# Program Objectives
# M.Sc. Forensic Science
# (Post graduate program offered by the department)

**1. Name of the program: Master of Science in Forensic Science**

**2. Program Specifications:**

School of Studies: School of Studies of interdisciplinary Education and Research

Department: Forensic Science

Program: M.Sc. Forensic Science

Head of the Department: Dr. Bharti Ahirwar

Date of Approval in Board of Studies: 07/09/2018

Date of Last revision: 2018

Next revision due: 2021

**3. Mode of Study:** Full time (Semester system):

**Purpose of the course:** Build up a conceptual understanding of criminal justice system, rules of evidence collection, legal system, critical thinking and analysis in a stepwise fashion that builds through the sequence of courses. Laboratory skills to exacting standards of precision and care, including microscopy, Toxicological and Chemical methods of analysis, molecular biology methods, anthropological methods of Human identification, DNA and Next generation sequencing, wide approach analysis of evidence without bias. Apply concepts learned in the classroom and make conclusions based on scientific thinking. Work collaboratively in the laboratory to acquire and analyze data and to solve problems. Graduates are competitive for employment in a field that uses their degree courses.

**Program objectives:** Our mission as a Forensic science program is to develop professional, ethical graduates whose competence in problem-solving, legal analysis and application, quantitative reasoning, investigation and scientific laboratory procedures can be applied to immediate employment or advanced study.

**Skills:** The Students will learn the following the skills after completion of the course:

- The basic analysis of biological samples found at the crime scene.
- To handle the evidences left out at the crime scene.
- The basic methods for examine the different types of questioned documents.
- Identify the different petroleum products by TLC examination.
- Examination of counterfeit Indian currency notes, passports and other mechanical impressions.
- Identify the classification and mode of different types of poisons.
- Understanding the classification of firearms and their mechanisms.

**Programme specific objectives:**

- To develop the Post graduate level students with the specific knowledge of handling different types of evidences and their examinations.
- To develop the laboratory skills in examining different types of evidences found at the crime scene.
- To prepare the students to compete for employment in State and central level Organizations.

**Programme outcomes:** On completion of the programme students will

- Apply the Laboratory skills to participate in the career needs of Forensic community.
- Become trained in the laboratory skills of different division of Forensic Science.
- Be able to work with different R&D organizations.

| Course Specific Objectives and Outcomes | | | |
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| **Course Code** | **Course Name** | **Course objectives** | **Course outcomes** |
| IFSC701 | Forensic science & Criminology | This course provides knowledge about Organizational setup of Forensic Science laboratories at state and central level, Ethics in Forensic science, white collar crimes, organized crimes, economic crimes, cyber crimes. This course will give details about various relevant sections of IPC, IEA and Cr.P.C, study of organizational structure of various departments such as Police organizations, CBI, BPRD, INTERPOL etc. | This course provides knowledge to students will learn details about structure of Forensic Laboratories, different types of crime in society, and various Acts and their relevant sections. Will have knowledge of working and function of Police Organization, CBI, BPRD etc. |
| IFSC702 | Forensic techniques & Instrumentation | This course will provide knowledge about various Forensic Profiling methods, basic Principle working and handling of different microscopes, basics of DNA fingerprinting, PCR, STR, RFLP etc. this course will Provide knowledge of various Instruments used in Forensic Examination. Study of various psychological tools their Principle and significance | Students will learn basic Principles of various instruments such as Microscopes, DNA sequence Analyzer, NAA, DTA etc. Principle of Narco Analysis, Brain Mapping etc. |
| IFSC703 | Crime Scene Management | Introduction to crime scene, types of crime scene, various methods of securing, searching and documenting crime scenes, collection, packaging and preserving different types of physical and trace evidence at crime scenes, maintaining chain of custody. Crime scene management in different cases such as Murder, Fire, Arson, theft, Burglary, also learns about death Investigation. | Student will learn crime scene management steps, collection, Packaging and forwarding of evidences. Dealing with various aspects of crime scenes such as in case of Fire , Arson – Fire patterns , in case of theft and burglary – collection of evidences and Fingerprints etc. Will get to know about stages after death, determination of time since death etc. |
| IFSC704 | Questioned Documents | In this course students will get knowledge about | In this course student will have knowledge of |

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| | | Document , Questioned Document, types of Questioned Document, collection and Preservation of Questioned document, basic knowledge about Handwriting and Principles of Handwriting examination, Forgery and its type, determination of age of Document. | questioned document, their classification and examination.<br>Basic Principles of handwriting and study of class and individual characteristics of handwriting.<br>Preliminary examination of documents, Forgery and its way of detection. |
| IFSL705 | Practical based on crime scene search study | Provide knowledge of crime scene photography, different searching methods for collection of evidences, study of various individual characteristics of shoe print, tyre marks etc . student will learn about report writing of cases, study of various blood stain patterns, their forensic significance, data gathering from crime scene etc. | Students will acquire skills to search and collect the evidences, finding individual characteristics in different evidences.<br>Student will able to reconstruct the crime scene by blood stain pattern analysis, hit and run cases etc.<br>Student will learn tracing and lifting of impression evidences. |
| IFSL 706 | Practical based on questioned document | This course will provide the knowledge about the questioned document analysis and its various portion. This will provide details of secret writing, indented writing, additions made in documents, erasures and examination of all above aspects in Questioned document.<br>Student will learn about composition of ink , ink dating and examination of ink by TLC. | Students will learn about Examination of erasures, obliterations made in document<br>They will learn how to handle the fragile documents.<br>Will learn to visualize secret and indented writing.<br>They will able to differentiate the different components of ink by using various techniques. |
| IFSC801 | Instrumental analysis-Chemical & Physical | Principles and Forensic applications of UV-visible spectroscopy, Infra Red (IR) spectroscopy, Fourier transforms Infra Red (FTIR) spectrophotometer. Basic concepts, principles and functions of Thin Layer chromatography (TLC), High Performance Liquid Chromatography (HPLC), Gas Chromatography (GC). | After completion of the course students will learn<br>• Principle and Forensic applications of UV-visible spectroscopy.<br>• Application of Thin layer chromatography and Gas chromatography.<br>• Usages of Atomic absorption |

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| | | Principles and Forensic application of Atomic Absorption Spectrophotometer. | spectrophotometer. |
| IFSC802 | Instrumental Analysis – Biological Methods | Basic principles of Microscopy, Comparison microscope, Stereoscopic microscope. General principles of Electrophoresis techniques. Molecular Biology Techniques. | Students will learn the principle application of microscopy.<br>General principles of electrophoresis techniques. |
| IFSC803 | Forensic Anthropology and Finger prints | Morphological and Anatomical Characteristics of human. Identification of humans from long bones. Identification of male and female from skull characteristic features. Personal identification techniques like Somatometry, craniometry, osteometry. Role of Forensic Anthropology in mass disasters. | After completion of the course students will learn<br>The personal identification from long bones and skull.<br>Identification of male and female by long bones and skull characteristics. |
| IFSC804 | Forensic Chemistry and Toxicology | Detection of adulteration in Petrol, Diesel and edible oils. method of analysis, Designer Drugs & Anabolic steroids. Methods of isolation of poison from Viscera, Collection and Preservation of Viscera. Extraction methods of poisons from viscera, blood and urine | After completion of the course students will learn<br>Students will learn the methods of detection of adulteration in petrol, diesel and kerosene oil.<br>Extraction of poisons from human blood and urine. |
| IFSL 805 | Practical based on Forensic Anthropology and Finger prints | Osteometric measurements on long bones. Craniometric measurements on skull. Determination of gender from Skull Sutures & Pelvis. Determination of age from teeth & Skull. develop latent finger Prints with powders and chemical methods | Upon completion students will learn to differentiate the gender from skull sutures and pelvis, age from teeth and skull.<br>Latent finger prints identification from powder and chemical methods. |
| IFSL 806 | Practical based on Chemistry and toxicological analysis | Determination of methanol and ethanol in liquor sample. Identification of opium/ dhatura alkaloids by TLC methods. Analysis of narcotic drugs by TLC methods. | Students will learn the determination technique of methanol and ethanol in liquor sample.<br>Narcotic drugs examination by TLC |

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| | | | methods. |
| IFSC901 | Computer Forensics and Digital investigations | To provide knowledge about the Difference between cyber and conventional crimes. Types of cyber crimes, Cyber stalking, Cyber pornography, forgery and fraud, Cyber terrorism, Spamming, Phishing, Privacy and National Security in Cyberspace. Use of Forensic Tool kit, preparation of the search of computer evidence to preparing courtroom testimony based upon the examination | After completion of course the students will have knowledge of<br>• Different types of cyber crimes, cyber stalking, cyber frauds, cyber terrorism and cyber spamming.<br>• Students will learn the different types of digital evidences. |
| IFSC902 | Forensic Ballistics and Physics | To provide knowledge about Internal, External and Terminal Ballistics. Classification, Characteristics and firing mechanism of smooth bored and Rifled firearms, Pistol, Revolver, and Rifles. Gun Shot Residues (GSR) analysis. Classification of explosives. | • Students will learn about the internal, external and terminal ballistics.<br>• The firing mechanism of smooth bored and rifled firearms. |
| IFSC903 | Forensic Biology and Serology | Collection and evaluation of biological evidences, Forensic significance of blood, semen Hair, Fibres and plant materials as evidence. Examination of dried blood. Identification and examination of other body fluids/stains-vaginal, saliva, urine, pus, vomit, milk, sweat and tears. DNA Polymorphism. Forensic Significance of mt DNA and Y chromosome. | • Students will be able to collect and evaluate the different types of biological evidences from the crime scene.<br>• Different characteristics of human and animal hairs.<br>• Forensic significance of DNA polymorphisms. |
| IFSC904 | Forensic Medicine | The Forensic Autopsy, Post-mortem changes, Post-mortem Hypostasis, Post-mortem report, Role of Forensic Pathologist. Expert in the investigation of death, collection and preservation of post-mortem exhibits. Classification of injuries and deaths. | • Students will be able to learn about the ante mortem and post mortem changes.<br>• Role of Forensic pathologist in investigation of sudden death. |
| IFSL905 | Practical Based on Forensic Ballistics and Physics | Identification of firearms, cartridges, bullets, gunpowder. Matching by | • Students will learn the firing mechanism.<br>• Microscopic |

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| | | comparison microscope of bullets and cartridge cases. Physical matching of broken pieces of different objects. | comparison of bullets and cartridge cases. |
| IFSL906 | Practical Based on Forensic Biology and Serology | Examination of blood stain, Examination of seminal stage and microscopic examination of spermatozoa. Examination of hair of different animals as cat, dog, cow, horse and goat. | Students have an idea about the Preliminary and confirmatory examination of biological stains. |
| IFSC 1001 | Quality Management & Research Methodology | Essential requirements for the competence of testing and calibration laboratories. Random and non random sampling procedures. 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. | Students will learn the basic concepts of frequency distribution and to measure the central values.<br>Basic concepts of Mean deviation and standard deviation with correlation and regression analysis. |

*Department of Forensic Science, GGV Bilaspur*

**Syllabus for**

**2 Years PG Programme**

**In**

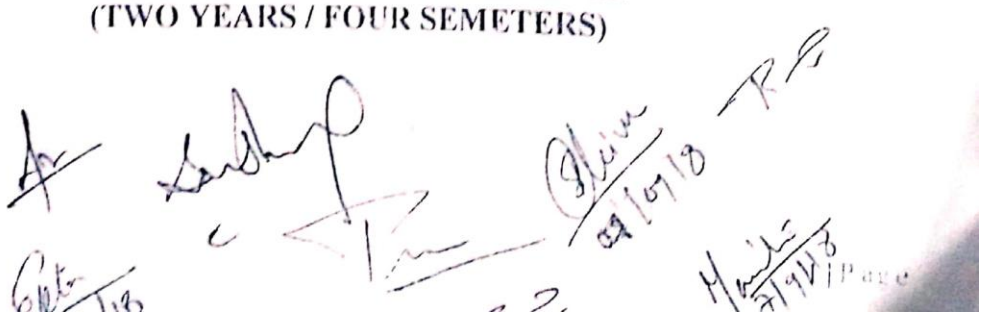
**Forensic Science**

**2018 – 19**

# FORENSIC SCIENCE

**School of Life Sciences**
**Department of Forensic Science**
**Guru Ghasidas Vishwavidyalaya**
**Bilaspur (C.G) 495009**

**PG COURSE IN FORENSIC SCIENCE**
**(TWO YEARS / FOUR SEMETERS)**



*Department of Forensic Science, GGV Bilaspur*

| Semester | Paper Code | Paper | Title of the Paper | Hours/ Week | Credits |
|---|---|---|---|---|---|
| | | | **Semester – VII** | | |
| Seventh Semester | IFSC701 | I | Forensic science & Criminology | 4 | 3 |
| | IFSC702 | II | Forensic techniques& Instrumentation | 4 | 3 |
| | IFSC703 | III | Crime Scene Management | 4 | 3 |
| | IFSC704 | IV | Questioned Documents | 4 | 3 |
| | IFSL705 | V | Practical based on crime scene search study | 6 | 3 |
| | IFSL 706 | VI | Practical based on questioned document | 6 | 3 |
| | IFSS 707 | VII | Seminar | 2 | 2 |
| | | | **Credits** | | **20** |
| | | | **Semester – VIII** | | |
| Eighth Semester | IFSC801 | I | Instrumental analysis-Chemical & Physical | 4 | 3 |
| | IFSC802 | II | Instrumental Analysis – Biological Methods | 4 | 3 |
| | IFSC803 | III | Forensic Anthropology and Finger prints | 4 | 3 |
| | IFSC804 | IV | Forensic Chemistry and Toxicology | 4 | 3 |
| | IFSL 805 | V | Practical based on Forensic Anthropology and Finger prints | 6 | 3 |
| | IFSL 806 | VI | Practical based on Chemistry and toxicological analysis | 6 | 3 |
| | IFSS 807 | VII | Seminar | 2 | 2 |
| | | | **Credits** | | **20** |
| | | | **Semester IX** | | |
| Ninth Semester | IFSC901 | I | Computer Forensics and Digital investigations | 4 | 3 |
| | IFSC902 | II | Forensic Ballistics and Physics | 4 | 3 |
| | IFSC903 | III | Forensic Biology and Serology | 4 | 3 |
| | IFSC904 | IV | Forensic Medicine | 4 | 3 |
| | IFSL905 | V | Practical Based on Forensic Ballistics and Physics | 6 | 3 |
| | IFSL906 | VI | Practical Based on Forensic Biology and Serology | 6 | 3 |
| | IFSC907 | VII | Seminar | 2 | 2 |
| | | | **Credits** | | **20** |

*Department of Forensic Science, GGV Bilaspur*

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| | IFSC 1001 | I | Quality Management & Research Methodology | 4 | 3 |
| | IFSC 1002 | | Elective Papers | 4 | 3 |
| | IFSC 1002 (A) | | Advanced Forensic Chemistry | | |
| | IFSC 1002 (B) | | Advanced Forensic Toxicology and Pharmacology | | |
| | IFSC 1002 (C) | | Drugs of Abuse | | |
| | IFSC 1002 (D) | | Advanced Forensic Physics | | |
| | IFSC 1002 (E) | | Advanced Forensic Ballistics | | |
| | IFSC 1002 (F) | | Questioned Documents | | |
| | IFSC 1002 (G) | II | Forensic Photography | | |
| | IFSC 1002 (H) | | Biometrics (Through portrait Parle Technique) | | |
| | IFSC 1002 (I) | | Advanced Forensic Biology | | |
| | IFSC 1002 (J) | | Advanced Forensic Serology & Immunology | | |
| | IFSC 1002 (K) | | Advanced Forensic Genetics & DNA Profiling | | |
| | **IFSL 1003** | | **Elective Practical's** | 6 | 4 |
| | IFSL 1003 (A) | | Practical based on Advanced Forensic Chemistry | | |
| | IFSL 1003 (B) | | Practical based on Advanced Forensic Toxicology and Pharmacology | | |
| | IFSL 1003 (C) | | Practical based on Drugs of Abuse | | |
| | IFSL 1003 (D) | | Practical based on Advanced Forensic Physics | | |
| | IFSL 1003 (E) | | Practical based on Advanced Forensic Ballistics | | |
| | IFSL 1003 (F) | III | Practical based on Questioned Documents | | |
| | IFSL 1003 (G) | | Practical based on Forensic Photography | | |
| | IFSL 1003 (H) | | Practical based on Biometrics (Through portrait Parle Technique) | | |
| | IFSL 1003 (I) | | Practical based on Advanced Forensic Biology | | |
| | IFSL 1003 (J) | | Practical based on Advanced Forensic Serology & Immunology | | |
| | IFSL 1003 (K) | | Practical based on Advanced Forensic Genetics & DNA Profiling | | |
| | IFSD 1004 | | Dissertation | | 10 |
| | | | Credits | | 20 |
| | | | **Total Credits** | | **80** |

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSC- 701**
**Paper – I**

**Forensic science and Criminology**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT I**

**Forensic Science** Definition, Scope, History and Development, Basic Principles of Forensic Science, Organizational structure of Forensic Science Laboratories at State and Central level , FPB, NICFS, CDTS (Central Detective Training School), NCRB, Ethics in Forensic Science, Duties of Forensic Scientist, Laboratory management system and Importance of accreditation in forensic science laboratories.

**UNIT II**

**Law**- General idea to IPC, IEA, CrPC, and its relevant sections related to Forensic Science.
Introduction to offences against person.

**UNIT III**

**Criminology:** Definition & scope, crime & Criminal, Introduction to classification of Offences. Brief introduction to schools of Criminology; White Collor crime, Organized Crimes, Economic crimes, Cyber crimes, crime against children and Woman.

**UNIT IV**

**Police Science:** Police Organizations at State and Central Level, Introduction to CBI, BPR&D. Interpole its Role and functions. Introduction to Punishment, theories and types.

**Recommended Book**

1. Sharma, B.R.: Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
2. Lundquest & Curry: Forensic Science, Vol I to IV, 1963, Charls C. Thomas, Illinosis, USA.
3. Saferstein: Forensic Science Handbook, Vol I, II & III, Prentice Hall Inc. USA.
4. Saferstein: Criminalistics, 1976, Prentice Hall Inc. USA.
5. Kirk: Criminal Investigation, 1953, Interscience Publisher Inc. New York.
6. Lee & Gaensselen: Advances in Forensic Science (Vol.2) Instrumental Analysis.
7. Kleiner, Munay (2002): Handbook of Polygraph testing. Academic Press.
8. Hess, A.K. and Weiner, I.B. (1999) Handbook of Forensic Psychology 2nd Ed. John wiley & sons.
9. Bruce A. Arrigo (2000) Introduction to Forensic Psychology Academic Press, London
10. N. Gilbert; Criminal Investigation; Third edition, Macmillan Publishing Company, 1993.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSC- 702**
**Paper – II**
**Forensic Techniques and Instrumentation**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT I**

Ballistic Fingerprinting: Basic concepts of Forensic Profiling, Geographic profiling, Automated Drug-Profiling System, Sound Spectrograph; Breathalyzer, Electrostatic detection device (EDD), Video Superimposition technique, Forensic Palynology, Basic principles and techniques of Forensic photography.

**UNIT II**

Infrared Microscope, Forensic Microscopy, Scanning Electron Microscope (SEM), Differential Scanning Calorimeter (DSC), Differential Thermal Analyzer (DTA), Neutron Activation Analysis (NAA) Nuclear Magnetic Resonance spectroscopy, DNA Sequence Analyzer.

**UNIT III**

**DNA fingerprinting**: Introduction of DNA, Nature, Sources of DNA, Extraction of DNA, Basics of DNA Profiling: Polymerase Chain reaction. (PCR), Restriction fragment length polymorphism (RFLP,) Short tandem repeat (STR), Forensic significance of DNA fingerprinting.

**UNIT IV**

**Introduction to forensic Psychology:** Basic concepts of Forensic Psycholinguistic Profiling, Psychological profiling, Legal tests for insanity. Narco analysis, Brain mapping, Polygraph: Principle, technique, forensic significance

**Recommended Books**


1. Robert D. Keppel Katherine M. Brown and Kristen Welch Forensic Pattern Recognition, Prentice Hall
2. Richard Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice Hall
3. Thali, Michael J., Brogdon's Forensic Radiology ,CRC Press
4. Sanford L. Weiss, Forensic Photography: The Importance of Accuracy, Prentice Hall
5. Christopher D D ,Advanced Crime Scene Photography CRC
6. Brent E. Turvey ,Criminal Profiling, Fourth Edition: An Introduction to Behavioral Evidence Analysis
7. Murray KleinerHandbook of Polygraph Testing. Academic Press.
8. Qazalbash Yawer Law of Lie Detectors – Narco Analysis, Polygraph analysis, Brain mapping, Brain Fingerprinting Universal Law Publishing Co. Pvt. Ltd
9. Sharma, B.R. Scientific Criminal investigation, Universal Law Publishing Co.
10. Eckert W.G. Introduction to Forensic Sciences , CRC, New York
11. Siegel, J. A., Saukko, P. J. And Knupfer, G.C., Encyclopedia of Forensic Sciences ,Academic Publishers, London
12. Frederick P. Smith, Sotiris A. Athanaselis Handbook of forensic drug analysis Academic Press

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSC-703**
**Paper – III**
**Crime Scene Management**

**Maximum Marks: 100** **Allotted credits: 03**

**Unit I**

Introduction to Crime scene investigation, Definition and Types of Crime scene, Principles of Forensic science, Experts team Composition, Role of First responding officer, Physical Evidences. Introduction, Definition, Types and their collection, Preservation, packaging, transporting and forwarding, various techniques used for handling, Physical and trace evidences, Crime scene tool kits and equipments etc. Ethics in Crime Scene Investigation.

**Unit II**

Digital evidence: Introduction, Definition types and their collection, preservation, packaging, transporting, storage and forwarding, Methodological approach to processing the crime scene. Processing a crime scene, Searching the scene- Types of Searches, Zone Search: Ever Widening, Circle Strip Search, and Grid Search, Indoor searches and outdoor searches.

**Unit III**

Crime Scene Documentation, Crime Scene Photography, Videography, sketching and mapping. chain of custody, interpreting a crime scene, Reconstruction of a crime scene.

**Unit IV**

Crime scene management or crime scene investigation in the cases of fire and Arson, Explosions, Burglary and Theft, Hit & run, Sexual offences, Death investigation. Use of Forensic light sources for detection of biological evidences at scene of crime scene, Presumptive test for identifying narcotic drugs, blood, semen, explosive and Gunshot residues etc. Computer graphics, Electronic Detectors ND Magnetic locators.

**Recommended Books**


1. Saferestein, Criminalistics: An Introduction to Forensic Science Prentice Hall INC,USA
2. James S.H. and Nordby,J.J. : Forensic Science- An introduction to scientific and Investigative Techniques, CRC Press USA.
3. Eckert W.G. Introduction to Forensic Sciences , CRC,New York
4. Siegel, J. A., Saukko, P. J. And Knupfer, G.C., Encyclopedia of Forensic Sciences, Academic Publishers, London
5. Kirk ,P.L .Fire Investigations, John Wiley and Sons
6. Kirk, P.L.; Criminal Investigation, Inter science Publisher Inc New York**.**
7. Anita .Y. Wonder ; Bloodstain Pattern Elsevier, London
8. Barry,A.J.Fisher.; Techniques of Crime Scene Investigation,6$^{th}$ Edition Ed, C.R.C Press NY(2003)
9. Mordby, J Deed Reckoning ; The Art of Forensic Detection, CRC Pre LLC(2000)
10. Eckett, W.G & James S.H; Interpretation of Bloodstains, Evidence of Crime Scene, Elsevier Pub. NY (1989)

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSC- 704**
**Paper – IV**
**Questioned Documents**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT I**

Nature and problems of Document examination, Classification of documents, Types of Forensic Documents; Collection, handling, preservation, marking and forwarding of documents to the laboratory; Writing instruments and their characteristics.

**UNIT II**

Principle of handwriting identification, Hand writing and its characteristics, Individual characteristics, Factors affecting hand writing, Samples for comparison and comparison of handwriting, Examination of Signature characteristics, Disguised, Indented and secrete writings, Anonymours letters.

**UNIT III**

Alterations in Documents, Examination of Paper & Ink, Examination of typed documents, Examination of Seal, rubber & other mechanical impressions, Handling and examination of charred documents, Examination of Forged currency notes.

**UNIT IV**

Forgery, Methods of Forgery, Age determination of documents, Basic tools needed for Forensic document examination, Photography of documents, Principle and Forensic significance of Video Spectral comparator (VSC), Electrostatic detection apparatus (ESDA).

**Recommended Books**

1. Hilton; O. Scientific Examination of Questioned Documents,, Elsevier, NY
2. Albert S. Osborn; Questioned Documents, 2nd Ed., Universal Law Pub., Delhi
3. Wilson R. Harrison; Suspect Documents Their Scientific Examination, Universal Law Pub. Delhi Indian
4. Hard less H.R; Disputed Documents, Handwriting and Thumbs – Print identification, profusely illustrated, Law Book, Allahabad
5. Morris Ron N. Forensic Handwriting Identification; AcadPress, London.
6. Roy A Huber, A.M. Headrick; Handwriting Identification- Facts and Fundamental, CRC Press
7. Laboratory working procedure manual, Documents DFS, New Delhi, 2005

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSL- 705**
**Paper – V**
**Practical Based on Crime Scene Search Study**

**Maximum Marks: 100** **Allotted credits: 03**

1. Evaluation of Crime scene and photographs
2. Searching of physical evidence at crime scene.
3. Collection of evidence with individual characteristics:
   (1) Fingerprints (2) Tire tracks and foot impressions
4. Analysis of pattern –Blood stain pattern, Fire pattern
5. Lifting or prints and impressions by caste and replicas.
6. Sole prints comparison and their lifting from the scene of crime.
7. Collection, packing and preservation of biological evidences
8. Reconstruction of crime scene
9. Preparation of report of the examination.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSL-706**
**Paper – VI**
**Practical Based on Questioned Documents**

**Maximum Marks: 100** **Allotted credits: 03**

1. Examination of Erasures on Questioned document.
2. Examination of Obliteration on Questioned document.
3. Examination of Addition on Questioned document.
4. Decipher unknown Secret Writings.
5. Chromatographic comparison of different ink.
6. Comparison of Handwriting and Signatures.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VII, IFSL- 707**
**Paper – VII**
**Seminar**

**Maximum Marks: 50** **Allotted credits: 02**

**Seminar based on any relevant topics taught from the above Four Theory Papers in Current Semester.**

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VIII, IFSC- 801**
**Paper – I**
**Instrumental Analysis- Chemical and Physical**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT-I**
Basic concepts of Atomic spectra, Energy levels and Molecular spectra, Electromagnetic spectrum, Sources of radiation, Introduction to spectroscopy, Detector and its types.

**UNIT-II**
UV-Visible spectroscopy: Basic concepts, Principles and Forensic applications of UV-visible spectroscopy, Infra Red (IR) spectroscopy, Fourier transform Infra Red (FTIR) spectrophotometer.

**UNIT-III**
Chromatography: General introduction to chromatography, Basic concepts, principles and functions of Thin Layer chromatography (TLC), High Performance Liquid Chromatography (HPLC), Gas Chromatography (GC) and High performance Thin layer Chromatography (HPTLC).

**UNIT -IV**
Spectrophotometry: General introduction, Basic concepts, Principles and Forensic application of Atomic Absorption Spectrophotometry (AAS), Atomic emission Spectrometry (AES),Inductive coupled plasma (ICP), X-ray spectroscopy, Auger emission spectroscopy, Mass spectrometry.

**Recommended Books:**

1. John C. Lindon, George E. Tranter & John L. Holmes; Encyclopedia of Spectroscopy & Spectrometry, Academic Press (2000)
2. Cottrell, C.T. Irish, D, Msters V M., and Steward, J.E. (1985) Introduction to ultraviolet and visible spectrophotometry, 2nd ed. Pye Unicam, Cambridge
3. Burgess, C., and Knowle, A. (1981) Technique in visible and Ultrviolet absorption spectroscopy, Chappman and Hall, London
4. Claridge, T. D. W., High-Resolution NMR Techniques in Organic Chemistry. A Practical Guide to Modern NMR for Chemists, OUP, Oxford, 2000
5. Gunther, H., NMR Spectroscopy. Basic Principles, Concepts and Applications in Chemistry, 2nd Edn, Wiley, Chichester, 1995
6. Chapman, R (1985) Practical Organic Mass Spectrometry, Wiley & Sons, London
7. Davis, R.and Frearson, M. (1987) Mass Spectrometry, Wiley, London
8. McLafferty, F.W. and Turecek, F. (1993) Interpretation of Mass Spectra, 4th edn., University Science Books, Mill Valley, USA.
9. Working Procedure Manual : Physics/Chemistry DFS, Publication (2005)
10. Long, D.A. (1977) Raman spectroscopy, McGraw-Hill, Maidenhad

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VIII, IFSC- 802**
**Paper – II**
**Instrumental methods-Biological**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT I**
Basic principles of Microscopy, Comparison microscope, Stereoscopic microscope, Fluorescent Microscopy, Infra red .Microscopy, Scanning Electron Microscope (SEM) & Transmission Electron Microscope (TEM)

**UNIT II**
General principles of Immuno chemical technique, Antigen-Antibdy bidning, Production of Antibodies, Precipitin reaction, Gel immuno diffusion, Immuno elctrophorsesis, Complement fixation, Radio Immuno assay, ELISA, Fluroscent immuno assay.

**UNIT III**

Electrophoretic Technique, General principles, Factors affecting electrophoresis, High voltage electrophoresis, polyacrylamide gel electrophoresis, Isoelectric focusing (IEF), Isoelectrophoresis, Preparative, Horizontal and Vertical Electrophoresis

**UNIT IV**
Molecular Biology Techniques: Genetic Manipulations, Gene cloning, DNA extraction, Polymerase chain reaction, DNA sequencing, Gene Libraries, Colony Hybridisation, Nick translation, Expression of Genes

**Recommended Books**

1. Alan Gunn Essential forensic biology Jhon. Wiley
2. Barbara Wheeler Lori J. Wilson, Practical Forensic Microscopy: A Laboratory Manual.
3. Bryan L.William & Keith Wilson; Principles & Techniques of Practical Biochemistry, Edward Arnold Pub. ( 1975)
4. Keith Wilson & John Walker; Practical Biochemistry- Principles & Techniques, 5th Ed., Cambridge University Press
5. George M. Malacinski; Essentials of Molecular Biology, 4th Ed. Jones and Bartlet Pub. (2003).
6. Gardnes & Snustd; Principles of Genetics 6th Ed., John Wiley& Sons
7. D.M.Weir; Hand Book of Experimental Immunology, 2nd Ed., Blackwell Pub.
8. Ivan M.Roett; Essential Immunology, 6th Ed., Blackwell Pub.
9. .Working Procedure Manual Biology / Serology, DFS Pub New Delhi 2005

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VIII, IFSC- 803**
**Paper – III**
**Forensic Anthropology and Finger prints**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT -I**

**Forensic Anthropology:** Definition scope and Problems, Human skeleton, comparative skeletal anatomy of human and non-human. Bones- Identification, Classification and determination of Site, Morphological and Anatomical Characteristics, Determination of Age, Sex, Race and Stature determination from skeletal remains: skull, Pelvis, and other bones.

**UNIT- II**

**Personal identification techniques**: Introduction and forensic importance; Significance of somatoscopy, somatometery, osteometery and craniometery in Personal Identification; Portrait Parle/Bertillon system, Facial reconstruction, Super imposition technique.

**Forensic Odontology:** Development and scope, Its role in mass disaster and anthropology, Types of teeth and their functions. Age determination from teeth: dental anomalies, Forensic significance of Bites marks: Photography, evaluation and legal significance of bite marks.

**UNIT -III**

**Fingerprint:** History and development of finger prints, Structure of ridged skin, morphological plan of volar pads and configurational areas. Development of volar pads, ridges, Classification of finger Prints, pattern types, Henry system of classification (Primary to key classification), Searching of finger print evidence and composition of Sweat.

**UNIT -IV**

Chance Finger Prints: Conventional methods of development of latent finger prints:. Biological methods of development of latent prints on skin; Systematic approach to latent print processing, preserving and lifting of finger prints; Photography of Finger Prints, comparison of finger prints .Automatic Finger Print Identification system (AFIS), Expert evidence.

**Recommended Books**

1. Steven N. Byers Introduction to Forensic Anthropology. Allyn & Bacon.
2. Karen Ramey Burns ,Forensic Anthropology Training Manual, The (2nd Edition) Prentice Hall
3. Debra Komar Jane Buikstra, Forensic Anthropology: Contemporary Theory and Practice , Oxford University Press, USA
4. M. Anne Katzenberg (Editor), Shelley R. Saunders, Biological Anthropology of the Human Skeleton, Wiley-Liss
5. Tim D. White , Michael T. Black, Pieter A. Folkens ,Human Osteology, Third Edition , Academic Press
6. D. Gentry Steele, Claud A. Bramblett, The Anatomy and Biology of the Human Skeleton ,Texas A&M University Press
7. Forensic Dentisty by Paul G. Stimson, Curtis A. Mertz; CRC Press, LLC, 1999.
8. Craniofacial Identification in forensic Medicine, edited by John. G Clement and David. L. Ranso; Oxiford University, Press; 1998.
9. Forensic Taphonomy, edited by William D. Haglernd, Marculla H. Sorg; CRC Press, LLC, 1997.
10. Modi, J.K. (1988): Medical Jurisprudence & Toxicology, N.M. Tripathi Pvt. Ltd.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VIII, IFSC- 804**
**Paper – IV**
**Forensic Chemistry & Toxicology**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT I**
Forensic chemistry Definition and scope, Introduction to Narcotic drugs, Depressants, stimulants, and Hallucinogens their Active components and method of analysis, Designer Drugs & Anabolic steroids, Analytical methods of analysis of IMFL, Country and Illicit liquor, Denatured spirits and their analysis.

**UNIT II**
Fire and Arson investigation- Methods of flammable oil residues detection from debris; Detection of adulteration in Petrol and Diesel, edible oils, Examination of chemicals used in trap cases, Analysis of metals in cheating cases, Explosives: Introduction, classification and various methods of analysis of Explosives.

**UNIT III**
**Forensic Toxicology:** Definition and scope, Poisons–Definition and Classification. Methods of isolation of poison from Viscera, Collection and Preservation of Viscera and other relevant materials, Analysis of ethyl alcohol and methyl alcohol in biological fluids.

**UNIT IV**
Extraction methods of poisons from viscera, blood and urine. Isolation and identification of Plant Poisons, opium and its derivatives, Benzodiazepine tranquilizers, Metallic Poison, Insecticides and Pesticides. Basic concepts of Poisonous Mushrooms, Poisonous fungi, Food Poisoning, Common vegetable abortificiants, Animal poison, Snake venom.

**Recommended Books:**


1. Khan, JaVed I., Ho, Mat H. Analytical Methods in Forensic Chemistry. New York: Working Procedure Manua Chemistry/Toxicology/Explosives/Narcotics, DFS Pub. New Delhi
2. Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry, Springer
3. Saferestein, Criminalistics: An Introduction to Forensic Science. Prentice Hall
4. Maudham.B.et.al; Vogel's Textbook of Quantitative Chemical. Analysis, Longman
5. John D. DeHaan ; Kirk's Fire Investigation, Prentice Hall Eaglewood Cliffs, N.J
6. Yinon J; Modern Methods & Application in Analysis of Explosives, John Wiley.
7. C.A. Watson; Official and standardized Methods of Analysis. Royal Society of Chemistry, UK.
8. Goutam, M. P. and Goutam S Analysis of Plant Poison, Selective & Scientific Books, New Delhi.
9. Feigl; Spot Test in Organic Analysis, Elsevier Pub., New Delhi.
10. Curry A.S; Analytical Methods in Human Toxicology, Part II, CRC Press Ohio
11. Clark, E.G.C.; Isolation and Identification of Drugs, Vol I&II, Academic Press,
12. Sunshine I; Year book of Toxicology, CRC Press Series, USA
13. 14. Michael J. Deverlanko et al: Hand Book of Toxicology CRC Press, USA.
14. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi.

**Five Year Integrated M.Sc. Forensic Science**

**Semester –VIII, IFSL- 805**

**Paper – V**

**Practical based on Anthropology and Finger Prints**

**Maximum Marks: 100** **Allotted credits: 03**

1. Determination of sex from Skull Sutures & Pelvis
2. Determination of age from teeth & Skull
3. To perform osteometric measurements on long bones
4. To perform craniometric measurements on skull
5. To perform somatometric measurements on livings- Height vertex, Head length, Head breadth, Foot length, Foot breadth, Nasal height. Nasal breadth, External bi-orbital breadth, Internal bi-orbita breadth, Bigonial breadth and Bizygomatic breadth
6. To obtain Plain and rolled inked finger prints.
7. To identify the finger Print Patterns.
8. To perform ridge tracing and ridge counting.
9. To identify the ridge characteristics.
10. To develop latent finger Prints with powder methods.
11. To develop latent finger Prints with chemical methods.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VIII, IFSL- 806**
**Paper – VI**
**Practical –Forensic Chemistry and Toxicological analysis**

**Maximum Marks: 100** **Allotted credits: 03**

1. Determination of methanol and ethanol in liquor sample.
2. Analysis of narcotic drugs by TLC
3. Determination of Ethanol and Methanol in alcoholic liquors
4. Examination of inorganic acid in partially burnt clothe
5. Detection of adulterant in vegetable oil
6. Identification of opium/ dhatura alkaloids by TLC
7. Identification of poisonous seeds- Ricinus, Croton and Argemone.
8. Analysis of viscera(simulated sample) for Organo Chloro and Organo Phosphorous pesticides

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester –VIII, IFSL- 807**
**Paper – VII**
**Seminar**

**Maximum Marks: 50** **Allotted credits: 02**

**Seminar based on any relevant topics taught from the above Four Theory Papers in Current Semester.**

**Five Year Integrated M.Sc. Forensic Science**
**Semester – IX, IFSC- 901**
**Paper – I**
**Computer Forensics and Digital Investigations**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT -I**

**Basics of Computer:** Introduction to computer, Operating System Windows/Unix: Operating system and operating environments DOS, Window 95 and 98, Windows NT, Windows 2000, Windows XP, Windows Vista, Windows 7 and Unix. Limitations of operating system, Networking, LAN, WAN, Internet and their forensic significance.

**UNIT- II**

**Computer Crimes:** Introduction; Classification; Difference between cyber and conventional crimes; Types of cyber crimes – Cyber stalking; Cyber pornography; forgery and fraud; Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism economic crimes, Internet or other telecommunication. Hacking, computer viruses and investigative techniques.

**UNIT- III**

**Forensics Tools:** Open Source versus Closed Source. Portable Devices & Mobile Phone Forensics, functioning of mobile phone and their operating. Search, Seizure, packaging and transporting of the digital evidence from the scene of crime. Use of Forensic Tool, FTK, Access data Forensic Tool Kit and preparation of the search of computer evidence to preparing courtroom testimony based upon the examination. Password Recovery Tools.

**UNIT - IV**

Advance practice in Digital Investigation, electronic format and representation in the court as per the Law suit. Fundamentals of current, domain administration; file system management; networked printers; user management; and workstation configuration. Linux Systems, key components of the Linux/UNIX operating system. History of its evolution, selection criteria for Linux/UNIX as an alternative (or cooperative) operating environment in the business world.

**Recommended Books:**

1. Relevant sections of Information technology Act 2000.
2. Esharenana, Adoni, Frame works for ICT Policy Government, Social and Legal Issues. Information Science Reference, Harsey, New YORK.
3. Robert C. Newman, Computer Forensics: Evidence Collection and Management Auerbach Publications.
4. Eoghan Casey , Handbook of Computer Crime Investigation: Forensic Tools and Technology ,Academic Press
5. Clark, Franklin, and Diliberto, Ken, (1996). Investigating computer Crime, CRC Press, Boca Raton, Florida, USA
6. Tewari, R.K., Sastry, P.K. and Ravikumar, K.V. (2003): Computer Crime & Computer Forensics, Select Publisher, New Delhi.
7. Lang, David L., (2002). Introduction to Computer forensics, CRC Press LLC, Boca Raton, Florida, USA
8. Middleton, Bruce (2001). Cyber Crime Investigator's Field Guide, CRC Press
9. Vacca John R; Computer Forensics, Computer Crime Scene Investigation, Firewall Medial, An imprint of Laxmi Pub.(2002)

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – IX, IFSC- 902**
**Paper – II**
**Forensic Ballistics and Physics**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT- I**

**Ballistics:** Introduction, History and Scope, Internal, External and Terminal Ballistics, Firearms, Definition and Classification, Characteristics and firing mechanism of smooth bored and Rifled firearms (Pistol, Revolver, and Rifles, etc), Classification, nomenclature and construction of country made firearms.

**UNIT -II**

**Ammunition:** Definition, classification and constructional features of different types of Cartridge, Types of primer & priming composition, propellant and their compositions, Bullets, Pellets and wads. Gun Shot Residues (GSR) analysis, Explosives: definition, types and classification of explosives, Arms and Explosives Act, Firearm injuries.

**UNIT- III**

**Forensic Physics:** Definition, area and scope, Types and Characteristics of Tool marks: Glass: Types of glass and their composition, Types and Identification of glass fractures, examination and its forensic significance.

**UNIT- IV**

Forensic analysis of Paint**,** Soil, Papers, Foot Prints and Tyre Impression, Principle & Technique of Restoration, Etching Reagents, Fibers - Classification and Characteristics examination of fibers, Physical matches of broken objects.

**Recommended Books**

1. Working Procedure Manual Ballistics/Physics, DFS, New Delhi,2005
2. Hatcher Jury & Weller, 1987: Firearm Investigation Identification and Evidence, the University Book Agency, Allahabad.
3. Gunther & Gunther, 1935: The Identification of Firearms, Willies, New York.
4. Jauhri, M. 1980: Monograph on Forensic Ballistics, Govt. of India Publication, New Delhi.
5. Burrad, 1951: The Identification of Firearms and Forensic Ballistics.
6. Sharma, B.R.: Firearms in Criminal Investigation and Trails, 1990.
7. Dimado: Gunshot Wounds, 1987.
8. Kumar K: Forensic Ballistics in Criminal Justice, 1987
9. Raymond C Murray & John C.F Tedrew; Forensic Geology, Prentice Hall NJ.
10. B. Caddy; Forensic Examination of Glass and Paints Analysis and Interpretation ISBN 0784 05749 (2001)
11. Safferstein, R, Handbook of Forensic Science, Vol. I, II, (Ed.) Prentice Hall, Eaglewood Cliffs, NJ.
12. Siegel, J. A., Saukko, P. J. And Knupfer, G.C., Encyclopedia of Forensic Sciences, Academic Publishers, London.
13. Philip Rose; Forensic Speaker Identification, Taylor and Francis, Forensic Science Series, London (2002).
14. Eckert W.G. Introduction to Forensic Sciences, CRC, New York.
15. Nickolls LC; Scientific Investigation of Crime, Butler west, London (1956)

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – IX, IFSC- 903**
**Paper – III**
**Forensic Biology and Serology**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT- I**

Definition and scope of Forensic biology and serology, Collection and evaluation of biological evidences, Forensic significance of blood, semen Hair, Fibers and plant materials as evidence, Introduction and Scope of Microbial forensics, Diatoms- Types, morphology, methods of isolation and their Forensic importance, Identification of pollen grains and and its Forensic Importance.

**UNIT- II**

Blood: Composition and Histology, Identification of blood and blood stains, Examination of dried blood. Determination of species, Grouping of Blood stains and their techniques; ABO, Rh and MN system, Genetic markers and their classification.

**UNIT- III**

Morphological structure of spermatozoa of human, confirmatory test for a spermic semen- p-30, Identification and examination of other body fluids/stains-vaginal, saliva, urine, pus, vomit, milk, sweat and tears etc.

**UNIT -IV**

DNA: Introduction, Source and Structure, DNA Profiling techniques, Forensic Significance of mt DNA and Y chromosome, DNA Polymorphism, PCR and RFLP methods of biological fluid analysis; Identification methods of wild life materials and Entomological evidences.

**Recommended Books**

1. Robertson, J. (1996): Forensic Examination of Hair. Taylor and Francis, USA.
2. Modi, J.K.: Medical Jurisprudence and Toxicology, N.M. Tripathi Pvt. Ltd.
3. Fraser, Roberts J.A (1965): An introduction to Medical Genetics.
4. Chatterjee, C. C- (1975): Human Physiology.
5. Boorman, K. E: Blood Group Serology, Churchill, and Lincolin, P. J. (1988)
6. Race, R. R. and Sangar, R. Blood Groups in Man. Blackwell Scientific, Oxford.
7. Saferstein, R. (1982): Science Handbook, Vol. I, II and III, Prentice Hall,
8. Barris, H. and Hopkinson, D. A. (1976): Handbook of Enzyme, Electrophoresis, Elsevier, North, Holland, New York.
9. Gilblet, E. (1969): Marker's in Human Blood, Davis, Pennsylvania.
10. Culliford, B. E. (1971), the examination and Typing of Blood Stains, US Deptt of Justice, Washington.
11. Chowdhuri, S. (1971): Forensic Biology, B P R & D, Govt. of India.
12. Dunsford, I. and Bowley, C. (1967): Blood Grouping Techniques, Oliver & Boyd, London.
13. Eckert, W. G. & James, S.H. (1989): Interpretation of Blood Stain, Evidence, Elsevaier, New York.
14. Coyle, H. M, Forensic Botany, CRC Press
15. Working procedure manual: Biology/ Serology; DFS, New Delhi

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – IX, IFSC- 904**
**Paper – IV**
**Forensic Medicine**

**Maximum Marks: 100** **Allotted credits: 03**

**Unit-I**

Forensic Medicine- Definition, Scope and Importance, The Forensic Autopsy, Postmortem changes, Postmortem Hypostasis, Postmortem report, Role of Forensic Pathologist medico legal Expert in the investigation of death, collection and preservation of postmortem exhibits.

**Unit II**

Death: Definition, types, and nature Scene Investigation, Introduction to Sudden and unexpected Death, Infanticide, Thermal Deaths, Anesthetic and operative death, Death due to Drowning and Electrocution, Starvation and its types, Asphyxial Death, Time of Death-Time Indicators Bladder content, Stomach Content, Lividity, Cooling of body, Rigor Mortis,

**Unit - III**

Injuries-Definition and Nature, Age of injuries, Ante-mortem and Post mortem, Fatal injuries, Incapacitation .After effects of Fatal injuries, Introduction to Trauma to the human body, Wounds Due to Blunt Trauma. Blunt Trauma Injuries of the Trunk and Extremities, Trauma to the Skull and Brain: Craniocerebral Injuries, Wounds Due to Pointed and Sharp, Edged. Classification -Abrasion, contusion, Bruise, Laceration, Punctured Incised, Gunshot.

**Unit -IV**

Burns-Classification of burns Ante-mortem and Post mortem Burns, Cause of death, Scalding, Electrocution The Effects of Heat & Cold: Hyperthermia & Hypothermia, Deaths Due to Fire, Carbon Monoxide Poisoning.

**Recommended Books**


1. David Dolinak, Evan Matshes , Emma O. Lew .Forensic Pathology: Principles and Practice , Academic Press
2. Dominick DiMaio , Vincent J.M. DiMaio M.D.Forensic Pathology, Second Edition (Practical Aspects of Criminal & Forensic Investigations) CRCPress.
3. Matshes & Dolinak & Lew Forensic Pathology, Principles and Practice 1st Edition Academic Press
4. Jay Dix , Robert Calaluce, M Guide to Forensic Pathology,. CRC
5. Vincent J.M. DiMaio , Suzanna E. Dana Handbook of Forensic Pathology, Second Edition,CRC
6. Richard Shepherd. Simpson's Forensic Medicine, Hodder Arnold;
7. Payne-James, Jason (ed.; et al.) Encyclopedia of Forensic & Legal Medicine. Amsterdam; Boston: Elsevier Academic Press
8. Werner U. Spitz (Author, Editor), Daniel J. Spitz. Spitz and Fisher's Medicolegal Investigation of Death: Guidelines for the Application of Pathology to Crime Investigation [Hardcover] Charles C Thomas Pub Ltd
9. Parikh C.K. Text book of Medical Jurisprudence, forensic medicine and toxicology. CBS Publishers and Distributors , New Delhi
10. Subrahmanyam B.V.; Modi’s Medical Jurisprudence & Toxicology, LexisNexis Butterworths, India .

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – IX, IFSL - 905**
**Paper –V**
**Practical based on Forensic Ballistics and Physics**

**Maximum Marks: 100** **Allotted credits: 03**

1. Identification of firearms, cartridges, bullets, gunpowder, etc.
2. Matching by comparison microscope bullets and cartridge cases.
3. Lifting or prints and impressions by caste and replicas.
4. Sole prints comparison and their lifting from the crime scene
5. Comparison of Tool Marks
6. Comparison of soil samples by Density gradient tube method.
7. Comparison of broken glass bangles.
8. Restoration of erased identification marks.
9. Physical matching of broken pieces of different objects.
10. Determination of density of glass fragments

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – IX, IFSL - 906**
**Paper –VII**
**Practical based on Forensic Biological and Serological analysis**

**Maximum Marks: 100** **Allotted credits: 03**

1. Examination of blood stain (Screening and confirmatory)
2. To perform precipitin test for species of origin determination.
3. Examination of saliva
4. Examination of seminal stage and microscopic examination of spermatozoa.
5. Examination and comparison of Human hairs.
6. Examination of hair of different animals as cat, dog, cow, horse and goat
7. To determine ABO blood grouping and Rh factor
8. To prepare gel plates for electrophoresis.
9. To perform electrophoresis for separation of various polymorphic enzymes
10. Examination of diatoms.
11. Extraction and isolation of DNA from blood and semen.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – IX, IFSL- 907**
**Paper – 907**

**Maximum Marks: 50** **Allotted credits: 02**

**Seminar based on any relevant topics taught from the above Four Theory Papers in Current Semester.**

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSC-1001**
**Paper – I**
**Quality management & research methodology**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT- I**
Elements of a Quality Management System: Quality, Total Quality, Quality assurance, Quality control Quality system. Quality Planning, Quality Audit: Internal and External Audit & MRM, History and development of ISO, Terminology of NABL.Benifits of ISO9000 series of standards.ISO9001 Requirements.

**UNIT -II**
Essential requirements for the competence of testing and calibration laboratories Introduction, scope, management Requirements: Organizational, Documents control, Review of requests and Calibrations, Purchasing service and supplies, service to the clients, complaints, corrective and preventive action, control of records

**UNIT –III**
Sampling: sampling procedures (random and non random), sampling statistics, Physical state, homogenization, size and hazards in sampling, Significance of statistics in forensic science. 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. Probability- Definition, Theory, Classical and types.

**UNIT- IV**
Meaning of research Problem: Research, definition, Objectives of research. Types of research-From the view point of application, Objectives, Inquiry mode. Search for existing literature, hypothesis, Interpretation and report writing.

**Recommended Books:**

1. ISO/IEC/17025:2005, NABL NABL -113, NABL -113A, 131, guidelines of NABL.
2. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E). C.G.G.
3. Kothari, C.R. Research Methodology Methods and Techniques. Wiley Eastern Limited, New Delhi.
4. Saferstein R. Forensic Science Handbook I, II, III.
5. William L. Duncan: Total Quality, Key Terms and Concepts.
6. Murray S. Cooper: Quality control in the Pharmaceutical Industry.
7. John T. Rabbitt, Peter A Bergh: The ISO 9000 Book.
8. Willard Merritt, Dean & Settle: Instrumental Methods of Analysis.
9. Jami St. Clair Crime Laboratory Management: Academic Press.
10. Thomas A The laboratory Quality Assurance system: A manual of Quality Procedures and forms.
11. Ratliff. 2003 3rd ed. John Wiley & Sons.
12. Gary B Clark Systematic Quality Management. Practical Laboratory Management Series.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSE-1002 (a)**
**Paper – II**
**Advanced Forensic Chemistry**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT -I**

Analysis of beverages: Alcoholic and non-alcoholic beverages, IMFL, country made liquor, licit and illicit liquors, Analysis of Proof spirit, Rectified spirit, denatured spirits, Special denatured spirit, Blood alcohol analysis by chemical methods; Significance of blood alcohol, Breath Screening devices

**UNIT -II**

Arson: chemistry of fire, pattern of fire, investigation and evaluation of clue material, analysis of arson exhibits by instrumental method, Examination of petroleum products: distillation and fractionation, standard methods of analysis of petroleum products like kerosene, petrol, diesel, lubricating oil, greases.

**UNIT -III**

Drugs of abuse: introduction, classification of drugs of abuse, drugs of abuse in sports, designers drugs and their forensic examination. Qualitative and quantitative analysis of Opium and opiates. Forensic examination of precursor chemicals and drugs under NDPS Act 1985

**UNIT -IV**

Analysis of trace evidence: cosmetics, dyes, paints, pigments, fibers, oils, fats, greases, soil and industrial dusts, chemicals; Analysis of corrosive chemicals- acids and alkalies; Chemistry and examination of detective dyes use in trap cases; Examination of cement and concrete, consumer item as gold, silver etc.

**Recommended Books:**


1. Clark, E.G.C.: Isolation and identification Drugs, Vol. I and Vol.II, (1986).
2. Vogel's Qualitative Inorganic Analysis ($7^{th}$ Edition) revised by G.Svehia ($2^{nd}$ Impression-2006).
3. Working Procedure Manual – Chemistry, DFS Publications (2005).
4. IS:3752; 1988 Indian Standard Alcoholic Drinks – Methods of Test, First Revision (1988)
5. IS:323-1959, Indian Standard Specification for rectified sprit, revised, $9^{th}$ reprint, December (1989)
6. The ISI Specification for Kerosene (IS: 1459/1974)
7. The ISI Specification for Motor Gasoline (IS: 2796/2000)
8. The ISI Specification for Diesel (IS: 1460/2000)
9. The Indian Standard Methods of Test for Petroleum Products IS:1448
10. The ISI Specification for Gear Lubricants (IS: 2297/1997)
11. The ISI Specification for Petroleum Hydrocarbon Solvents (IS: 1745/1978)
12. Fire and Arson Investigation, J. Kennedy, Chicago (1962)
13. Forensic Science Hand Book, by Saferstein, R., Printice Hall : N. Jersey, 1982

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X IFSE- 1002 (b)**
**Paper –II**
**Advanced Forensic Toxicology and Pharmacology**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT- I**
Poisons: Defination, classification, types of poisoning, collection and preservation of toxicological exhibits in fatal and survival cases, mode of action and its effect on vital functions, specific analysis plan/ approach to toxicological examination of poisoning samples, significance and concept of forensic toxicological examination and law relating to poison.

**UNIT – II**
Extraction, Isolation/Separation and clean-up procedures of poisons and drugs: using conventional as well as modern techniques, Identification and estimation of following poisons from viscera, blood and urine, Barbiturates Benzodiazepines and its derivatives, Amphetamines. Insecticides/ Pesticides: Organochloro, organophosphorus and carbamates.

**UNIT - III**
Vegetable poisons: Nature, type, mode of action, extraction, isolation, Identification of the Poisonous seeds, fruits and roots. Animal Poisons: Snake venom, composition, site of action, mode of action, effect on the body as a whole, and tests for identifications, Analysis of metallic poisons. Carbon monoxide poisoning: significance, signs and symptoms, methods of diagnosis, testsfor identification.

**UNIT –IV**
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. Spectrum of Toxic Effects, Dose and Response, Absorption, Distribution, Excretion and Influencing Factors; Dose – Response Relationship – Lethal dose 50, Effective dose 50

**Recommended Books:**

1. Curry, A.S.: Poison Detection in Human Organs, C. Thomas Springfield, Illinois USA, (1963).
2. Clark, E.G.C.: Isolation and identification Drugs, Vol. I and Vol.II, (1986)
3. Working Procedure Manual – Toxicology, DFS Publications (2005)
4. Sunshine, I: Guidelines for Analytical Toxicology Programme, Vol. I, CRC Press, (1950).
5. Michael J. Deverlanko etal: Hand Book of Toxicology CRC Press, USA (1995)
6. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi (1999)
7. Goutam,M.P. and Goutam ,S Analysis of Plant Poison,Selective & Scientific Books,New Delhi
8. Balraj S. Parmar etal; Pesticide Formulation, CBS Publishers, New Delhi (2004)
9. Cravey R.H, Baselt, R.C; Introduction to Forensic Toxicology, Biochemical Pub. Davis C A (1981)
10. Niesink RJM; Toxicology- Principles and Applications, CRC Press (1996).
11. Sunshine, I: Handbook of Analytical Toxicology, Press, (1969).

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSE-1002 (c)**
**Paper –II**
**Drugs of abuse**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT –I**

Drugs of abuse: Introduction, Classification of drugs of abuse, Introduction to Narcotics of Natural Origin, Semi-Synthetic & Synthetic Narcotics, Stimulants Cannabis, Depressants, Hallucinogens and Inhalants, drug addiction and its problems. (NDPS Act) 1985 and its Amendments, Aim and objectives of Narcotics Control Bureau and Central Bureau of Narcotics.

**UNIT –II**

Analytical methods of testing- Active principles of narcotic drugs of natural origin, synthetic and semi-synthetic Narcotics by chemical and instrumental methods, Analysis of psychotropic substances e.g. psilocybin containing mushroom and peyote cactus, Analysis of rave drugs and sports drugs.

**UNIT –III**

Herbal drug: Introduction, Taxonomy, Macroscopic and microscopic characteristics, Forensic analysis by presumptive tests, Colour tests, TLC , GC-FID, GC-MS and HPLC.

**UNIT IV**

Designer Drugs – Introduction, Definition, Field and laboratory tests of Identification for Fentanyl Analogue, PCP Analogues, Amphetamine and Methamphetamine Analogue and Meperidine Analogue. Basic concepts of Drug abuse in sports.

**Recommended Books:**


1. Simon Wills ,Drugs of abuse ,Pharmaceutical Press, USA
2. A, Drugs of abuse. ,Practice Management Information Corp U. K
3. Lauri S. Friedman, Jennifer L. Skancke Athletes and Drug Use, Green haven Press, USA.
4. Paul K. Roberts Steroid Use and Abuse ,Nova Science Publishers ,USA
5. UNODC Recommended methods for the identification and analysis of cannabis and cannabis products Manual for use by National Drug Testing Laboratories United Nations office on drugs and crime, Vienna.
6. K. Valter , P. Arrizabalaga , J.C. Landry, Designer Drugs Directory. Elsevier Science, Switzerland.
7. Lawrence Clayton Designer Drugs Rosen Pub Group, New York
8. Lawrence Clayton, Tranquilizers, Enslow, Berkeley.
9. United Nations Drug Control Programme, Recommended Methods for Testing Lysergide (LSD).
10. Goutam, M. P. and Goutam, S, Analysis of Plant Poison, Selective & Scientific Books, New Delhi.
11. Working Procedure Manual: Chemistry DFS, Pub. (2005)
12. Saferstein. R,Forensic science Hand Book,Vol I& II,Prentice Hall

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSE- 1002 (d)**
**Paper –II**
**Advanced Forensic Physics**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT – I**

Soil as evidence and challenges to forensic scientist, Composition and types of soil, Methods of examination of Preliminary discrimination methods and Density gradient tube technique. Glass: Types of glass and their composition, examination of glass fractures under different conditions, determination of direction of impact: cone- fracture, rib marks, hackle marks, backward fragmentation, colour and fluorescence, physical matching, density comparison, physical measurements, Refractive index by Refractometer, Elemental analysis, Interpretation of glass evidence.

**UNIT- II**

Tool marks: 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. Physical, chemical and instrumental methods of examination of strings/ropes, fibers, threads & fabrics, Wires/cables, seals, counterfeit coins, Physical match of broken objects. Restoration of erased/obliterated marks in different surfaces.

**UNIT –III**

Forensic analysis of paint: Macroscopic & instrumental analysis like IR spectroscopy, Raman spectroscopy & X-ray diffraction, elemental analysis, Interpretation of Paint evidence.

**UNIT- IV**

Speaker identification and tape authentication: Introduction to techniques of pattern recognition and comparison .Legal aspects. Principle and forensic application of Brain fingerprinting, Narco analysis and Lie detection.

**Recommended Books**

1. C.E.O Hara and J.W. Osterburg; An Introduction to Criminalistic, Indiana University Press, Blomington.
2. Raymond C Murray & John C.F Tedrew; Forensic Geology, Prentice Hall NJ
3. Working Procedure Manual : Physics DFS, New Delhi Publication (2000)
4. B. Caddy; Forensic Examination of Glass and Paints Analysis and Interpretation ISBN
5. Goutam, S and Goutam, M.P..: Physical Evidences-Introduction & Bibliography on their Forensic Analysis. Shiv Shakti Book Traders, New Delh
6. James Michael Curran, Tachia Natilie Hicks and John S.Buckleton; Forensic Interpretation of Glass Evidence, CRC Press (2000)
7. David A. Crown; The Forensic Examination of Paints and Pigments, Toylor & Francis,
8. Jay A.Siegel, Pekka J Saukko and Geoffrey C. Kooupfer; Encyclopedia of Forensic Science, Academic Press (2000).
9. Robertson, J and Grieve, M, Forensic Examination of Fibers, CRC.
10. Philip Rose; Forensic Speaker Identification, Taylor and Francis, London.
11. Bengold & Nelson Moryson; Speech and Audio signal processing, John Wiley & Sons, USA (1999)

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSE- 1002 (e)**
**Paper –II**
**Advanced Forensic Ballistics**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT- I**

Firearms, Definition , History, classification and characteristics of firearms. Examination and identification of fire arms. Identification of origin, improvised/ country-made/ imitative firearms and their constructional features, Velocity and pressure characteristics under different conditions; various types of bullets and compositional aspects, latest trends in their manufacturing and design

**UNIT- II**

Internal Ballistics: Definition, ignition of propellants, shape and size of propellants, manner of burning, Piobett's law, pressure space curve, shot start pressure. various factors affecting the internal ballistics: All burn point, velocity, space curve Le Due's formula, muzzle velocity, factors affecting muzzle velocity ,theory of recall

External Ballistics : Definition-trajectory drop in the flight of the projectiles force of gravity air resistance-base drag, Yaw, shape of bullet, (Spherical ball, Cylindrical-conical, flat nose ,round nose etc ), effective range, extreme range.

Terminal Ballistics: Definition, behavior of various type of bullets on the target, remaining velocity, stopping power, Ricochet.

**UNIT- III**

Different types of marks produced during firing process on cartridge-firing pin marks, breech face marks, chamber marks, extractor and ejector marks and on bullet number/direction of lands and grooves, striation marks on the lands and grooves. Class and individual characteristics. Determination of range of fire-burring , scorching, blackening, tattooing and metal fouling, shots dispersion and GSR distribution, time of firing, different method employed, and their limitations Analysis of Gunshot Residues: Mechanism of formation of GSR.

**UNIT -V**

Firearm injuries: Evaluation of injuries caused due to shot-gun, rifle, handguns and country made firearms, methods of measurements of wound ballistics parameters, post-mortem and anti mortem firearm injuries; Report writing and expert's evidence.

**Recommended Books:**

1. Arms Act, 1959. And Arms Rule, 1962.
2. Working Procedure Manual: Ballistics, DFS New Delhi Publication,20005.
3. Bhattacharyya C.N., (2000) Particle Analysis for Detection of Gunshot Residues – A State-of-the-Art Technique, The Indian Police Journal, BPR&D, Vol.XLVII, No. 4, pp. 113-127
4. Burrad, G., (1951) The Identification of Firearm and Forensic Ballistics, Herbert, Jenkins, London.
5. Kumar, K., (1987) Forensic Ballistics in Criminal Justice, Eastern Book Co
6. Davis, J.E., (1958) An Introduction to Tool marks, Firearms and the Striagraph Charles C 7. Thomas, Springfield, Illinois, USA.
8. DiMaio, J.M., (1985) Gunshot Wounds, Elsevier, USA.
9. Feigl, F., (1962) Spot Tests in Inorganic Analysis, Elsevier Publishing Co., Netherlands.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSE- 1002 (f)**
**Paper –II**
**Questioned Documents**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT – I**

**Questioned Document**–Definition, Nature and History of document examination, Classification of Forensic documents-Admitted, Request and Typescript specimens, Holographic documents, Care and Handling of documents, Basic tools needed for Forensic Document Examination - Hand lens, Stereo microscope, Electrostatic detection device (EDD), Video Spectral Comparator (VSC)

**UNIT – II**

**Handwriting** : Principle, General qualities, Writing habits, Individual Characteristics; Factors that causes changes in Handwriting, Systematic Examination of Handwriting; Examination of signatures, Characteristics of genuine and forged signatures; Alteration of Documents, Secret writings, Anonymus writing, Disguised writing, indented writings, Charred documents.

**UNIT – III**

**Forgery :** Various types of forgery and their examination, Determination of sequence of strokes; Age of Documents, Examination and Identification of Paper, Ink, Typescripts, seal, rubber, Carbon copies & other mechanical impressions, counterfeiting and examination of forged currency notes, Presentation of evidence in court.

**UNIT -IV**

**Photography**; Basic principles and techniques of Black & White and colour photography, Cameras and lenses, developments and printing, Different kinds of developers and fixers, Linkage of Cameras and Film negatives, Digital photography, digital water marking & digital imaging, Photogrammetry and videography, crime scene and laboratory photography IR, UV and Portrait photography, Recent developments in photography.

**Recommended Books:**

1. Ordway Hilton; Scientific Examination of Questioned Documents, Elsevier, NY
2. Albert S. Osborn; Questioned Documents, 2nd Ed., Universal Law Pub., Delhi
3. Albert S Osborn; The Problem of Proof, 2nd Ed., Universal Law Pub. Delhi
4. Charles C. Thomas; I.S.Q.D. Identification System for Questioned Documents, willy Prior Bates Springfield, Illinois, USA
5. Wilson R. Harrison; Suspect Documents Their Scientific Examination, Universal Law Pub. Delhi Indian Reprint
6. Goutam, Shubhra and Goutam M.P. Physical Evidences- Introduction and Bibliography on their forensic analysis,Shiv Shakti Book Traders, New Delhi.
7. Morris Ron N; Forensic Handwriting Identification, Acad .Press, London (2001)
8. Lerinson Jay; Questioned Documents, Acad Press, London
9. Mcmenamin, G. R; Forensic Linguistics- Advances in Forensic Stylistics, CRC
10. Ellen David; Questioned Documents- Scientific Examination, Taylor & Francis, Washington (1997)
11. H.L. Blitzer and J.Jacobia; Forensic Digital Imaging and Photography, Academic Press (2002)

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1002 (g)**
**Paper –II**
**Forensic Photography**

**Maximum Marks: 100** **Allotted credits: 03**

**Unit I:**
Photography definition and scope, Introduction to Camera, lens, shutter depth of film

**Unit II:**
Videography, Videography for fire and crime scene,motor vehicle accident scene, surveillance photography and photographic aspects of injuries.

**Unit III**:
Basics of Digital photography, digital imaging, resolution, digital cameras, Monitors and scanners.

**Unit IV:**
Crime scene photography, photography of foot and fingerprints, Significance of photography in document examination, Photography in hit and run cases.

**References:**

1. David R Redsicker: The practical methodology Forensic photography: (second edition) CRC press
2. Duckworth J E: Forensic photography. Springfield I L. Charles C Thomas
3. Samsone SJ: Modern photography for police and fireman, Cincinna TI OH WH. Anderson Company. 1971.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1002 (h)**
**Paper –II**
**Biometrics (Through Portrait parle technique)**

**Maximum Marks: 100** **Allotted credits: 03**

**Unit I:**
History and definition of Biometrics, Types, features and function of Biometrics, Gait scan and principles. Face, voice, signature scan and their principles.

**Unit II:**
Fundamentals of fingerprints, History, Fingerprint patterns, Definition of patterns: Arch, Loop and Whorl, Ridge counting and Ridge tracing, Henry's system of classification (primary to key classification).

**Unit III**:
DNA and its principles in personal identification

**Unit IV:**
Introduction to skin prints, lip prints, ear prints, bare foot prints and their significance in personal identification, conventional method for development of Latent fingerprints.

**References:**
1. Ellen David; Questioned Documents- Scientific Examination, Taylor& Francis, Washington (1997).
2. H.L. Blitzer and J. Jacobia; Forensic Digital imaging and Photography, Academic Press (2002).
3. R.E. Jaconson, S.F. Ray, G.G. Attridge, N.R. Oxford; The Manual of Photography-Photographic and Digital Imaging, 9th Ed., Focal Press (2000).
4. B.H.E. Jacobson, Ray GG Attridge; The Manual of Photography, Focal Press, London (1998).
5. Upton, Kobre, Brill; Photography, Pearson Education, Inc.
David R. Redsicker; the Practical Methodology of Forensic Photography- 2nd Ed. CRC Press LLC(2001).

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1002 (i)**
**Paper –II**
**Biometrics (Through Portrait parle technique)**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT – I**

**Hair**- Introduction and forensic Evidential Value; Morphology, Anatomy, Chemistry of Hair; The scene of occurrence; Collection, sampling and preservation of Hair; Human Hair Characteristics, Somatic origin of human hair; Morphological Examination**:** Ends, Root present/ absent ,Tapered tips (uncut) Rounded or abraded , Square cut/ Angular cut Crushed/ Burned, Distal ends, Broken.

**UNIT – II**

Microscopic Examination of Hair; Drug analysis in Hair; Analytical methods of analysis; Elemental analysis of Hair and its forensic aspects; Morphological changes of hairs by Disease; Pigmentation, Color treatments; Temporary dyes, rinses, sprays, gels, mousses, Bleaches or lighteners, Hair spray and Hair gel; mtDNA Profiling of Hair and its forensic significance.

**UNIT – III**

**Forensic Osteology:** Basic Biology of human skeleton; Number and types of bones in human body; Collection, packaging and storage of human skeletal remains; Distinguishing Humans from other non-human skeletal remains.Use of fragmentary long bones in stature reconstruction. Racial differences in human skeleton, Other techniques of identifying skeletal remains: Facial reconstructions, Cranio facial superimposition, Video superimposition,

**UNIT – IV**

**Forensic Biology:** Introduction to Human Genome, DNA Extraction, DNA Quantitation, DNA Amplification by Ploymerase Chain Reaction, DNA detection methods, Forensic DNA Profiling, VNTR profiling, Autosomal STR profiling, Y chrosome profiling, Mitochondrial DNA profiling, DNA Databases, Diatoms- types, morphology,methods of isolation from different tissue and forensic significance in drowning cases.

**Recommended Books:**

1. Robertson, J. (1996): Forensic Examination of Hair. Taylor and Francis, USA.
2. Goutam Shubhra. ; An Introduction to Forensic Hair Examination;Selective and Scientific Book, New Delhi
3. Fazekas, I Gy; Forensic m foetal Osteology, Akademiai Kiado(1978)
4. Singh, Inderbir; Human Osteology, Jayee Brothers, (2004)
5. Joseph, J; Human Osteology, Jaypee Brothers, (1996)
6. Marion, Krogman Wilton; Human skeleton in forensic medicine, Charles C Thomas, (1986)
7. Singh, Inderbir; Textbook of human osteology, Jaypee Brothers, (2002)
8. P.L. Williams & R. Warwick; Gray' Anatomy, Churchill Livingston, London,(1980)
9. Krogman, W.M.. The Human Skeleton in Forensic Medicine, Chalres C Thomas, Springfield, (1973)
10. K.J. Reich; Forensic Osteology: Advances in the identification of Human remains, Charles C Thomas, (1998)
11. William M. Bass;Human Osteology: A Laboratory and Field Manual,Missouri Archaeological Society (1995)

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSE 1002 (j)**
**Paper –II**
**Advanced Forensic Serology & Immunology**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT-I**

**Blood:** Composition and functions, collection and species identification, Structure and function of serum proteins, Hemoglobin and its variants, Haptoglobins. **Blood groups** – history, biochemistry and genetics of ABO, Rh, Mn and other systems. Methods of ABO blood grouping (absorption-inhibition, mixed agglutination and absorption elution) from blood stains and other body fluids/stains viz. menstrual blood, semen, saliva, sweat, tear, pus, vomit, hair, bone, nail. Secretors and non-secretors . Blood groups that make racial distinctions.

**UNIT-II**

**Analysis of Blood in Forensic Serology**: Identification of blood, Chemical test for Blood identification, Species Origin determination in Blood Stains. **Blood Pattern Analysis:** History of Bloodstain Pattern interpretation, Properties of human blood, Size, Shape and Directionality of bloodstains, Spattered blood, other Bloodstain Patterns, Interpretation of Bloodstain on clothing and footwear.

**UNIT-III**

**Forensic Identification of Biological Fluids and Stains:** Composition of Semen and morphology of spermatozoa, identification of Semen, Qualitative Assays of seminal fluids: Acid phosphatase, Microscopic identification of Spermatozoa,Oligospermia and Azoospermia. Identification of Azoospermic Semen stains, Prostate specific Antigen (PSA, P30) as an indicator of Semen. Saliva: Composition, Identification tests

**UNIT-IV**

**Immunology:** Immune system, immune response, innate and acquired immunity and antigens, Immunoglobulin: Types, physio-chemical properties and function, Rising of antisera. Lectins: Forensic significance, buffers and serological reagents, methods of sterilization employed for serological work. Antigen-Antibody Reactions: Precipitation, agglutination, complement, neutralization, immunofluorescence.

**Recommended Books**

1. Working Procedure Manual Serology, DFS, New Delhi.
2. Danniel P. Stites, Abba I. Jerr, Tristram G. Parstow Medical immunology, Ninth edition; Prentice Hall International Inc. 1997.
3. Saferstein, R. (1982): Science Handbook, Vol. I, II, & III, Prentice Hall New Jersey.
4. Stern, C. (1964) : Principles of Human Genetics, Freeman, California.
5. Beerman, K.E.: Blood Group Serology, Churchill, and Lincoin, P.J. (1988)
6. Race, R.R, and Sanger, R. (1975) : Blood Groups in Man. Blackwell Scientific, Oxford.
7. Gilblet, E. (1969) : Markers in Human Blood, Davis, Pensylvania
8. Culliford, B.E. (1971) The Examination and Typing of Blood Stains, US Deptt. of Justice, Washingron
9. Chowdhari, S. (1971) : Forensic Biology, B P R & D, Govt, of India.
10. Dunsford, I and Bowley, C. (1967) : Blood Grouping Techniques, Oliver & Boyd, London

**Five Year Integrated M.Sc. Forensic Science**
**Semester – X, IFSE-1003 (k)**
**Paper –II**
**Forensic genetics & DNA profiling**

**Maximum Marks: 100** **Allotted credits: 03**

**UNIT- I**

**DNA:** An Introduction to Genetic Material, Structure of DNA, denaturation and renaturation of DNA, DNA binding proteins, factors affecting DNA stability, DNA Damage & repair, Chemical nature of DNA, Replication of DNA in prokaryotes and eukaryotes, genetic code, degeneracy and universability of genetic code, transcription and translation machinery.

**UNIT –II**

Elements of human genetics: Introduction, heritability, human genetic variations, human chromosomes, Mendelian inheritances: Dominant inheritance, recessive inheritance, sex-linked inheritances, polymorphic traits; Heritable human diseases; Metabolic/molecular basis and detection of inherited disease, gene mapping; Genetic markers and their forensic significance.

**UNIT- III**

Biological evidence- Sources collection, characterization and storage; DNA extraction and Quantification; General principles of DNA extraction and quantification; Basic concept of sequence variation - VNTRs, STRs, Mini STRs, SNPs. Detection techniques- RFLP, PCR amplifications, Y-STR, Mitochondrial DNA Evaluation of results, frequency estimate calculations and interpretation, Allele frequency determination, Match probability – Database

**UNIT –IV**

**STR Profiling:** Structure of STR loci; The development of STR multiplexes; Detection of STR polymorphisms; Interpretation of result; Assessment of STR profiles: Stutter peaks. Sp. Pull-up; Degraded DNA; Statistical Assessment of STR profiles ; estimating the frequencies of STR profiles. History of DNA profiling applications in disputed paternity cases, child swapping, missing person's identity, civil immigration**,** limitations of DNA profiling, Analysis of SNP, DNA chip technology- Microarrays Cell free DNA, DNA typing from blood, semen, bone and teeth and the use of DNA typing in wildlife investigations.

**Recommended Books:**


1. Saferstein, Richard, Handbook of Forensic Science, Vol. I, II, (Ed.) Prentice Hall, Eaglewood Cliffs, NJ;.
2. William Goodwin, Adrian Linacre, Sibte Hadi; An introduction to forensic genetics John Wiley & son's ltd, UK.
3. Coyle, H. (ed.) Nonhuman DNA Typing, International Forensic Science and Investigation Series, CRC Press, Boca Raton.
4. Linacre, A. (ed.)Forensic Science in Wildlife Investigations, International Forensic Science and Investigation Series, CRC Press, Boca Raton.
5. Bruce Budowle, Steven. Schutzer, Roger G. Breeze and Paul S. Keim Microbial Forensics.
6. Niels Morling, Handbook of Forensic Genetics (Forensic Science and Medicine) Humana Press.
7. John M. Butle. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers Elsevier Academic Press.

**Five Year Integrated UG/PG Course in Forensic Science**

**Semester – X, IFSEL – 1004 (a)**

**Paper –IV**

**Practical based on Advanced Forensic Chemistry**

**Maximum Marks: 100** **Allotted credits: 04**

1. Analysis of liquor sample as per BIS Specification.
2. Analysis of kerosene/Diesel as per BIS Specification.
3. Detection of kerosene adulteration in gasoline by instrumental analysis.
4. Analysis of opiates, cannabis, Amphetamines, benzodiazepines
5. UV/VIS Spectrophotometric analysis of Narcotic Drugs
6. Detection of blue dye in kerosene(PDS Kerosene)
7. Detection of phenolphthalein in alkaline solution.
8. TLC separation of anabolic steroid
9. Qualitative analysis of explosive residues
10. Detection of Adulterants in edible oils

**Five Year Integrated UG/PG Course in Forensic Science**

**Semester – X, IFSEL- 1004(b)**

**Paper –IV**

**Practical based on Advanced Forensic Toxicology**

**Maximum Marks: 100** **Allotted credits: 04**

1. Analysis of Viscera (simulated sample) for organochloro / organo phosphorous pesticides by chromatographic and spectroscopic methods
2. Systematic extraction and identification of acidic and basic drugs from viscera (simulated samples).
3. Detection of metallic poisons (arsenic and mercury) in viscera and food stuff (simulated samples).A
4. Analysis of narcotic drugs-colour tests and TLC analysis.
5. Microscopic examination of Plant Poisons.
6. Identification of Cannabinoids by TL
7. Analysis of Solanum alkaloids by colour tests and TLC analysis
8. Chemical analysis of Strychnine and Brucine –colour tests and TLC.
9. Identification of poisonous seeds- Ricinus, Croton and Argemone..
10. Identification of methanol mixed in ethanol.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL-1004(c)**
**Paper –IV**
**Practical based on Drugs of Abuse**

**Maximum Marks: 100** **Allotted credits: 04**

1. Analysis of Benzodiazepines and Amphetamines by Laboratory and Field tests
2. Identification of cannabis & Amphetamines by Thin layer chromatographic method
3. TLC separation of anabolic steroids.
4. Microscopic examination of narcotic drugs of plant origin
5. Analysis of Barbiturates by instrumental methods-by HPLC/ Infra red spectroscopy.
6. UV/Vis Spectrophotometric examination of barbiturates ,amphetamines and benzodiazepines
7. Qualitative and Quantitative analysis of morphine
8. Analysis of Designer drugs

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X IFSEL-1004(d)**
**Paper –IV**
**Practical based on Advanced Forensic Physics**

**Maximum Marks: 100** **Allotted credits: 04**

1. Restoration of erased identification marks
2. Comparison of soil samples by Density gradient method
3. Matching of broken pieces of different objects
4. Examination & comparison of broken Glass bangles
5. Identity of small glass pieces by flotation method.
6. Determination of refractive index of glass and liquids
7. Comparison of Tool marks
8. Comparison of Fibers , threads and ropes
9. Analysis and comparison of Paint samples
10. Examination of Glass fracture impact/heat/caused by projectiles

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1004 (e)**
**Paper –IV**
**Practical based on - Advanced Forensic Ballistics**

**Maximum Marks: 100** **Allotted credits: 04**

1. Chemical tests for powder residues (Walker's test) and Barrel wash
2. Identification of propellants
3. Examination and Comparison of fired Cartridges/cases (Caliber, firing pin, breech face, Extractor / Ejector marks etc.)
4. Determination of shot number from size and weight of shots.
5. Examination and Comparison of fired bullets – Caliber, rifling, characteristics, probable type of firearms
6. Characteristics of Firearms – Caliber, Choke, Trigger pull, Proof marks etc.
7. Determination of range of firing
8. Examination and Comparison of fired bullets – Caliber, rifling, characteristics, type of firearms
9. Restoration of Erased marking on firearm

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL-1004(f)**
**Paper –IV**

**Practical Based on Questioned Document**

**Maximum Marks: 100** **Allotted credits: 04**

1. Examination of ink by TLC
2. Examination of paper
3. Examination of rubber stamp.
4. Examination of typescripts and printed matters
5. Examination of photocopy documents for machine defect marks.
6. Detection and decipherment of alterations, additions and over writing.
7. Detection of forgeries including traced and simulated forgery and built up documents.
8. Decipherment of indented writings, secret writings and charred documents
9. Examination of security documents Currency notes, Stamp Papers and lottery tickets.
10. Examination of erasures-mechanical and chemical erasures.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1004 (g)**
**Paper –IV**
**Practical based on Forensic Photography**

**Maximum Marks: 100** **Allotted credits: 04**

1. Photography of crime scene
2. Photography of Tyre print impressions
3. Photography of Hanging
4. Photography of trace evidencde
5. Photography of vehicular accidents

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester- X, IFSEL- 1004 (h)**
**Paper-IV**
**Practical based on Biometrics (Through Potrait Parle Technique)**

**Maximum Marks: 100** **Allotted credits: 04**

1. Examination of photocopy documents for machine defect marks.

2. Detection and decipherment of alteration, additions and overwriting.

3. Detection of forgeries including traced and simulated forgery and built up documents.

4. Decipherment of indented writings, secret writings and charred documents.

5. Examination of security documents Currency notes, Stamp papers and Lottery tickets.

6. Examination of erasures-mechanical and chemical erasures.

7. Photography of documents/ Crime Scene.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL-1004 (i)**
**Paper –IV**
**Practical based on Advanced Forensic Biology**

**Maximum Marks: 100** **Allotted credits: 04**

1. Morphological examination of Human and Animal Hair
2. Examination & Comparison of Human Hair originated from different body parts
3. Determination of sex from Skull Sutures & Pelvis
4. Determination of age from teeth & Skull
5. To perform craniometrical measurements on skull
6. Examination of diatoms
7. Microscopic Examination of Pollen Grains

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1004 (j)**
**Paper –IV**
**Practical based on Forensic Serology and Immunology**

**Maximum Marks: 100** **Allotted credits: 04**

1. Examination of bloodstains: Catalytic Test, Crystal and Spectrophotometric method.
2. Determination of Grouping of blood stains by absorption elution, inhibition and mixed agglutination method.
3. Examination of urine and sweat.
4. Determination of Species of origin of blood, semen and saliva.
5. Examination of seminal stains by biochemical, microscopically and electro-immuno-diffusion method.
6. Preparation of Lectins and testing their activities against Body fluids & TissuesAnalysis of biological fluids by Immuno-Electrophoresis method.

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSEL- 1004(k)**
**Paper –IV**
**Practical based on Forensic genetics and DNA profiling**

**Maximum Marks: 100** **Allotted credits: 04**

1. Extraction and isolation of DNA from Blood
2. Extraction and isolation of DNA from saliva
3. Creating a Hybridization Reaction for DNA typing
4. To perform DNA Fragmentation Assay
5. Performing a Southern Blot in DNA analysis
6. DNA typing by PCR Method

**Five Year Integrated UG/PG Course in Forensic Science**
**Semester – X, IFSD 1004**
**Paper – IV**
**Dissertation/Project work**

**Maximum Marks: 100** **Allotted credits: 10**

**Dissertation / Project work & Seminar Based on Project Dissertation work**