, Escape velocity, Maximum horizontal and vertical range of shot pellets, Ricochet; Critical angle for ricochet for the bullet and the surface, Relationship between the angle of incidence and ricochet, Stability in flight after ricochet, Lethal effects of ricochet bullet.

### **Unit – IV: Terminal (Wounds) Ballistics**

Introduction, Stopping power of bullet, Injuries and the quantity of energy of projectiles, Shock wave and cavitation effect, Wounding mechanism, Elements of wound Ballistics; Nature of target, Velocity of projectile, Constructional features of projectile. Range; Classification of range (maximum horizontal/ vertical, effective, dangerous, safe and legal sense), Contact Range, Point blank range, near range, chips range, distant range. Penetration of shots in different regions of the body.  
Legal Aspect: Arms Act, 1950, (Licensing, Offenses and Penalties).

### **Unit – V: Forensic Microscopy**

Basics of microscope, Compound microscope- parts and properties, Comparison microscope, Stereomicroscope, Polarizing microscope- polarization and applications, Micro spectrophotometer, Scanning Electron Microscope (SEM). Transmission Electron Microscope (TEM).

### **Unit – VI: Forensic Applications in Trace Analysis**

Review of physical properties of materials: temperature, weight and mass, density, refractive index; methods of comparing refractive indices, Composition of glass, Comparison of glass fragments, Measuring and comparing density and refractive index of glass, classification of glass samples, Glass fractures, Collection and preservation of glass evidence. Forensic analysis and examination of soil, the significance of soil evidence, Variations in soil, Collection and preservation of soil evidence. Fiber; Types, Identification and comparison of manufactured fibers (Microscopic examination, Dye composition, Chemical composition, Other properties for examination), Significance of match, Collection and preservation of fiber evidence.

## **PRACTICALS**

(Department is advised to arrange as many as experiments from the following list and other

experiments related to theory syllabus having forensic importance

1. Comparison of glass fragments and Study of fractures in forensic material.
2. Examination of soil sample.
3. Determination of density of a given sample.
4. Determination of refractive index of a transparent material.
5. Examination of tire/ other marks.
6. Study of scuffmarks.
7. Analysis of accident scene photography and Physical examination accidental vehicle.
8. Testing and examination of given electric components / parts / circuits.
9. To study the effect of magnetic field on aqueous solution of paramagnetic salt,
10. Measurement of resistivity by four probe method.
11. Measurement of Hall voltage.
12. Working with Geiger Mueier counter.
13. Working with Compound microscope and Working with Comparison microscope.
14. Working with Stereomicroscope and Working with Polarizing microscope.
15. Working with Micro spectrophotometer.
16. Working with communication kit and Optical fiber parameters.

17. Simulation of bullet trajectory.
18. Development of 35 mm photograph.
19. Measurement of recoil ( Sample calculations) and Determination of remaining velocity  
(Sample Calculations).
20. Twist versus muzzle velocity (Sample Calculations) and Muzzle velocity (Sample Calculations).
21. Determination of remaining velocity (Sample Calculations).
22. Identification of firearm injury.
23. Piezoelectric measurements.
24. Fiber strength measurements.

**List of Books:**

1. Encyclopedia of Forensic Science, Volume one: Jay A Siegel, Pekka J Saukko, Geoffery Knupfer. Academic Press.
2. Criminalistics, An Introduction to Forensic Science: Richard Saferstein, 10<sup>th</sup> Edition, Pearson Education International.
3. Forensic Science An Introduction to Scientific and Investigative Techniques : Stuart H. James and Jon J. Nordby., 3<sup>rd</sup> Edition CRC Press, Taylor & Francis Group.
4. Forensic Ballistics in Criminal Justice: Kaushalendra Kumar.
5. Firearms in Criminal Investigation and Trials: B. R. Sharma, 4<sup>th</sup> Edition, Universal Law Publishing Company. New Delhi.
6. Handbook of Firearms and Ballistics, Examining and Interpreting Forensic Evidence: Brain J. Heard, John Wiley & Sons.
7. Advanced Practical Physics, Vol.II: Dr. S.P.Singh, Pragati Prakashan, Meerut.
8. Practical Physics: Worsnoff and Flint.

## **Paper IV: Applied Forensic Biology**

**15 lectures per Unit**

### **UNIT I : FORESIC SEROLOGY**

Determination of human and animal origin from bones, hairs, nails, skin, body tissue, fluids / stains viz. blood, menstrual blood, semen, saliva, sweat, pus, vomit, etc., through immunediffusion and immune – electrophoresis. Serogenetic markers:- Blood groups – biochemistry and genetics of ABO, Rh, Mn systems, stains and other fluids / stains viz. menstrual blood, semen, saliva, sweat, tear, pus, vomit, hair, bone, nail blood specific ABH substances, determination of secretor / non secretor Lewis antigen, Bombay Blood group, Polymorphic enzymes typing – PGM, GLO, ESD, EAP, AK, ADA, etc., and their forensic significance, HLA typing, role serogenetic markers in individualization, paternity disputes etc.

### **UNIT II : WILD LIFE FORENSIC AND FORENSIC ORNITHOLOGY**

Introduction and importance of wild life, Protected and endangered species of Animals and Plants. Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants by conventional and modern methods. Identification of Pug marks of various animals census of wild life population. Birds flight and means of locomotion, Strikes and collisions, Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts, Applications of Forensic Ornithology, Feather structure and topography.

### **UNIT III : FORENSIC MICROBIOLOGY AND PALYNOLOGY**

Development of forensic microbiology, Types and identification of microbial organisms/ fungi of forensic significance, Techniques in forensic microbiology. Understanding Bioterrorism: - Types of biological agents – Category A, B, C. Planning and response to

bioterrorism – Preparedness Biosurveillance, Biodefence. Epidemiology of Bioterrorism, Punishments for Bioterrorism act Under Prevention of Terrorism Act, 2002. Study of spore, powdered minerals and pollens of forensic importance, Use of pollen grains & spores in criminal or civil investigation, Applications of Forensic Palynology.

#### **UNIT IV: DNA PROFILING AND ITS FORENSIC SIGNIFICANCE**

History of DNA fingerprinting, Human genetics – Heredity, Alleles, Mutations & Population Genetic, Molecular Biology of DNA. Forensic Application of recombinant DNA technology/ Forensic Biotechnology, Human Genome Project, Variations, Polymorphism in DNA system – DNA markers RELP, RAPD, VNTRs, SNP, Autosomal – STR, Y-STR, Mitochondrial DNA. Forensic Significance of DNA Profiling:- Application in disputed paternity cases, child swapping, Missing person's identity – immigration, veterinary & wild life and Agriculture cases, legal perspectives – legal standards for admissibility of DNA profiling, procedural and ethical concerns, status of development of DNA profiling in India and abroad. New and future technologies: DNA chips, SNPs and limitations of DNA profiling.

#### **UNIT V: FORENSIC ANTHROPOLOGY & ODONTOLOGY**

Introduction & History of Anthropology, Physical Anthropology & Human Variability, Understanding Archeology & Osteology, Scene Processing, Examining remains – Human or Animal / Old or New, Issues involved in development of biological profile, Issues in Identification, Age estimation in childhood and adulthood, Sexual Dimorphism, Population Ancestry, Stature estimation, Individualization & Identification, Evidence for cause and manner of death from bones, Documentation & Expert Witness Testimony. Portrait Parle, Bertillon system, Facial reconstruction, Super-imposition techniques, Reconstruction based on craniometric and somatoscopic methods. Importance of tissue depth to reconstruct various facial features. Introduction & History of Odontology, Dental Training required, Expert Witness Testimony, Body Identification by Dental Records, Post Mortem Examination & Records, Antemortem examination & records, Record Analysis & Processing, Forensic Dentistry in Mass Disasters, Bite Mark Analysis – Time of Death, Response of Assailant or Victim, Collection of Bite mark evidence & comparison.

#### **UNIT VI : FORENSIC ENTOMOLOGY**

Introduction & History, Identification of insects, Training required, Determination of Time elapsed since death, Dipterans Larval Development, Successional Colonization of Body, Determination of displacement and disturbance of the body, Presence and Position of wounds, Drugs consumption ante mortem, Human & Animal neglect or abuse, Collection of entomological evidence, Challenges encountered in Entomology, Report Submission, Testifying in Court.

## **PRACTICALS**

1. To determine titre of antisera.
2. To perform precipitin test for species of origin determination.
3. To perform Immunodiffusion test for species of origin.
4. To perform electrophoresis for separation of various polymorphic enzymes.
5. Extraction and isolation of DNA from blood.
6. Blood grouping from stains of blood, semen, saliva and other body fluids by Absorptioninhibition, Absorption-elution and mixed agglutination technique, determination of secretor/non-secretor status.
7. Identification of orders of insects and other arthropods of forensic significance.
8. Preparation of permanent slides by using maceration technique of various forensic material of Plant origin.
9. Determination of age from skull sutures.
10. Determination of age from Teeth.
11. Determination of sex from skull.
12. Determination of sex from Pelvis.
13. To examine Barr bodies from blood sample.
14. To identify blood strains.
15. To identify semen stains.
16. To identify saliva stains.
17. To determines species of origin from blood.
18. Identification and culture of bacteria of forensic significance.
19. Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants
20. Identification of birds from feathers.
21. Study of pollen grains and spores of forensic significance.
22. Examination of fur, nails, horn, teeth.
23. Examination of hair of different animals such as Dogs, Cats, Cow, Horse, Goats etc.
24. Determination of human hair morphology.

### **List of Books**

1. Practical Crime Scene Analysis & Reconstruction – Roos M. Gardner & Tom Bevel
2. Death Scene Investigation – Scott A. Wagner
3. Forensic Science in criminal investigation and trials – B.R. Sharma
4. Forensic Science in Crime Investigation – Dr. Mrs. Rukmani Krishnamurthy
5. Forensic Science – An introduction to scientific and investigative techniques – Stuart H. James  
& Jon J. Nordby
6. Forensic Medicine – P.V. Guharaj & M. R. Chandran
7. Bryant, V.M. Jr, Mildenhall, D.C. and Jones, J.G., Forensic Palynology in the United States of America Palynology. 1990, 14.PP.193-208
8. Faegri, K. Iverson, J. and Krzywinski, K. Textbook of Pollen Analysis 4<sup>th</sup> Edition. John Wiley & Sons, New York 1989.
9. Microbial forensics By Roger Breeze, Bruce Budowle, Steven E. Schutzer. Elsevier Academic Press
10. The Forensic Laboratory Handbook Procedures and Practice By Ashraf Mozayani, Carla Noziglia. 2<sup>nd</sup> edition. 2011. Human Press.
11. Forensic Science in Wildlife Investigations. Adrian Linacre Taylor and Francis, 2009
12. The Wildlife Detectives: How Forensic Scientists Fight Crimes Against Nature By Donna M. Jackson, Wendy Shattil, Bob Rozinski UniversalAthenaeum (Denver, CO, U.S.A.)
13. Forensic Entomology: The Utility of Arthropods in Legal Investigations Jason H. Byrd, James L. Castner Taylor and Francis, 2009
14. Forensic entomology: an introduction By Dorothy E. Gennard Wiley.
15. Forensic palynology Dallas Mildenhall, Patricia Wiltshire, Vaughn Bryant Elsevier, 2006
16. Forensic palynology: an in-depth look at its indispensable value National University, San Diego, 2002



## **Paper V: Applied Forensic Psychology**

**15 lectures per Unit**

### **UNIT I: Essentials of Forensic Psychology**

1. Development of forensic psychology
2. Ethical standards of forensic psychology
3. Scientific methods used in forensic psychology
4. Importance of study of forensic psychology.

### **UNIT II: Causes of criminal behavior and Psychological theories**

1. Psychological Factor & delinquency
2. ADHD & conduct disorder
3. Psychopathy & antisocial personality disorder
4. Sexual disorder
5. Substance abuse
6. Treatment

#### **Psychological theories:**

1. Learning behavioral theory
2. Psycho analytic theory
3. Cognitive theory
4. REBT

### **UNIT III: Investigative psychology**

1. Criminal psychological profiling-Nature, definition.
2. Psychological tests used Criminal psychological profiling
3. Psychological autopsy
4. Forensic hypnosis (Narco analysis)
5. Polygraph
6. Stalking
7. The Psychology of violence

### **UNIT IV: Police psychology**

1. Psychological testing & selection of police officer: aptitude test, intelligence test, personality test.
2. Stress & stress management
3. Fitness for duty evaluation
4. Police suicide

### **UNIT V: Rehabilitation & counselling:**

1. Nature ,definition & scope

2. Type of rehabilitation
3. Technique & skills
4. Rehabilitation model
5. Rehabilitation of victim of crime
6. Definition, nature & scope of counselling
7. Characteristic of counsellor
8. Type of counselling: legal, crisis, preventive
9. Skill to counsel criminal

#### **UNIT VI: Psychology & court**

1. The mentally ill in court
2. Competency to stand trial
3. Insanity
4. Mc Naughten rule
5. Sentencing evaluation
6. Risk assessment
7. Memory & eyewitness testimony

#### **Legal Aspect**

1. Relevant Provisions of Indian Penal Code 1860 (General Exceptions),
2. Mental Health Act, 1987 (object, Establishment or maintenance of psychiatric hospitals and psychiatric nursing homes, Procedure on production of mentally ill person in front of Magistrate).
3. Relevant Provisions of Juvenile Justice Act 1986 (Objectives, Juvenile Court and Its Procedure)

## **PRACTICALS**

To conduct

1. Relevant questions by using lie detection test.
2. Irrelevant questions by using lie detection test.
3. control questions by using lie detection test.

Conduction of Psychological tests – Intelligence test:

4. Wechsler's adult intelligence scale
5. Wechsler's intelligence scale for children
6. Standard progressive matrices by Raven.
7. Nonverbal test of intelligence by Dr. Nafde.(age group 16-18)
8. Nonverbal test of intelligence by Dr. Nafde.(age group 19-21)

Personality test:

9. Minnesota multiphasic personality inventory
10. Eysenck personality inventory
11. 16.P.F. by R.B. Cattle
12. Thematic apperception test
13. Rorschak inkblot test
14. Children apperception test
15. Picture Frustration study by Rosenswieg(Children form)
16. Picture Frustration study by Rosenswieg(Adult form)

Aptitude test : Differential aptitude test.

17. Abstract reasoning
18. Numerical
19. Spatial
20. Verbal
21. Verbal
22. Clerical
23. Mechanical
24. Differential aptitude test.
25. Measuring Locus of control .

## **List of Books:**

1. Graham J.Towel & David A. Crighton,Forensic Psychology,BPS BLACKWELL  
Cochrane, R.

- E., Tett, R. P., Vandecreek, L. (2003). Psychological testing and the selection of police officers:  
A National Survey. *Criminal Justice and Behavior*, 30(5), 511-537.
2. Kocsis, R. N. (2003). Criminal psychological profiling: Validities and abilities. *International Journal of Offender Therapy and Comparative Criminology*, 47(2), 126-144.
3. Indian Penal Code 1860
4. Mental Health Act 1987.
5. Juvenile Justice Act 1986
6. Prof. Paranjape N. V., Criminology and Penology, Central Law Publication, Allahbad.
7. Barlow & Durand. V. M. (2005) *Abnormal Psychology*, 6<sup>th</sup> Ed. New Jersey
8. Seligman, *Systems & Skill*, 6<sup>th</sup> Ed. New Jersey
9. *Serial Crime, Theoretical & Practical issues in behavioural profiling*, Petherick, Woodworth Publications.
10. *Manual of Psychological Test in Syllabus*

## **Paper VI: Applied Digital and Cyber Forensics**

**15 lectures per unit**

### **Unit I: Data and Evidence Recovery**

Computer and cyber forensic basics, Cell Phone / Mobile Forensics, Blue-Tooth, Computer Ethics and Application Programs.

Data and Evidence Recovery-Formatted Partition Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, File Transfer Protocol (FTP), Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files, Introduction to Encase Forensic Edition, Forensic Tool Kit (FTK) etc, Use computer forensics software tools to cross validate findings in computer evidence related cases.

### **Unit II: Cyber Forensics Investigation**

Technical issues – Security Technologies: Certification and key Distribution, Cryptographic Applications, Digital Signature Protocols for Transactions, SSL-Secure Socket Layer, SET-Secure Electronic Transaction. Cyber Forensics Investigation-Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking

### **Unit III: Security Issues**

Security Issues –Types of Attacks(Active and Passive) Stealing Passwords, Social Engineering, Bugs and Backdoors, Illegal accessing, Authentication Failures, Protocol Failures, Information Leakage, Viruses and Worms, Denial-of-Service, etc. – Firewalls, Packet Filters, Application-Level Filtering, Circuit-Level Gateways, Dynamic Packet Filters, Distributed Firewalls; Digging for Worms, Packet Filtering, Implementing policies (Default allow, Default Deny) on proxy, etc., Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Threats, crimes, etc.; Why require a security? Picking a Security Policy, Strategies for a Secure Network, The Ethics of Computer Security, Security Threats, and levels, Security Plan (RFC 2196)

### **Unit VI: Electronic World**

E-Governance, Introduction, IT and business, EDI, E-Business, E-Banking, Real Time Gross Settlement (RTGS), Mobile Banking E-commerce: Concerns for E-commerce Growth, Concepts Electronic Communication, PCs and Networking, E-mail, Internet and intranets. EDI, EDI to E-commerce, UN/EDIFACT Concerns for E-commerce Growth, Internet bandwidth, Technical issues, Security issues. India E-commerce Readiness, Legal issues, Credit Card Business Electronic Commerce providers. CyberCash, Digicash, VeriSign Software Package: EDI software developed by NIC for Customs

### **Unit V: Forensics auditing**

Forensics auditing – step-by-step, how-to process for securing, investigating, and auditing or assessing various IT environments. Introduction to Forensic Accounting: Introduction to Forensic Accounting and Fraud Examination; Principles of Forensic Accounting and Fraud Examination; Roles of the Forensic Accountant; Introduction to Fraud and Forensic Accounting; The Nature of Fraud, Why People Commit Fraud, Fighting Fraud, Fraud Prevention, Fraud Detection, Recognizing the Symptoms of Fraud; Data- Driven Fraud Detection, Fraud Investigation, Investigating Theft Acts; Investigating Concealment, Conversion Investigation Methods; Private Sources of Information, Inquiry Methods and Fraud Reports Honesty Testing, The Fraud Reports,

Management Fraud; Financial Statement Fraud; Revenue-and Inventory-Related Financial Statement Frauds; Liability, Asset, and Inadequate Disclosure Frauds; Fraud Against Organizations, Consumer Fraud; Identity Theft, Investment Scams, Money Laundering; Bankruptcy, Divorce, and Tax Fraud, Fraud in E-Commerce; Resolution of Fraud, Legal Follow-Up, Being an Expert Witness; Financial Statement Fraud Standards; Avoiding common mistakes in fraud risk assessment and examination; Credit Card Frauds, Online Transaction Frauds, Cheque Frauds etc.

**Unit VI: Information technology law**

IT Act 2000: Scope, Objectives,

E- Governance,

Creation, Recognition and Verification of Digital Signature

Digital Signature and Penalties under IT Act 2000,

Certifying Authority and Controller.

Emerging trends in Information Technology law.

**PRACTICALS**

1. Data Recovery integrated with forensic technology (2 nos.)
2. Mobile Forensic using cell phone forensic suit (2 nos.)
3. Computer Forensic Investigation Tools, Digital Forensics investigation Tools (2 nos.)
4. AccessData eDiscovery (2 nos.)
5. Creation & verification of Digital Signature (2 nos.)
6. Hardware Data Recovery-SalvationDATA Tools (2 nos.)
7. Network Analysis (2 nos.)
8. Detail Analysis of E-mail ,E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery (2 nos.)
9. Working on EnCase Software (2 nos.)
10. Imaging of discs using various tools (2 nos.)
11. Image processing using tools like, Photoshop, Corel Photo paint etc. (2 nos.)

12. E-Commerce (E-shopping of any product to understand the transaction and security issues)  
(2 nos.)

**List of Books:**

1. File System Forensic Analysis by Brian Carrier, Publisher: Addison-Wesley Professional
2. Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis) by Barkha & Ram Mohan, Publisher: Asian Law House, Hyderabad
3. Cyber Crime – Dr. R C Mishra, Publisher: Authorspress
4. Forensic Science in Crime Investigation Dr. Rukmani Krishnamurthy, Publisher: Selective & Scientific Books
5. Handbook of Security, Cryptography & Digital Signature
6. Forensic Science – From the Crime Scene to the Crime Lab by Richard Saferstein
7. E-Commerce: The Cutting Edge of Business, Kamlesh K. Bajaj & Debjani Nag, Tata McGraw Hill
8. Cyber Law and E .Commerce, David Baumer, J C Poindexter, TMG Cyberlaw Simplified  
Vivek Sood, TMG
9. e- Commerce Strategy , Technologies and Applications, David Whiteley, McGraw Hill

International

10. E- Security, Electronic Authentication and Information Systems Security Sundeep Oberoi,

TMG

11. Firewalls and Internet Security: Repelling the Wily Hacker , Second Edition Addison