M.Sc FORENSIC SCIENCE

COURSE OUTLINE

PART –I

SEMESTER-I

PAPER CODE: TITLE	Maximum Marks
MFSC-101: General Forensic Science & Criminalistics	100(30+70)
MFSC-102: Criminology & Law	100(30+70)
MFSC-103: Instrumental Methods – I	100(30+70)
MFSC-104: Forensic Ballistics and Explosives	100(30+70)
MFSC-105: Practical-Forensic Ballistics & Criminalistics	100(30+70)
MFSC-106: Seminars, Tutorials & Assignments	100

SEMESTER-II

MFSC-107: Questioned Documents & Fingerprints Examination	100(30+70)
MFSC-108: Instrumental Methods – II	100(30+70)
MFSC-109: Instrumental Methods- III	100(30+70)
MFSC-110: Fundamentals of Computer Forensics	100(30+70)
MFSC-111: Practical- Questioned Documents & Fingerprint Examination, Computer Forensics	100(30+70)
MFSC-112: Attachment with FSL/CFSL/Police Station /Court Room.	100

SEMESTER-III

MFSC-113: Forensic Chemistry & Toxicology	100(30+70)
MFSC-114: Forensic Biology & Serology	100(30+70)
MFSC-115: Forensic Physical Anthropology & Forensic Medicine	100(30+70)
MFSC-116: Quality Management & Research Methodology	100(30+70)
MFSC-117: Practical- Forensic Chemistry & Toxicology	100(30+70)
MFSC-118: Practical- Forensic Biology & Serology & Physical Anthropology	100(30+70)

SEMESTER-IV

Option A: Specialization in Forensic Biology & Serology (FBS)

MFSC-119 (FBS): Advanced Forensic Biology	100(30+70)
MFSC-120 (FBS): Advanced Forensic Serology	100(30+70)
MFSC-121 (FBS): Practical- Forensic Biology & Serology	100(30+70)
MFSC-122 (FBS): Dissertation	300

Option B: Specialization in Forensic Chemistry and Toxicology.

MFSC-119 (FCT): Advanced Forensic Chemistry	100(30+70)
MFSC-120 (FCT): Advanced Forensic Toxicology	100(30+70)
MFSC-121 (FCT): Practical -Forensic Chemistry & Toxicology	100(30+70)
MFSC-122 (FCT): Dissertation	300

Option C: Specialization in Questioned Documents and Finger Print Examination (QDFP).

MFSC-119 (QDFP): Questioned Document Examination	100(30+70)
MFSC-120 (QDFP): Fingerprints Examination	100(30+70)
MFSC-121 (QDFP): Practical- Questioned Document & Fingerprint Examination	100(30+70)
MFSC-122 (QDFP): Dissertation	300

Option D: Specialization in Forensic Physical Sciences (FPS)

MFSC-119 (FPS): Advanced Forensic Physics	100(30+70)
MFSC-120 (FPS): Advanced Digital Forensics	100(30+70)
MFSC-121 (FPS): Practical- Forensic Physics & Digital Forensics	100(30+70)
MFSC-122 (FPS): Dissertation	300

SEMESTER-I

MFSC 101- GENERAL FORENSIC SCIENCE & CRIMINALISTICS

Unit A

Forensic Science: Definition, History and Development, Scope & Need, Basic Principles, Branches of Forensic Science, Tools and Techniques of Forensic Science.

Forensic Science Laboratories: Organizational setup of CFSL, FSL, GEQD, FPB, NICFS, CDTS, NCRB, NPA. Mobile Forensic Science Laboratory.

Education of Forensic Science, Role of Media, Human Right & Criminal Justice System. Ethics in Forensic Science.

Duties of Forensic Scientist, Qualification of Forensic Scientist.

Various Police Organizations, Organization of Police Station, Evolution of Police as an Institution, Role & Function of Police Organization in the State & Centre, Police and Forensic Scientist Relationship with reference to Crime Investigation.

International Perspective of Forensic Science.

Unit B

Crime: Definition, various types of crime, causes of crime, prevention of crime, Difference in blue and white collar crime, Introduction of Cyber crime, Criminal Justice System, Criminal behavior

Crime Scene : Introduction, Significance, Role of Investigator, Evaluation of crime scene, protection of crime scene, Photography of Crime scene, Tools and techniques, Significance of Photography and Videography, Introduction of Sketching, Purpose of Sketching, Making of Sketches, Types of Sketches, Methods of Sketching, Procedure of Sketching, Searching Methods, Chain of Custody types, Significance and their evaluation.

Modus Operandi & Role of Modus Operandi Bureau in crime investigation.

Investigation & Examination of various types of cases (a) Murder (b) Rape (c) Burglary (d) Railway &Air Crashes (e) Road Accidents etc.

Location, Collection & Evaluation of various types of Tool Marks& Trace Evidences: Paint, Soil, Glass, Detective dyes, GSR etc.

Unit C

Narco Analysis: History, Method of investigation, Importance as an investigative tool.

Limitations & Legal Aspects.

Brain Fingerprinting: History, Method of investigation, Significance, Limitations & Future perspective of the Technique.

Forensic Psychology: Psychology of Lying, Various methods of lie detection, Principles of Polygraphy, Limitations & Legal aspects.

Voice Identification: Introduction, Significance, Theory of generation of Voice Characteristics, Voice Spectrography, Recent development of Computerized Speech Laboratory, legal aspects.

Unit D

Counterfeit coins: Blocks and Casts, Importance, Nature, Collection of evidence and their evaluation.

Resuscitation: Introduction and importance, Techniques commonly used to obliterate numbers, General experimental procedure and theoretical consideration with special reference to metal deformation and its effects. Methods of restoration: Chemical, electrolytic & Magnetic particle methods, Laboratory procedure, Evaluation and Interpretation of results.

Presentation of Expert Evidence: Data, Reports, Evidence in the Court.

Suggested Readings:

1. Nanda, B.B. & Tiwari, R.K. ; Forensic science in India- A vision for the twenty first century, Select Publisher, New Delhi (2001)
2. James, S.H. and Nordby, J.J.; Forensic science: An introduction to scientific and investigative techniques, CRC press, USA (2003)
3. Saferstein:Criminalistics -An introduction to Forensic Science, Prentice Hall inc. USA. (1995)
4. C.G.G. Aitken and D.A. Stoney; The use of statistics in Forensic Science, Ellis Harwood Limited, England (1991)
5. Hess, A.k. and weiner, I.B. handbook of Forensic Psychology 2nd ed. Jhon Wiley & Sons (1999)
6. Bruce A. Arrigo, Introduction to Forensic Psychology Academic press. London (2000)
7. David L. Shapiro, Forensic Psychology Assessment an Investigative Approach; Allyn and Bacon Publisher (1991)

8. Loe Nicharrs; Investigative Forensic Hypnosis CRC Press LLC (1999)
9. Kleiner, Murray; Handbook of Polygraph Testing Academic Press (2002)
10. W.W. Bennett & Karen M. Hass- Criminal Investigation; wordsworth Thompson Learning 6th ed. (2001)
11. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)
12. Mordby, J.Deed Rrckoning- The art of Forensic Detection- CRC Press LLC, Boca Raton FL CRC Press (2000)
13. Eckett W.G and James S.H; Interpretation of Blood Stains, Evidence of Crime Scene; Elseiver Pub. New York (1989)
14. James S.H; Scientific and Legal Application of Blood Stain Pattern, Identification; Boca Raton FL CRC Press (1998)
15. Jhon, D. Deehan; kirk's Fire Investigation 5thed. Prentice Hall (2002)
16. Turrey, B; Criminal Profiling- An Introduction to behavioural evidence analysis; Academic Press London (1999)
17. Sharma B.R.; Forensic Science in Criminal Investigation and Trails; Universal Pub. Co. (2003)
18. K. Ranakant; Elementary Statistics in a Word of Application, Goodyear, California Pub. Co. (1979)
19. The Indian Evidence Act (1872), Amendment Act (2002), Universal Law Pub. Co. (2003)
20. The Code of Criminal Procedure (1973), amendment act (2001), Universal Law Pub. Co. (2002)
21. Rattan Lal and Dhiraj Lal; The Indian Panel Code, 28thed. Wadhwa & co. Nagpur (2002)
22. C.R. Swansan, L Terrib and R.W Taylor; Police Administration; Prentice Hall USA (1998)
23. Ram Ahuja; Criminology; Rewal Pub. Jaipur (2000)
24. M Meguire, R Morgan and R Reiner; Oxford Handbook of Criminology, 2nded. Biddles Ltd. Lyon (1997)
25. R.k. Beg; Supreme Court on Criminal justice; Asia Law House (1999)
26. R.Deb; Criminal Justice; The Law Book co. Pvt. Ltd. (1998)

27. J.A. Seigel, R.J Sukoo and G.C Knupfer; Encyclopaedia of Forensic Science vol. I, II& III, Academic Press (2000)
28. Bridges BC; Criminal Investigation, Practical Fingerprinting , Thumb Impression, Handwriting Expert Testimony Opinion Evidence, University book Agency, Allahabad (2000)
29. Bennet, waynew; Criminal Investigation, Wordsworth Pub. Co. (2000)
30. Gross, Dr. Hans; Criminal Investigation- A Practical textbook for Magistrates, Police Officers and Lawyers; Universal Pub. Co. (2000)
31. Bell, William R; Practical Criminal Investigation in correctional facilities, CRC Pres London (2001)
32. Lyman M.D; Criminal Investigation- The art and the Science, Prentice Hall (2002)

MFSC-102: CRIMINOLOGY &LAW

Unit A

Concept and Definition of Crime , Causes of Crime , Social Change and Crime , Control and Prevention of Crime in Context with Organization , Industrialization , Family set up, Criminal Behavior and Psychology.

Criminal Procedure Code-291,292,293. Constitution of Courts, Hierarchy of Courts and their Powers, Evidence in Enquiries and Trials, Lok Adalat, Lok Ayukts and Juvenile Courts .

Unit B

Constitution of India – Preamble, Fundamental Rights Article 20, 21, 22.

Indian Evidence Acts – Sections 32,45,46,47,57,58,60,73,135,136,137,159.

Criminal Justice System: Structure of Police, Prosecution & Judicial Organizations.

Unit C

Sections of the Indian Penal Code:

(i) Offences Against Person:
Sections:299,300,302,304B,306,319,320,326,339,340,351,359,362,357 & 377.

(ii) Offences Against Property:
Sections: 378,383,390,405,415,441,463,471,499,503,511.

Unit D

Narcotic Drugs and Psychotropic Substances Act , Drugs and Cosmetics Acts , Explosive Substances Acts , Dowry Prohibition Act, Prevention of Food Adulteration Act, Prevention of Corruption Act, Arms Act, Wild Life Protection Act, I.T. Act(Information Technology Act)-2000.

Suggested Readings

1. Arrigo (2002) : Introduction to forensic Psychology.
2. Cooke, G. (1980) : The role of Forensic Psychologist. Chanles C. Thomas.
3. Howitt D : 2002 Forensic and Criminal Psycholgy. Prentic Hall Publications
4. Constitution of India
5. Indian Evidence Act
6. Criminal Procedure code.
7. Indian Penal Code.

8. 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 Adultration Act, Prevention of Corruption Act, Arms Act, Wild Life Protection Act.
9. Hess, A.K. and Weiner, I.B. (1999) Handbook of Forensic Psychology 2nd Ed. John wiley & sons.
10. Barak, Gregg : Integrative Criminology.
11. Adler, Freda : Criminology
12 Reid S.T. : Crime and Criminology.
13 Johnson : Crime, Correction and Society.
14 Riderman : The Manipulation of Human Behaviour.
15 Lionel Haward : Forensic Psychology, 1981, Batsford Academic and Education Ltd., London.

MFSC: 103 INSTRUMENTAL ANALYSIS-I

Unit A

Basic Concepts-Atomic & Molecular Spectroscopy-I

What is spectroscopy , electromagnetic spectrum, Sources of radiation, their utility and limitations, conventional sources for UV, Visible and Infrared rays, sources for shorter wavelength radiations (X-ray tubes) radioactivity, gama rays and β rays. Laser (He, Ne, Argon ion, dye lasers, semi conductor lasers) as source of radiation. Interaction of radiation with matter: reflection, absorption, transmission, fluorescence, phosphorescence and their Forensic applications,

Unit B

Basic Concepts-Atomic & Molecular Spectroscopy-II

Molecular spectra: Introduction, molecular orbital, types of molecular energies, vibrational and electronic spectra, Atomic spectra, energy levels, quantum numbers and designation of states, selection rules, and qualitative discussions of atomic spectra. Augur effect. Detection of radiations, photographic detectors, thermal detectors, photoelectric detectors, radiation filters etc.

Unit C

Absorption Spectroscopy

Ultra violet and visible spectrophotometry: Types of sources and stability, wavelength selection, filters-cells and sampling devices, detectors, resolution, qualitative and quantitative methods for detection.

Fluorescence and phosphorescence spectrophotometry: Types of sources, structural factors, instrumentation, comparison of luminescence and UV- visible absorption methods.

Atomic absorption spectrometry: instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis.

Infrared spectrophotometry: Dispersive and Fourier Transform spectrophotometry, sample handling, quantitative analysis and interpretation of IR spectra.

Unit D

Emission Spectroscopy

Raman spectroscopy: Instrumentation, sample handling and illumination, structural analysis, polarization measurements and Dispersive & FT analysis.

Atomic emission spectrometry: Instrumentation and techniques, arc/spark emission, ICP-AES, comparison of ICP vs. AAS methods, quantitative analysis, applications.

X-ray spectroscopy: Elements of X-ray spectroscopy, X-ray absorption and fluorescence methods, X-ray diffraction, Auger emission spectroscopy (AES), and Dispersive X-ray analysis (EDX), Wavelength Dispersive X-ray analysis (WDX)

Nuclear magnetic Resonance spectroscopy: Basic principles, theory and Instrumentation.

Suggested Readings

1. James w. Robinson; Atomic Spectroscopy, 2nd ed. Revised & Expanded, Marcel Dekkar, inc. NY, (1996).
2. V.B. Patania; Spectroscopy, Campus Books International, (2004)
3. Jerry Workman, Jr, Art Springsteen; Applied Spectroscopy- A compact reference for practitioners, Academic Press (1997)
4. N. Subrahmanyam & Brij Lal; A text book of Optics, S. Chand & co. (2004)
5. Gurdeep R. Chatwal & Sham k. Anand; Instrumental Methods of Chemical Analysis, Himalaya Pub. House (2004)
6. Hobert H. Willard, Lynne L. Merrett Jr, Jhon A Dean Frank A. Settle Jr; Instrumental Methods of Analysis, 7th ed. CBS Pub & Distributors (1986)
7. R.S. Khandpur; Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co. New Delhi (2004)
8. John A Dean; Analytical Chemistry Handbook, Tata McGraw Hill Inc. (1995)
9. K.C. Thompson & R.j. Renolds; Atomic Absorption Fluorescence & Flame Emission Spectroscopy, A practical approach, 2nd ed. Charles Griffin & co. (1978)
10. Robert M. Silverstein & Francis X Webster; Spectrometric Identification of organic Compounds, 6th ed. John Wiley & Sons, Inc (1997)
11. John C. Lindon, George E. Tranter & John L. Holmes; Encyclopedia of Spectroscopy & Spectrometry, Academic Press (2000)
12. Dudley H, Williams & Ian Fleming; Spectroscopic Methods in Organic Chemistry, 4th ed. Tata McGraw-Hill Pub Co. New Delhi, (1994)
13. Colin N. Banwell & Elaine M, Mc. Cash; Fundamentals of Molecular Spectroscopy 4th ed. McGraw-Hill Pub Co. New Delhi, (1995)
14. R. Murugeshan; Optics & Spectroscopy, S. Chand & co. (1998)
15. Jack L Koeing; Spectroscopy of Polymers, 2nd ed. Elsevier pub. Co. (1999)

MFSC-104: FORENSIC BALLISTICS AND EXPLOSIVES

Unit A

1. Firearms : Early history of firearms, the earliest firearms, the fifteenth century Match lock, sixteenth & seventeenth century small arms, The age of the Flint lock, the percussion lock firearms.

2. Classification, Characteristics and firing mechanism of smooth bored firearms (M.L., B.L.) Rifled firearms (Pistol, Revolver, Rifles, Machine Guns), Classification, nomenclature and construction of country made firearms.

3. Ammunition: Types, Cartridge Components (Cartridge case primer propellant, Bullets, Pellets and wads).

Unit B

4. Internal Ballistics: Definition, Ignition of the propellent, manner of burning, Piobett's law, Shape and Size of the propellent, pressure space curve, shot start pressure. All burnt point, Velocity, Space curve, Le Due's formula, muzzle velocity, Factors affecting muzzle velocity, theory of recoil.

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

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

Unit C

7. Matching of crime & test Bullets and cartridge cases in regular firearms, Identification of Bullets, pellets & wads fired from improvised country made firearms. Automated method of cartridge case and bullet comparison.

8. Determination of Range of fire, time of fire. Visual and Chemical, instrumental methods with special reference to the applications of Neutron activation, Atomic absorptions, Scanning Electron microscopy and other miscellaneous methods.

9. Gun Shot Residues (GSR): Mechanism of formation of GSR, modern methods of analysis of GSR from the shooting hand & target with special reference to clothings.

10. Firearm injuries: Ballistic aspect of firearm injuries, nature, Effect of target, Velocity, constructional features and range on the wounding, identification of firearm injuries. Evaluation of Firearm injuries, Reconstruction: Accident, Suicide, murder and self defence.

Unit D

Explosives: Classification, Composition and Characteristics of explosives, pyrotechnics, IEDs, explosion process and affects, types of hazard, effect of blast wave on structures, human etc., specific approach to scene of explosion, post- blast residue collection, reconstruction of sequence of events, evaluation and assessment of scene of explosion, systematic examination of explosives and explosion residues in the laboratory using chemical and instrumental techniques in the laboratory and interpretation of results.

Suggested Readings:

1. Howard MATHEWS; Charles C. Thomas, Firearms identification, vols. 1,2 & 3; Springfield, Illinois; (1973)
2. Hatcher, Jury and Weller: Firearms Investigation, Identification and Evidence; Stackpole Books, Harrisburg, PA; (1977)
3. Vincent Di Maio, Gunshot Wounds; CRC press, Washington, DC; (1999)
4. Brain J. Heard; Handbook of Firearms and Ballistics; Jhon Willey, England; (1997)
5. Warlow; Firearms, The Law and Forensic Ballistics; Taylor& Francis, London; (1996)
6. Karl G. Sellier et al; Wound Ballistics and the scientific Background; Elsevier, London; (1994)
7. M. Johari, Identification of Firearms, Ammunition and Firearms Injuries; BPR& D, New Delhi; (1980)
8. I.V. Hogg; The Cartridges Guide- A small arms Ammunition Identification manual; The Stackpole co. Harrisburg, PA (1982)
9. Gray J. Ordog, Management of Gunshot Wounds; Elseiver, New York (1983)
10. Working Procedures Manual: Ballistics, BPR & D pub. (2000)

11. Boundreau JE, et.al,Arson Investigation , Survey & Assessment National Institute of Law Enforcement, U.S. Deptt.of Justice, US Govt. Printing Press (1977)
12. Dettean J D; Kirk's Fire Investigation, 5th ed. Prentice Hall, Eaglewood Cliffs, N.J (2002)
13. Yinon Jitrin; Modern & Application in Analysis of Explosives, john Wiley & Sons, England (1993)
14. Working Procedure Manual; Chemistry, Explosives and Narcotics, BPR& D Pub. (2000)
15. C.A. Watson; Official and standardized Methods of Analysis, Royal Society of Chemistry, UK (1994)

MFSC-105: PRACTICAL- FORENSIC BALLISTICS & CRIMINALISTICS

1. Sketching and photography of scene of crime.
2. Collection and packing of physical clues at the scene of crime.
3. Reconstruction and evaluation of scene of crime (Hit and Run, Arson and Shooting cases etc.).
4. Determination of density, by density gradient tube techniques.
5. Comparison of paints, Soils and glass.
6. Miscellaneous Examination (Cloth, Bangles, threads etc.)
7. Lifting of prints and impressions by caste and replicas.
8. Sole prints comparison and their lifting from the scene of crime.
9. Identification of firearms, cartridges, bullets, gunpowder, etc.
10. Examination and comparison of fired bullets – Caliber, rifling characteristics, probable type of firearms.
11. Examination and Comparison of fired Cartridge cases (Caliber, firing pin, breech face, Extractor/ ejector marks etc.)
12. Determination of Shot number from size and weight of shots.
13. Determination of range and time of firing.
14. Identification of propellants.
15. Chemical tests for powder residues (Walker's test) and Barrel wash.

MFSC- 106 Seminars, Tutorials & Assignments

SEMESTER-II

MFSC-107: QUESTIONED DOCUMENTS & FINGERPRINTS EXAMINATION

Unit A

Document in General: Importance, Classification& Preliminary Examination.

Nature & Problems of Document Examination. Handling & Preservation of Documents.

Basic tools needed for Forensic Document Examination and their use.

Writing instruments and their influence on writing. Examination of Paper and Ink.

Handwriting: Basic Principle of Handwriting Identification, Handwriting characteristics-General and Individual.

Development of Individuality in Handwriting, Comparison of Handwriting, Natural variations, Fundamental divergences. Standard for Comparison.

Signatures: Characteristics of genuine and forged signatures and their Examination.

Unit B

Forgery: Definition, types, Characteristics and their detection.

Disguised writing and anonymous letters: Definition, Characteristics and Indentification of writer.

Sequence of strokes: Definition and determination of sequence of strokes.

Alteration in the Document: Examination of erasures, additions, overwriting and Obliteration. Decipherment of Secret writing, Indented and Invisible writing, Charred documents. Examination of seal impression and other mechanical impressions.

Age of document: Absolute/relative age, determination of age of documents by Examination of Printed Matter, Types Script Writing, Signatures, Paper and Ink.

Unit C

Type writing: Working of type writer, Various type of typewriting devices, Identification of type Scripts, Typist.

Printed matter: Various type of printing processes, Examination of various types of Printed Matter.

Preparation of detailed report with reasons and illustrative charts, Use of standard Terminology.

Photography: Basic principles and techniques, Exposing, Developing and Printing, Modern Developments in Photography, Digital Photography, Videography/High speed videography, Crime scene and Laboratory photography.

Unit D

History and Development of Fingerprints, Formation of Ridges, Pattern Types, Pattern areas, Classification of Fingerprints- Henry System of Classification, Single Digit Classification, Search of Fingerprints, Fingerprint Bureau.

Chance Fingerprints-Types of chance prints, Composition of Sweat, Development of latent Fingerprints. Conventional method of development of Fingerprints. Digital imaging & Enhancement, Application of laser & other radiations to develop latent fingerprints. Photography of Fingerprints, Digital Transmission, Comparison of Fingerprints, Automated Fingerprint Identification System (AFIS).

Suggested readings

1. Huber, A. R. and Headride, A.M. (1999) : Handwriting identification : facts and fundamental CRC LLC
2. Ellen, D (1997) : The scientific examination of Documents, Methods and techniuqes. 2nd ed., Taylor & Francis Ltd.
3. Morris (2000) : Forensic Handwriting Identification (fundamental concepts and Principals)
4. Madinger J. and Zalopany, A.R. (1999) : Money Laundering CRC Press.
5. Manning, C.A (1999) : Financial Investigations and Forensic Accounting CRC Press.
6. Harrison, W.R.(1966) : Suspect Documents & their Scintific Examination, Sweet & Maxwell Ltd., London.
7. Hilton, O(1982) : The Scientific Examination of Questioned Document, Elsaevier North Holland Inc., New York.
8. Brewster, F(1932) : Contested Documetns and Foregeries, The Eastern Law House, Calcutta.
9. Ames : Ames on Foregery(1900), Ames Rellingson Co., New York.
10. Conway, J.V.P. : Evidential Documents(1959), Charles C. Thomas, Illinois.
11. Mehta, M. K.(1970) : The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad.
12. Sulner, H.F.(1966) : Dispated Documents, Oceana Publications Inc., New York.
13. Saxena's : Saxena's Law & Techniques Relating to Finger Prints, Foot Prints & Detection of Forgery, Central Law Agency, Allahabd (Ed. A.K. Singla).

14. Osborn, A. S.(1929) : Questioned Documents , Boyd Printing Co., Chicago.
15. Cummins & Midlo(1943) : Finger Prints, Palms and Soles, The Blakiston office London.
16. Cherril, F.R.(1954) : The Finger Prints. System at Scotland Yard, Her Majesty's office, London.
17. Wentworth & Wilder(1948) : Personal Identification, . R. G. Badger. Boston.
18. Mehta, M. K.(1980) : Identification of Thumb Impression & Cross Examination of Finger Prints, N. M. Tripathi (P) Ltd. Bombay.
19. Moenssens(1975) : Finger Prints Techniques, Chitton Book Co., Philadelphia, New York.
20. Bridges (1942): Practical Finger Printing, Funk and Washalls Co. New York.
21. Saferstein, R.(1990) : Criminalistics, Prentice Hall, New York.

MFSC-108: INSTRUMENTAL METHODS- II

Unit A

Light Microscopy-Introduction, Geometrical optics, Image formation, Magnification and Resolution, Lens aberrations, Distortion of image and curvature of field. Basic principles, working and Forensic Applications of Following Microscopes:

1. Compound Microscope
2. Comparison Microscope
3. Fluorescence Microscope
4. Polarized Microscope
5. Stereomicroscope
6. Infra-red Microscope

Unit B

Electron Microscopy- Introduction, Historical review, Types of Electron Microscopy- **Scanning electron microscopy (SEM)**: Theory & Principle, Specific feature, instrumentation, sample preparation, specimen interaction, specimen interaction volume, signal produced by specimen & Forensic applications.

Transmission electron microscopy (TEM): Theory and basic principles, Instrumentation & Forensic applications.

Unit C

Photomicrography: Photography, Microscope, Camera, light system, Film, Filters, Photographic papers, Photocapture, Development of film, Positive photograph prepration, Developer, Stop- Bath, Fixing.

Ultra- Violet Photography

Infra-red Photography

Microphotography

Unit D

Radiochemical techniques: Basic principles and theory, introduction about nuclear reactions and radiations, Neutron sources, Neutron Activation Analysis (NAA).

Thermal analysis methods: Basic principles and theory, differential scanning colorimetry and differential analysis, thermogravimetry.

MFSC-109: INSTRUMENTAL METHODS- III

Unit A

Chromatography: Introduction, Review of basic principles and types of chromatography

1. Paper Chromatography- Basic Principle, Experimental Procedure, Forensic Application.
2. Thin layer chromatography- Basic Principle, Experimental Procedure, Rf Value, Forensic Application, Advantage of TLC over Paper Chromatography.
3. Column Chromatography: Basic Principle, Experimental Procedure, Advantages & Disadvantages, Forensic Applications.

Unit B

HPTLC-: Theory and Basic principle, Experimental Procedure, Qualitative and Quantitative analysis, Forensic Application.

Gas chromatography: Theoretical principles, instrumentations and technique, columns, stationary phases, detectors, Pyrolysis GC, GC-MS, Forensic applications.

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

Unit C

Electrophoresis: Introduction, Basic Principles, Various factors affecting electrophoresis, Instrumentation & Forensic applications of Various electrophoresis techniques- Moving boundary electrophoresis, Zone electrophoresis (Paper electrophoresis, Cellulose acetate membrane electrophoresis, Gel electrophoresis, Agrose gel electrophoresis, Polyacrylamide gel electrophoresis), Sodium dodecyl sulphate (SDS) polyacrylamide gel electrophoresis, Two dimensional electrophoresis, Capillary electrophoresis, Immunoelectrophoresis, Isoelectric focusing.

Unit D

Immunological Techniques: Introduction, immune system, types of immunity.

Radioimmunoassay: Basic Principle, Labelling of Antigen and technique of Assay & Applications.

Enzyme linked Immunosorbent Assay (ELISA): Competitive method, Sandwich method, Indirect method & Applications.

Suggested Readings:

1. Lurie and Witturer(1983): High Performance Liquid chromatography in Forensic Chemistry.
2. Gilbert(1997): GC-MS guide to ignitable liquids.
3. Brown, P.R: Advance in chromatography
4. Howard: Forensic Analysis by Gas Chromatography.
5. Grahm D.(1973): The use of X-ray Techniques in Forensic Investigation.
6. Settle, F.A.(1997): Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall.

MFSC 110: FUNDAMENTALS OF COMPUTER FORENSICS

Unit A

Fundamentals of Computers: History of Computers, Areas of Application, Computers and its components, Advantages and Disadvantages of Computer, Application Software and System Software, The Memory Hierarchy and Cache Memory. Operating System Overview: Introduction, Objectives and Functions of Operating System. Types of Operating system- Windows, Linux, Mac. Basics of Networks: Types of Networks, Networks Topology, OSI Model, TCP/IP and Related Protocols.

Concept of Internet: Introduction, Applications and Working of Internet. Search Engines, Chat, E-mails.

Unit B

Cyber Crimes: Introduction, Classification, Reasons of Cyber Crimes. Types of Cyber Crimes:

(a) Crimes Targeting Computers.

(b) Online Based Cyber Crimes.

Investigation of Cyber Crimes: Investigation of Malicious Applications, Evidence Collection and Seizure Procedures of Digital Mediums, Securing the Scene, Documenting the Scene, Evidence Collection and Transportation. Data Acquisition, Data Analysis and Reporting. Concealment techniques.

Unit C

Provisions in Indian Laws in dealing with Cyber Crimes and its critical analysis, Information Technology Act, 2000, Penalties under IT Act, Offences under IT Act, Offences and Analysis related with Digital Signature and Electronic Signature under IT Act, Statutory Provisions, Establishment of Authorities under IT Act and their functions, powers, etc.

Unit D

Image Processing: Introduction and Process, Image Enhancement and Restoration. Investigation of Erased Tapes and Analysis of Signals (Analog Video Image Processing), Compression, Encryption Methods. Methods for Digital Video Recording, Digitalization Techniques, Investigation of Integrity of Images and Videos.

Suggested Readings:

1. Cyber Law in India by Farooq Ahmad- Pioneer Books

2. Infromation Technology Law and Practice by Vakul Sharma- Universal Law Publishing Co. Pvt. Ltd.

3. The Indian Cyber Law by Suresh T. Vishwanathan- Bharat Law House NewDelhi

4. Guide to Cyber and E- Commerce Laws by P.M. Bukshi and R.K. Suri- Bharat Law House, New Delhi

5. Guide to Cyber Laws by Rodney D. Ryder- Wadhwa and Compney, Nagpur

6. The Information technology Act, 2000- Bare Act- Professional Book Publishers, New Delhi.

7. Computer Forensics: Principles and Practices by Linda Volonino, Reynaldo

Anzaldua and Jana Godwin -Pearson Prentice-Hall 2007.

8. First Responder's Guide to Computer Forensics by Richard Nolan et al.-

Carnegi Mellon, 2005.

9. Digital Evidence and Computer Crime, 2nd ed. By Eoghan Casey- Acdemic

Press, 2004.

10. The Regulation of Cyberspace by Andrew Murray, 2006- Routledge –

Cavendish.

11. Scene of the Cybercrime: Computer Forensics Handbook by Syngress.

12. Security and Incident Response by Keith J. Jones, Richard Bejtlich and Curtis

W. Rose

13. List of Websites for more information is available on:

Http://www.garykessler.net.library/forensicsurl.html

14. Introduction to Forensic Science in Crime Investigation By Dr.(Smt) Rukmani

Krishnamurthy

15. Tiwari, R.K. and Ravikumar, K.V. (2003): Computer Crime & Computer Forensics, Selective publication, New Delhi.

16. Stern, D.L. Preventing Computer Frauds.

MFSC-111: PRACTICAL- QUESTIONED DOCUMENTS & FINGERPRINT EXAMINATION, COMPUTER FORENSICS

1. Identification of Handwriting General Characteristics.
2. Study of natural variations in handwriting.
3. Study of fundamental divergences.
4. Identification of individual characteristics.
5. Study of Disguised in handwriting.
6. Comparison of handwriting.
7. Detection of Simulated forgery.
8. Detection of traced forgery.
9. To obtain Plain and rolled inked finger prints.
10. To identify the finger Print Patterns.
11. To perform ridge tracing and ridge counting.
12. To identify the ridge characteristics.
13. To Compare the finger Prints.
14. To develop latent finger Prints with powder method.
15. To develop latent finger Prints with fuming method.
16. To develop latent finger Prints with chemical methods.
17. Working in Windows
18. Application of Internet- visiting websites with given URL, searching information using search engine.
19. Investigation of E-mail- Finding senders IP Address of received e- mail, tracing route of e-mail received using tools available on internet e.g. Visual Trace Route etc.
20. To Recover Concealed Data in the form of Altered Data viz. Renamed Files, Manipulated File System, Data Hidden on NTFS.
21. To Take Images from various Storage media.

MFSC-112: Attachment with FSL/CFSL/Police Station /Court room.

SEMESTER III

MFSC-113: FORENSIC CHEMISTRY & TOXICOLOGY

Unit A

Forensic Chemistry: Introduction, Types of cases which require chemical analysis, Limitations of forensic samples, conventional methods of chemical analysis, presumptive tests (colour/spot tests), Microcrystal tests, Elemental analysis (organic and inorganic).

Examination of contact Traces: Introduction to cosmetics and detective dyes, collection, sampling and analysis.

Unit B

Arson: Introduction, chemistry of fire, scientific investigation and evaluation of clue materials, collection and preservation, analysis of flammable residues.

Drugs of abuse: Introduction, drug addiction and its problems, classification of drugs of abuse, Depressants, stimulants, Hallucinogens, Identification, Field tests and laboratory tests.

Drug abuse in sports: Introduction, common prohibited substances, analytical approach.

Unit C

Forensic Toxicology: Introduction, Role of the toxicologist, significance of toxicological findings, poisons, definition, classification on the basis of their origin, physiological action and chemical nature, metabolism and excretion of poisons, poisoning in India.

Unit D

Management of Toxicological cases in the hospital: Signs and symptoms of common poisons, antidotes.

Collection and preservation of viscera for various types of poisons: Choice of preservatives, containers and storage.

Extraction, Isolation, Identification, Estimation of poisons from Viscera, Blood and Urine.

Suggested readings

1. Ret Newman, Micheal Gilbert, Kevin Lothridge; GC-MS Guide to Ignitable Liquids, CRC Press, LLC, 1999.
2. Modi's: Medical Jurisprudence & Toxicology, M. M. Trirathi Press Ltd. Allahabd, 1988.

3. S.N. Tiwari: Analytical Toxicology, Govt. of India Publications, New Delhi, 1987.
4. Saferstein, R: Forensic Science Hand Book, Vol I, II and III, Pretince Hall, 1982.
5. Saferstein, R: Criminalistics, 2002.
6. O Hara & Osterburg : Introduction to Criminalistics, 1949.
7. Sharma, B.R.: Forensic Science in Criminal Investigation & Trials, 2003.
8. Maehly and Stromberg : Chemical Criminalistics, 1980.
9. Curry: Analytical Methods in Human Toxicology, Part II, 1986.
10. Casarett & Doll Toxicology : The Basic Science of poisons.
11. Curry, A.S. : Poison Detection in Human Organs, 1976.
12. Holfmann, F.G.: Handbook of Drug and Alchoho Abuse.
13. Arena Poisoning: Chemistry, Symptoms and Treatment.
14. Froede, R.C.: The Laboratory Management of the Medico-Legal, Specimen Analytical Chemical Laboratory Sciences.
15. Connors, K.: A text book of Pharmaceuticals analysis, Interscience, New York, 1975.
16. Gleason, M.N. et. al.: Clinical Toxicology of Commercial products,
. Williams and Williams, Baltimore USA, 1969.

MFSC:114 FORENSIC BIOLOGY AND SEROLOGY

Unit A

Biological evidence: Importance, nature, location, collection and evaluation.

Hair and Fibers: Importance, nature, location, collection, evaluation and tests for their identification.

Importance and identification of Botanical evidence such as Pollen grains, wood, leaves and seeds.

Unit B

Blood: Composition and functions, collection and species identification.

Human Blood groups: General Principles, theory of their inheritance, Blood group determination from fresh blood.

Definition of antigen and antibody, Various Antigen-antibody reactions.

Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption-inhibition, Absorption-elution and mixed agglutination techniques, determination of secretor/non-secretor status.

Unit C

Semen: Forensic significance, location, collection, evaluation and tests for identification

Forensic significance of other body fluids like saliva, sweat, milk etc. Their collection and identification.

Unit D

Polymorphic enzymes: Forensic significance, identification from fresh blood and stains.

Paternity disputes: Causes, Various serological and biochemical methods, calculation of paternity index and probability for paternity and maternity.

Suggested Readings

1. Robertson, J. (1996): Forensic Examination of Hair. Taylor and Francis, USA.
2. Modi, J.K. (1988): 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. (1975): Blood Groups in Man. Blackwell Scientific, Oxford.
7. Saferstein, R. (1982): Science Handbook, Vol. I, II and III, Prentice Hall, New Jersey.
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, Elsevier, New York.

MFSC:115 FORENSIC PHYSICAL ANTHROPOLOGY AND FORENSIC MEDICINE

Unit A

Forensic Anthropology: Definition, scope and objectives, Human skeleton, comparative skeletal anatomy of human and non-human.

Identification of bones and determination of side: Age determination from skeletal remains: General considerations, classification of bones, suture closure in skull and ossification in other bones. Sex determination from skeletal remains: skull, Pelvis, and other bones. Estimation of stature from skeletal remains with special reference to long bones.

Unit B

Personal Identification Techniques (Somatoscopy, Somatometery, Osteometery and Craniometery) & their Importance in Determination of Age and Sex.

Portrait Parle/Bertillon system, Introduction and Importance of Photofit/Identi Kit System for Facial Reconstruction. Cranio Facial Super Imposition Techniques (Photographic Super Imposition, Video-Superimposition, Roentgenographic Superimposition). Use of Somatoscopic and Craniometric Methods in Reconstruction. Importance of Tissue Depth to Reconstruct various Facial Features. Genetic and Congenital Anomalies: Causes, Types, Identification and their Forensic Significance.

Unit C

Forensic odontology: Development and scope, role in mass disaster. Structural variation in teeth (human and non-human), types of teeth and their functions, determination of age from teeth: eruption sequence, Gustafson's method, dental anomalies, their significance in personal identification.

Bites marks: Forensic significance, collection and preservation of bite marks, photography of bite marks, and evaluation of bite marks. Legal aspects of bite marks.

Unit D

Forensic Medicine: Medico legal aspects of Death, causes of Death (asphyxial death, starvation, electrocution, Accidents).

Determination of time since death by various methods including, histopathological methods.

Determination of age of living person, medico-legal investigation of sexual offences, including examination of victim and suspect.

Injuries: Types and classification of injuries, anti-mortem and post-mortem injuries, aging of injuries, artificial injuries.

Suggested Readings

1. Text book of Forensic Medicine by Krishan Vij; B.I. Churchill Livingstone Pvt. Ltd. 2001.
2. Forensic Dentisty by Paul G. Stimson, Curtis A. Mertz; CRC Press, LLC, 1999.
3. Craniofacial Identification in Forensic Medicine, edited by John. G. Clement and David. L. Ranso; Oxiford University, Press; 1998.
4. Forensic Taphonomy, edited by William D. Haglernd, Marculla H. Sorg; CRC Press, LLC, 1997.
5. Beals, R.L. and Hoizir, H. (1985): An Introduction to Anthropology, Macmillan, New Delhi.
6. Krogman, W.M. And Iscan, M. (1986): Human Skeleton in Forensic Medicine, Charles C. Thomas, U.S.A.
7. Gray'ss Anatomy (1987): Churchill Livingston, Edinburgh.
8. Glaister (Ed)-Rentoul & Smith (1973) : Forensic Medicine & Toxicology, Churchill Livingston, Edinburgh.
9. Modi, J.K. (1988): Medical Jurisprudence & Toxicology, N.M. Tripathi Pvt. Ltd.
10. El Najjar and Mcwilliams (1978) : Forensic Anthropology.
11. Mukherjee, J.B.: Forensic Medicine & Forensic Toxicology.
12. Cummins, H. and Midlo, C. (1961) : Finger Prints, Palms and Soles, Dover Publications, U.S.A.
13. Fraser, Roberts, J.A. (1965): An Introduction to Medical Genetics.
14. Comas, J.A. (1960): A Manual of Physical Anthropology, Charles C. Thomas U.S.A.
15. Whitaker, D.K. and MacDonald, D.U. (1989): Forensic Dentistry, Wolfe Medical Publications Ltd.
16. Robert A. Jensen: Mass falality and Casulity incidents: A field guide
17. Taylor (2000) : Forensic Art and Illustrations CRC Press.

18. Singh, I.P. and Bhasin M. K. (1968): Anthropometery, Kamla-Raj Publications, Delhi.
19. Hooton, E.A. (1946): Up from the Ape, Macmillan, New York.
20. Whitaker, D.K. and MacDonald, D.U. (1989): Forensic Dentistry, Wolfe Medical Publication Ltd
21. Nath, S. (1987): An Introduction to Forensic Anthropology. Gian Publishing House, New Delhi.

MFSC-116: QUALITY MANAGEMENT & RESEARCH METHODOLOGY

Unit A

Quality Management System: Quality, Total Quality, Quality assurance, Quality Control, Quality Planning, and Quality Audit: Internal and External Audit, Accreditation, NABL, ISO, IEC, BIS.

Unit B

General Requirements for the competence of testing and calibration of laboratories, Management Requirements: organizational, document control, Subcontracting of tests and calibrations, Control of non conforming testing/ calibration work, Corrective and preventive actions, management review.

Technical Requirements: Test and calibration methods and their validation, measurements, standards and reference material, traceability, sampling.

Unit C

Selection of Research Problem: Research proposal, literature search, hypothesis, report writing. Sampling population and Sample, Sampling procedures (random and non random), sampling statistics, sampling and physical state, homogenization of samples, sample size and hazards in sampling.

Unit D

Types of data, Basic concepts of frequency distributions, measure of central Tendency, Mean, Median and Mode, measure of dispersion, range, mean deviation and standard deviation. Correlation and regression analysis. Variance – coefficient of variation, moment, Skewness, and kurtosis, binomial distribution, normal distribution, hyper geometric distribution, correlated measurements. Test of significant of attributes , Z-test of significance and coefficient of correlation , small sample test , t- test , paired test , chi-square test, F-test for equality variance , large sample test, Normal test . Significance of statistics in Forensic Science.

Suggested Readings

1. C.G.G. Aitken and D.A Stoney; The use of statistics in Forensic Science, Ellis Horwood Limited, England 1991.
2. Visweswara Rao. K: Biostatistics, A Manual of Statistical Methods for Use in Health, Nutrition & Anthropology.

3. Sokal, R.R & Rolf, F.J: Biometery, Principles & Practices of Statistics in Biological Research
4. Rao, C. R Advanced Statistical Methods in Biometric Research.
5. Saferstein R. Forensic Science Handbook I, II, III.
6. William L. Duncan: Total Quality, Key Terms and Concepts.
7. Murray S. Cooper: Quality control in the Pharmaceutical Industry.
8. John T. Rabbitt, Peter A Bergh: The ISO 9000 Book.
9. Willard Merritt, Dean & Settle: Instrumental Methods of Analysis.
10. NABL -113
11. NABL -113A
12. Quality Management systems: A Practical Guide
Howard S. Gitlow 2001 CRC Press ISBN 1-574-44261-9
13. Crime Laboratory Management: Jami St. Clair 2003. Academic Press. ISBN 12661051-3
14. ASCLD Guidelines for Forensic Science Laboratory Practics.
15. The laboratory Quality Asurance system: A manual of Quality Procedures and forms. Thomas A Ratliff. 2003 3rd ed. John Wiley & Sons ISBN. 0-471 26918-2
16. Systematic Quality Management Gary B Clark. 1995 Practical Laboratory Management Series.
17. Quality assessment of chemical Measurments John K. Taylor. CRC Press 1987. 087371-097-5.
18. Quality in the analytical chemistry laboratory E. Prichard. 1995 JohnWiley ISBN 0471 955418

MFSC: 117 PRACTICAL - FORENSIC CHEMISTRY AND TOXICOLOGY

1. Colour/spot tests for common drugs of abuse.
2. TLC separation of drugs of abuse.
3. TLC separation of pesticides/insecticides.
4. TLC separation of anabolic steroids.
5. Distillation characteristics of gasoline, kerosene, and diesel oil.
6. Analysis of phenolphthalein in trap cases.
7. M.P, B.P and flash point Determination.

MFSC:118 PRACTICAL BASED ON FORENSIC BIOLOGY AND SEROLOGY INCLUDING FORENSIC PHYSICAL ANTHROPOLOGY

1. Determination of Age from Skull Sutures.
2. Determination of Age from Teeth.
3. Determination of Sex from Skull.
4. Determination of Sex from Pelvis.
5. To Perform Osteometric measurements on Long bones.
6. To Perform Craniometric measurements on skull.
7. To perform Somatometric measurement on living.

(a)	Height Vertex,	(b)	Head Length
(c)	Head Breadth	(d)	Foot Length
(e)	Foot Breadth	(f)	Nasal Height
(g)	Nasal Breadth	(h)	External Biorbital Breadth
(i)	Internal Bi-Orbital Breadth	(j)	Bigonial Breadth
(k)	Bizygomatic Breadth.		

8 To prepare slides of scale patterns of human hair.

9 To examine human hair for cortex and medulla.

10 To examine Barr bodies from hair root.

11 To Identify Blood Stains.

12 To Identify Semen Stains.

13 To Identify Saliva Stains.

14 To Identify Various Type of Fibers.

15 To Determine Species of Origin from Blood.

16 To Determine Blood Group from Fresh Blood and Blood Stains.

SEMESTER - IV

Option -A: Specialization in Forensic Biology and Serology (FBS)

MFSC: 119(FBS) ADVANCED FORENSIC BIOLOGY

Unit A

Fiber Examination: Introduction, Classification, Fiber transfer and persistence. Fiber Recovery: At the scene, in the laboratory, contamination and its prevention. Fiber Identification and comparison: Microscopic Examination, Determination of optical properties, Refractive Index, Birefringence, Instrumental analysis, dye analysis by TLC, factors affecting the strength of fiber evidence.

Hair examination: Hair structure, growth and replacement of hair.

Identification: Species of origin, variation in different major population groups, somatic origin.

Individualization: Blood grouping, enzyme typing and DNA typing

Unit B

Wild Life Forensics: Introduction, importance, 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.

Unit C

Forensic Entomology**:** Introduction, general entomology and arthropod biology, insects of forensic importance, collection of entomological evidence during death investigations, the role of aquatic insects in forensic investigations, Insect succession on carrion and its relationship to determine time since death, its application to Forensic Entomology.

Unit D

Botanical evidences: Introduction, types, location, collection evaluation and forensic significance.

1. Wood: Type of wood and their identification and comparison.
2. Leaves: Identification of various types of leaves and their anatomy, methods of comparison.
3. Pollens: Structure, function, methods of identification and comparison.

4. Diatoms: Nature, location, structure, extraction from various body tissues, including bone marrow, preparation of slides, methods of identification and comparison, forensic significance.

Forensic Microbiology: Types and identification of microbial organisms of forensic significance.

Suggested Readings

1. Richard saferstein; Forensic Science Hand book, Vol (I); Prentice Hall, Publications.
2. Jason H. Byrd and James L. Castner; Forensic entomology, CRC Press LLC, 2001.
3. Forensic Science Hand book by Richard saferstein Vol (II); Prentice Hall, Publications.
4. Robertson (1996) : Forensic examination of Hair. Francis & Taylor, USA.
5. Robertson (1999) : Forensic examination of Hair. Francis & Taylor, USA.
6. Safersstein, R. (1982) Science Handbook; Vol. III, Prentice Hall, New Jersey.
7. Curry, A. S. (1965) Methods of Forensic Science, Vol. IV, Interscience, New Youk.
8. Chowdhuri, S. (1971) : Forensic Biology, B P R & D Govt. of India.

MFSC:120 (FBS) ADVANCED FORENSIC SEROLOGY

Unit A

Immunology: Immune system, immune response, innate and acquired immunity and antigens, haptenes and adjuvants.

Immunoglobulin: Types, physio-chemical properties and function, raising of antisera.

Lectins: Forensic significance, buffers and serological reagents, methods of sterilization employed for serological work.

Antigen-Antibody Reactions: Precipitation, agglutination, complement, neutralization, immunofluorescence.

HLA system: Its applications in paternity testing, pitfalls of HLA system.

Unit B

Forensic examination of Body fluids: 1) Blood: Identification (Preliminary and confirmatory tests), species of origin (Immunodiffusion and Immunoelectrophoresis), Individualization: Blood grouping, enzyme typing,

2) Semen: Composition, functions and morphology of spermatozoa,

Identification (Preliminary and confirmatory tests including Azoospermic semen stains), Individualization (Blood Grouping, seminal fluid isozymes typing,

3) Composition, functions and forensic significance of saliva, sweat, milk, urine, faecal matter, vaginal secretions and tests for their identification including the presence of blood group specific ABH substances.

Unit C

DNA Profiling**:** Introduction, History of DNA Typing, human genetics- heredity, alleles, mutations and population genetics, molecular biology of DNA, variations, polymorphism, DNA typing systems- RFLP analysis, PCR amplifications, sequence polymorphism. Analysis of SNP, Y- STR. Mitochondrial DNA, evaluation of results, frequency estimate calculations, interpretations, allele frequency determination, match probability- database, quality control, certification and accreditation.

Unit D

Forensic Significance of DNA profiling: Applications in disputed paternity cases, child swapping, missing person’s identity- civil immigration, veterinary, wildlife 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.

Suggested Readings

1. Medical immunology by Danniel P. Stites, Abba I. Jerr, Tristram G. Parstow, Ninth edition; Prentice Hall International Inc. 1997.
2. Stern, C. (1964) : Principles of Human Genetics, Freeman, California.
3. Chatterjee, C. C-(1975) Human Physiology.
3. Beerman, K.E.: Blood Group Serology, Churchill, and Lincoin, P.J. (1988)
4. Race, R.R, and Sanger, R. (1975) : Blood Groups in Man. Blackwell Scientific, Oxford.
5. Saferstein, R. (1982): Forensic Science Handbook, Vols. I, II, & III, Prentice Hall New Jersey.
6. Curry, A. S. (1965): Methods of Forensic Science, Vol IV, Interscience, New York.
7. Barris, H. and Hopkinson, D.A. (1976) : Handbook of Enzyme, Electrophoresis Elsevier, North, Holland, New York.
8. Gilblet, E. (1969) : Markers in Human Blood, Davis, Pensylvania
9. Culliford, B.E. (1971) The Examination and Typing of Blood Stains, US Deptt. of Justice, Washingron
10. Kirby : DNA Fingerprinting Technology.
11. Furley, M.A. & Harrington, J.J. (1991) Forensic DNA Technology
12. National Research Council (1992) : DNA Technology in Forensic Science, Washington DC National Academy Press.
13. Chowdhari, S. (1971) : Forensic Biology, B P R & D, Govt, of India.
14. Dunsford, I and Bowley, C. (1967) : Blood Grouping Techniques, Oliver & Boyd, London
15. Bokert, W. G. & James, S. H. (1989) Interpretation of Blood Stain, Evidence, Elsevaier, New York.
18. Erikson : Blood Group Serology.
19. DNA structure and functions by Richard R. Sinden; Academic Press, Inc. 1994.
20. DNA Structure and functions by Richard R. Sinden; Academic Press, Inc. 1994.

21. DNA Profiling and DNA fingerprinting; Edited by Jorg T. Epplen and Thomas Lubjuhn; Birkhauser Verlag, Switzerland, 1999.
22. Forensic DNA Profiling Protocols edited by Patrick J. Lincoln and Jim Thomson; Humana Press, Inc. 1998.
23. DNA and other Polymorphism in Forensic Science by Henry C. Lee and R.E. Gaensslen; Year book Medical Publishers, Inc. 1990.
24. DNA Technology in Forensic Science by committe on DNA Technology in Forensic Science, Board on Biology, Commission on Life Sciences, National Research council; National Academy Press, Washington, D.C. 1992.

MFSC:121(FBS) PRACTICAL BASED ON FORENSIC BIOLOGY AND SEROLOGY

1. To determine titre of antisera.
2. To prepare anti-H from seeds of Eulex.
3. To perform precipitin test for species of origin determination.
4. To perform Immunodiffusion test for species of origin.
5. To determine blood group from stains of blood and various body fluids with Absorption-inhibition, mixed agglutination and absorption-elution techniques.
6. To prepare gel plates for electrophoresis.
7. To perform electrophoresis for separation of Haptoglobins.
8. To perform electrophoresis for separation of various polymorphic enzymes.
9. Examination of diatoms.
10. Examination of hair of different animals such as cat, dog, cow, horse and goat.
11. Extraction and isolation of DNA from blood and other body fluids.

MFSC:122 (FBS) DISSERTATION

Every student will have to undertake a dissertation based on the option and the actual work carried out on the problem under the guidance of his/her supervisor. The supervisor will be allotted by the HOD to each of the student. The supervisor will be the faculty member of the institute. The institution may decide to send the students to external institution for completion of the experimental work/consultation with the scientist and library for their dissertation work. In that case the HOD of the concerned external institute will allot one of its facility member/scientist as co supervisor to the student. If a student goes to any external institute for the completion of his dissertation work he/she has to submit one certificate duly signed by the allotted co-supervisor and HOD of the external institution. The student will have to submit minimum for copies(04) of his/her dissertation before the last date specified by the department. The dissertation will be evaluated in terms of quality of written work, experimental and performance in the viva-voce by internal and external examiners.

Option - B: Specialization in Forensic Chemistry and Toxicology (FCT)

MFSC: 119(FCT) ADVANCED FORENSIC CHEMISTRY

Unit A

Analysis of petroleum products and residues: Distillation and fractionation, Various fractions and their commercial uses, Standards/methods of commercial analysis of petroleum products as per ASTM and BIS, Analysis of traces of petroleum products in forensic exhibits, Comparison of petroleum products, Adulteration of petroleum products, Characterization of petroleum products in oil spills, Application of conventional and Modern Techniques in the analysis of petroleum products.

Unit B

Analysis of Narcotic Drugs and Psychotropic Substances: Job of forensic drug chemist, analysis of NDPS evidence by various procedures prescribed by U.N. Manual, DFS manual, spot tests, microcrystal tests, extraction methods, TLC, UV-Vis spectrophotometry, IR spectrophotometry, GC-HPLC, MS, GC-MS, NMR and XRD as exemplified by cocaine, cannabis, barbiturates, benzodiazepines, amphetamines, opiates and hallucinogens (LSD, psilocybine and mescaline), evidence handling techniques, clandestine laboratory investigation and designer drugs.

Unit C

Explosives: Classification, composition and characteristics of explosives, pyrotechnics, IEDs, explosion process and affects, types of hazards, effect of blast wave on structures, human etc, specific approach to scene of explosion, post blast residue collection, reconstruction of sequence of events, evaluation and assessment of scene of explosion, systematic examination of explosives and explosion residues in the laboratory using chemical and instrumental techniques and interpretation of results.

Unit D

Analysis of Beverages: Alcoholic and non-alcoholic beverages and their composition, Analysis of alcoholic beverages as per BIS and PFA Act, Detection and determination of ethanol, furfural, organic acids, aldehydes, chloral hydrate, methanol and ethylene glycol in liquors by color tests, TLC, GC, and GC-MS methods, Distinction between licit and illicit liquors.

Suggested Readings

1. Lundquist & Curry : Methods of Forensic Science, 1963.
2. Saferstein : Criminalistics, 1976.
3. O Hara & Osterburg : Introduction to Criminalistics, 1949.
4. Sharma, B.R. : Forensic Science in Criminal Investigation & Trials, 1974.
5. Walb & Brounds : Drunks, Drugs & Driving.
6. Crown : The Forensic Examination of Paint and Pigments, 1968.
7. White : Dynamics of Accident Investigation in criminal cases.
8. Moenssens, Mosses and Inbaw : Scientific Evidence in criminal cases.
9. Hoffman : A Handbook on Drug Alcoholic Abuse.
10. Maehly and Stromberg : Chemical Criminalistics, 1980.
11. Cunliffe and Piazza : Criminalistics and Scientific Investigation.
12. Moffat, A.C. (Editor) : Clark's Isolation and Identification of Drugs, 1996.

MFSC:120 (FCT) ADVANCED FORENSIC TOXICOLOGY

Unit A

Systematic Extraction, Isolation, Identification, Estimation of following poisons from viscera, blood and urine.

(i) Common narcotics (as poisons): opium and its derivatives.

(ii) Barbiturates, Benzodiazepines derivatives, Amphetamines.

(iii) Insecticides/ Pesticides: Organochloro, organophosphorus and carbamates.

(iv) Common inorganic poisons, salts of Arsenic, Mercury, Lead and Cyanides.

Unit B

Vegetable poisons: Nature, type, mode of action, extraction, isolation, Identification of the following:

(i) Poisonous seeds: Abrus precatorius, Atropa belladonna, Argemone mexicana, Cerbera thevetia, Croton tiglium, Datura fastuosa, Ricinus communis.

(ii) Poisonous fruits: Semicarpus anacardium, Urginea scilla.

(iii) Poisonous roots: Digitalis, Aconitum napellus, Plumbago rosea.

(iv) Poisonous Mushrooms.

Animal Poisons: Snake venom, composition, site of action, mode of action, effect on the body as a whole, and tests for identifications.

Carbon monoxide poisoning: significance, signs and symptoms, methods of diagnosis, tests for identification.

Unit C

Metabolism and excretion of poisons:- Introduction, Pathways of drug-metabolism-Non synthetic pathway or phase- I reactions like oxidation, hydroxylation, N-and –O de-alkylation and sulphoxide formation, Synthetic pathways or phase II reactions like conjugation, acetylation, methylation of drugs/poisons as exemplified by alcohols, aldehydes, ketones, aliphatic amines, carbamates, phenols, cyanides, barbiturates, amphetamines and opiates.

Unit D

Interpretation of toxicological data, limitations of methods, Limits of detections: residue levels, toxic levels, and therapeutic levels, fatal levels of commonly encountered poisons in blood, urine and tissues.

Immunoassays: Basic principles, separation of bound and unbound drug , different techniques: radio-immunoassays, optical-immunoassays, enzyme-immunoassays, fluoro-immunoassays, luminescence-immunoassays, their basic principles and applications in forensic work.

Suggested Readings

1. Curry : Analytical Methods in Human Toxicology, Part II, 1986.
2. Casarett & Doll Toxicology : The Basic Science of poisons.
3. Clark, E.G.C. : Isolation and identification of Drugs, VI and Vol. II, 1966, 1975-1986.
4. Curry, A.S. : Poison Detection in Human Organs, 1976.
5. Curry, A.S. : Advances in Forensic Chemical Toxicolo, 1972.
6. Holfmann, F.G. : Handbook of Drug and Alchoho Abuse.
7. Turner : Drugs & Poisons.
8. Samford : Poisons Their Isolation Identification.
9. Dubois and celling : Textbook of Toxicology.
10. Arena : Poisoning Chemistry, Sympto Treatment.
11. Stoleman : Progress in Chemical Toxicology.
12. Sunshine, I : Guidelines for Analytical Toxicology Programme, Vol. I, CRC Press, 1950.
13. Sunshine, I : Handbook of Analytical Toxicology, Press, 1969.
14. Sunshine : Methods for Analytical Toxicology, Press USA, 1975.
15. Curry, A.S. : Poison Detection in Human Organs, C. Tho Springfeild, Illinois USA, 1963.
16. Froede, R.C. : The Laboratory Management of the Medico-Legal, Specimen Analytical Chemical Laboratory Sciences.
17. Connors, K. : A text book of Pharmaceuticals analysis, Interscience, New York, 1975.
18. Gleason, M.N. et. al. : Clinical Toxicology of Commercial products, Williams and Williams, Baltimore USA, 1969.

MFSC: 121(FCT) PRACTICAL- FORENSIC CHEMISTRY AND TOXICOLOGY

1. Analysis of alcoholic liquor as per BIS specifications.
2. Determination of methanol and ethanol in alcoholic liquors.
3. Analysis of gasoline as per BIS specifications.
4. Analysis of explosive residues (Qualitative).
5. Systematic identification of Narcotic Drugs and Psychotropic substances (opiates, cannabis and barbiturates, benzodiazepines and amphetamines) by spot colour tests.
6. Thin layer chromatographic analysis of above NDPS.
7. U.V/Vis spectrophotometric analysis of barbiturates, benzodiazepine and amphetamines.
8. Systematic extraction and identification of acidic and basic drugs from viscera (simulated sample).
9. Detection of metallic poisons (arsenic and mercury) in viscera and food stuff (simulated samples).
10. Analysis of viscera (simulated sample) for organo-chloro /organo-phosphorus pesticides by TLC.
11. Identification of vegetable poisons through microscopy.

MFSC:122 (FCT) DISSERTATION

Every student will have to undertake a dissertation based on the option and the actual work carried out on the problem under the guidance of his/her supervisor. The supervisor will be allotted by the HOD to each of the student. The supervisor will be the faculty member of the institute. The institution may decide to send the students to external institution for completion of the experimental work/consultation with the scientist and library for their dissertation work. In that case the HOD of the concerned external institute will allot one of its facility member/scientist as co supervisor to the student. If a student goes to any external institute for the completion of his dissertation work he/she has to submit one certificate duly signed by the allotted co-supervisor and HOD of the external institution. The student will have to submit minimum for copies (04) of his/her dissertation before the last date specified by the department. The dissertation will be evaluated in terms of quality of written work, experimental and performance in the viva-voce by internal and external examiners.

OPTION - C: SPECIALIZATION IN QUESTIONED DOCUMENTS AND FINGER PRINT EXAMINATION (QDFP)

MFSC: 119 (QDFP) QUESTIONED DOCUMENT EXAMINATION

Unit A

Handwriting: Origin of alphabet, teaching of handwriting, writing systems; Principle of handwriting identification, copy book form Deviations from copy book form Development of individuality in handwriting classification of characteristics: Class and individual characteristics, Natural characteristics in handwriting, accidental characteristics in handwriting. Various types of characteristics contributed due to (a) Element of style as Arrangement, connection, design, size and relative size, slant, spacing (b) elements of execution as Abbreviations, Alignment, Commencement and termination, diacritic and punctuation, embellishment, legibility, pen control leading to pen scope, pen pressure, pen lift, pen pause, writing movements, line quality.

Unit B

Comparison of handwriting**:** Natural Variations in handwriting range of variations (consistency), fundamental divergences in handwriting. Interpretation of these two in relation of identification of handwriting, individual characteristics, significant individual characteristics, relative weightage of characteristics of handwriting, consideration of various writing instruments used in writing.

Forgeries of Signature: Classes of forgery and their examination, Disguise in handwriting, anonymous letters, Handed ness and ambidexterity, examination of numeral and initials

Unit C

Alterations in the document: Advanced methods of examination of alterations as Projectina, video- spectral comparator (VSC) and ESDA, their working principles and uses. Modern Typewriting devices as check writing machine, electronic type writer, proportional spacing type writer, Computer Printing devices as dot matrix printer, inkjet printer and laser printer, their working, identification and limitations.

Composition of ink, paper and their examination.

Unit D

Types and working of Photostat Machine, Fax Machines, identification of Photocopies and Photocopier, fax machines.

Desktop printing including image processing devices, their role in counterfeit currency and certificate etc.

Plastic currency: Examination of credit cards and similar material, Holographic marks and their examination.

Examination of e-documents & Digital signatures etc.

Preparation of detailed report with reasons and illustrative charts, use of standard terminology.

Suggested Readings

1. Huber, A. R. and Headride, A.M. (1999) : Handwriting identification : facts and fundamental CRC LLC
2. Ellen, D (1997) : The scientific examination of Documents, Methods and techniuqes. 2nd ed., Taylor & Francis Ltd.
3. Morris (2000) : Forensic Handwriting Identification (fundamental concepts and Principals)
4. Madinger J. and zalopany, A.R. (1999) : Money Laundering CRC Press.
5. Manning, C.A (1999) : Financial Investigations and Forensic Accounting CRC Press.
6. Harrison, W.R. : Suspect Documents & their Scientific Examination, 1966, Sweet & Maxwell Ltd., London.
7. Hilton, O : The Scientific Examination of Questioned Document, 1982, Elsaevier North Holland Inc., New York.
8. Brewster, F, : Contested Documetns and Foregeries, The Eastern Law House, Calcutta. 1932.
9. Ames : Ames on Foregery, 1900, Ames Rellingson Co., New York.
10. Conway, J.V.P. : Evidential Documents, 1959, Charles C. Thomas, Illinois.
11. Mehta, M. K. : The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad. 1970.
12. Sulner, H.F. : Dispated Document, 1966 Oceana Publications Inc., Ner York.

13. Saxena's : Saxena's Law & Techniques Relating to Finger Prints, Foot Prints & Detection of Forgery, Central Law Agency, Allahabad (Ed. A.K. Singla).
14. Quirke, A.J. : Forged, Anonymous & Suspet Documents, 1930, Reorge Rontledge & Sons Ltd., London.
15. Osborn, A. S. : Questioned Documents 1929, Boyd Printing Co., Chicago.

MFSC:120 (QDFP) FINGER PRINTS EXAMINATION

Unit A

History and development of finger prints as a science for personal, identification, structure of ridged skin, morphological plan of volar pads and configurational areas. Development of volar pads, ridges, factor affecting alignment of ridges, transition of configuration, types, and variations in finger prints: Causes and genetics, population variations.

Unit B

Basics of taking inked prints, taking inked prints of living and dead: Plain and rolled prints, other devices and material for recording prints. Classification of finger Prints, pattern types, pattern area, Henry system of classification (Primary to tertiary and key classification) extension of Henry system searching of finger prints, classification system, single finger print, Finger Prints Bureau.

Unit C

Chance Finger Prints: Latent prints, plastic prints & visible prints, causes, composition of sweat. Development of latent finger prints: Conventional methods- fluorescent powders(Black, grey, white, magnetic powder). Fuming methods: Iodine and cynoacrylate methods. Chemical methods: Ninhydrin and its analogue silver nitrate, enhancement of latent prints, application of laser technologies, metal deposition method. Biological methods of development of latent prints on skin.

Unit D

Systematic approach to latent print processing, preserving and lifting of finger prints. Photography of Finger Prints, comparison of finger prints: basis of comparison, class characteristics, individual characteristics, various types of ridge characteristics.

Automated Finger Print Identification system (AFIS) and its variants, digital Image processing of finger prints and their enhancement. Presentation of expert evidence on finger prints in court.

Suggested Readings

1. David R. Ashbaugh; Quantitative and Qualtative Friction Ridge Analysis, CRC Press, 1999.
2. E. Roland Menzel; Fingerprint Detection with Laser; Second edition; Marcel Dekker, Inc. 1999.
3. James F. Cowger; Friction Ridge skin CRC Press London, 1993.
4. Cummins & Midlo : Finger Prints, Palms and Soles, 1943, The Blakiston office London.
5. Cherril, F.R. : The Finger Prints. System at Scotland Yard, 1954; Her Majesty's office, London.
6. Wentworth & Wilder : Personal Identification, 1948. R. G. Badger. Boston.
7. Mehta, M. K. : Identification of Thumb Impression & Cross Examination of Finger Prints, 1980 N. M. Tripathi (P) Ltd. Bombay.
8. Moenssens : Finger Prints Techniques, 1975, Chitton Book Co., Philadelphia, New York.
9. Allison : Personal Identification.
10. Chatterjee S.K. and Hagne R.V. (1988) : Finger Print or Dactyloscopy and Ridgeoscopy.

MFSC:121 (QDFP) PRACTICAL - QUESTIONED DOCUMENTS AND FINGER PRINTS EXAMINATION

1. To study the handwriting of person suffering from illness.
2. To study the handwriting written on unusual surfaces as wall.
3. To study the initials.
4. To perform TLC of writing inks and writing papers.
5. To study alterations on the document.
6. To study the indented and invisible writings.
8. To photograph the watermarks in the document.
9. To examine currency notes.
10. To study the type scripts and printed matter from various computer print devices.
11. To study sequence of intersecting strokes.
12. To perform cynoacrylate method to develop latent finger prints.
13. To classify the fingerprints from Primary classification to key classification.
14. To compare the fingerprints.

MFSC: 122 (QDFP) DISSERTATIONS

Every student will have to undertake a dissertation based on the option and the actual work carried out on the problem under the guidance of his/her supervisor. The supervisor will be allotted by the HOD to each of the student. The supervisor will be the faculty member of the institute. The institution may decide to send the students to external institution for completion of the experimental work/consultation with the scientist and library for their dissertation work. In that case the HOD of the concerned external institute will allot one of its facility member/scientist as co supervisor to the student. If a student goes to any external institute for the completion of his dissertation work he/she has to submit one certificate duly signed by the allotted co-supervisor and HOD of the external institution. The student will have to submit minimum for copies (04) of his/her dissertation before the last date specified by the department. The dissertation will be evaluated in terms of quality of written work, experimental and performance in the viva-voce by internal and external examiners.

SEMESTER-IV
OPTION-D: SPECIALIZATION IN FORENSIC PHYSICAL SCIENCES (FPS)
MFSC: 119 (FPS) ADVANCED FORENSIC PHYSICS

Unit A

Ballistics: History, Types of Firearms and Ammunition. Internal, External and Terminal Ballistics. Types of Evidences found at Crime Scene. Collection, Preservation, Packeging, Forwarding and their Laboratory Examination.

Various Marks Produced on Bullets and Cartridge Cases during Firing. Techniques for obtaining Test Material from various types of Weapons. Methodology used in linkage of Fired Bullets/ Cartridge Cases with Firearms.

Integrated Ballistic Identification system (IBIS): Automated Examination and Comparison of Fired Bullets/ Cartridge cases and Ballistics Imaging Database of the Marking of Fired Bullets/ Cartridge Cases.

GSR: GSR and its Analysis by advanced methods.

Report Writing and Expert Witness.

Unit B

Tool Marks: Introduction, Types of Tool Marks, Class & Individual Characteristics, Tracing, Photography, Lifting and Casting of Tool Marks, Examination, Identification and Comparison of Tool Marks.

Foot/Footwear/Tyre Impression: Introduction, Collection, Tracing, Lifting, Casting of Impressions, Enhancement, Analysis & Comparison of Impressions, Moulds, Identification Characteristics.

Lip Prints: Introduction to Cheiloscopy and History of Lip Prints, Classification, Collection, Development, Identification and Comparison of Lip Prints.

Ear Prints: Introduction, History, Morphology of the Ear, Procedures of taking Standards from the Suspects, Identification and Comparison of Ear Prints.

Unit C

Paint: Introduction, Composition and Use of Paint, Types of Paint, Resins and Binders, Lacquers, Plasticizers, Water Based Polymers & Emulsions, Additives, Solvents, Pigment types, Microscopic & Macroscopic Examination, Micro Chemical Tests, Differential Solubility and TLC, IR Spectroscopy, Pyrolysis GC-MS, Elemental Analysis of the Pigments.

Soil: Introduction, Formation & Types of Soil, Composition & Colour of Soil,

Sample preparation, Removal of Contamination, Microscopic Examination, Particle Size Distribution, Ignition Test, Density Distribution, pH Measurement, Differential Thermal Analysis (DTA), Elemental Analysis, Interpretation of Soil Evidence.

Glass: Introduction, Types of Glass and their Composition. Forensic Examination of Glass Fractures under different conditions. Physical Measurement of Glass, Colour and Fluorescence, Physical Matching, Density Comparison, Refractive Index Measurement (RI), Elemental analysis and Interpretation of Glass Evidence.

Introduction, Location, Collection, Packeging, Forwarding and Laboratory Examination of Fiber, Paper, Ink, Cement & Mortar, Polymers, etc.

Unit D

Forensic Speaker Identification: Speaker Identification and Tape Authentication: Voice Production Theory, Speech Signal Processing and Pattern Recognition, Acoustic Parameters of Sound, Fourier Analysis, Frequency and Time Domain Representation of Speech Signal, Analogue to Digital Conversion-Sampling and Quantization, Fast Fourier Transform, Speech Enhancement, Authentication of Audio-Video Signal.

Suggested Books

1. Forensic science hand book by Richard Saferstein
2. Forensic examination of glass and paint, Brian Caddy, Taylor & Francis.
3. Forensic Science Progress, A. Maehly et all, Vol.1 to 5.
4. Crime Investigation by P.L. Kirk.
5. Forensic Science Hand Book, Vol.-III Chapter-3 (1993), R Saferstein, Prentice Hall International, London.
6. Methods of Chemical Analysis of Hydraulic Cement, Bureau of Indian Standards, ARE: 4032-1985.
7. Elements of X-ray Diffraction, B.D. Cullity, Addision- Weseley Publ.Comp. Inc.
8. ASTM standards, Vol.15-09.
9. Forensic examination of fibers, James Robertson.
10. Gem Testing, B. W. Anderson.
11. Annual Book of ASTM standard, Vol.04.01:1985
12. Precious stones, Max Bauer (Vol.I and II).
13. The chemistry of cement and concrete, Lea, F.M.1971, Chemical Publication. Comp.Inc. New York (USA).

MFSC: 120 (FPS) ADVANCED DIGITAL FORENSICS

UNIT A

Digital Forensics: Introduction, Classification of Digital Crimes and Branches of Digital Forensics. Digital Evidences: Types of Digital Evidences, Acquisition, Handling and Chain of Custody. Evidence Imaging and File System Analysis (FAT and NTFS). Various Tools for Disc Imaging and Data Recovery (ENCASE, NUIX), Vulnerability Assessment Tools. Investigations on Various Imaging Methods (RAW, SMART, E01, AFF). Password and Encryption Techniques. Password Recovery Tools.

UNIT B

Cyber Forensics: Definition and Types of Cyber-Crimes. HTML and Internet Protocols, Internet History and Topology, Internet Services and Access, Internet Protocols and Addressing, E-mail and Header Interpretation, E-mail Attachments, FTP, Telnet and IRC, Internet Chat, HTTP. Outlook Express, Virus and Trojan Infection, Different Types of Attacks, Internet Research & Investigating Tools.

UNIT C

Image Analysis: Formation of Image, Image Sampling and Quantization, Basics of Full-color Image Processing, Image Enhancement Techniques, Filters for Image Enhancement, JPEG, PNG, Header Data Analysis, Noise Analysis, Linkage of Camera. Image Steganography, Image Forgery Detection, Detect Steganography from Image, Digital Watermark, Multimedia IPR, Forensic Analysis of Multimedia Files.

Video Analysis: Forensic Video Analysis, Enhancement Techniques, Specific Frame Analysis, Resolution, Scope & its Forensic Application in the Field of Security.

UNIT D

Mobile Forensics: History of Mobile Phones, Types of Mobile Phones, Advantage and Disadvantages of Mobile Phones and their Forensic Applications. Operating Systems: Introduction, Objective and Types of Operating System- Java, Symbian, Window, Android and iPhone. Evidence Collection from Mobile Phones and SIM Cards. Recovering and Reconstructing of Deleted Data (call records, phone books, massages, multimedia files i.e. image, video etc.) from Mobile Phones and SIM Cards. Process of Cloning of SIM Data and Password Extraction from Mobile Phones.

MFSC-121 (FPS): PRACTICAL- FORENSIC PHYSICS & DIGITAL FORENSICS

1. To examine various marks on bullet and cartridge cases.
2. To Lift GSR and its Analysis by different methods.
3. Various types of Tool Marks and their Comparison.
4. Lifting of different Prints & Impressions and their Comparison.
5. To Examine Paint, Soil and Glass Samples.
6. To Identify Various Types of Fibers by Different Methods.
7. Detailed Analysis of FAT and NTFS File Systems.
8. Practical Recovery of Data using Methods to preserve its Integrity, Methods of Recovering Deleted Files. Copying & Imaging.
9. To unfold Concealed Data from various Storage Media.
10. A series of Practical Lab Exercises by applying NUIX Software.
11. To Recover Passwords by applying Password Recovery Software (Passware).
12. To Understand Dynamic and Static Pages, Viewing HTML Source and HTTP Headers, and to get Header Information.
13. Extraction of Data from various Mobile Phones.
14. Password Extraction from Mobile Phones.
15. Cloning of SIM data.
16. Extraction of Data from SIM Cards.

MFSC: 122 (FPS) DISSERTATION

Every student will have to undertake a dissertation based on the option and the actual work carried out on the problem under the guidance of his/her supervisor. The supervisor will be allotted by the HOD to each of the student. The supervisor will be the faculty member of the institute. The institution may decide to send the students to external institution for completion of the experimental work/consultation with the scientist and library for their dissertation work. In that case the HOD of the concerned external institute will allot one of its facility member/scientist as co supervisor to the student. If a student goes to any external institute for the completion of his dissertation work he/she has to submit one certificate duly signed by the allotted co-supervisor and HOD of the external institution. The student will have to submit minimum for copies (04) of his/her dissertation before the last date specified by the department. The dissertation will be evaluated in terms of quality of written work, experimental and performance in the viva-voce by internal and external examiners.