SCHEME OF EXAMINATION

&

SYLLABI

OF

MASTER OF FORENSIC SCIENCE

for

First to Fourth Semester
(w.e.f. 2005-2006 Academic Session)

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

GURU GOBIND SING INDRAPRASTHA UNIVERSITY
KASHMERE GATE, DELHI-11006

w.e.f. 2005-200

Scheme of M.Sc. Forensic Science

	L	T	P	S	Total credits
First Semester					
FS-101 Forensics, Crime& Investigative Techniques	4	1	0	1	6
FS-103 Instrumental Methods-Physical	4	1	0	0	5
FS-105 Instrumental Methods-Biological & Chemical	4	1	0	0	5
FS-107 Forensic Ballistics and Photography	4	1	0	1	6
FS-151 Instrumental methods-Physical, Chemical & Bilogical and Crime scene	0	0	4	0	2
FS-153 Practicals-Forensic Ballistics, Photographys	0	0	4	0	2
Total Credits	**16**	**4**	**8**	**2**	**26**
Second Semester					
FS-102 Finger Prints and Impressions	4	1	0	0	5
FS-104 Questioned Documents	4	1	0	0	5
FS-106 Forensic Chemistry and Explosives	4	1	0	1	6
FS-108 Forensic Toxicology and Pharmacology	4	1	0	1	6
FS-152 Practicals- Questioned documents, Finger prints and impressions	0	0	4	0	2
FS-154 Practicals-Forensic Chemistry & Toxicology	0	0	4	0	2
Total Credits	**16**	**4**	**8**	**2**	**26**
Third Semester					
FS-201 Forensic Physics	4	1	0	0	5
FS-203 Forensic Biology	4	1	0	0	5
FS-205 Forensic Serology and DNA Profiling	4	1	0	1	6
FS-207 Recent advances, quality management and evidence evaluation	4	1	0	1	6
FS-251 Practicals- Forensic Physics	0	0	4	0	2
FS-253 Practicals- Forensic Biology, Serology and DNA Isolation	0	0	4	0	2
Total Credits	**16**	**4**	**8**	**2**	**26**
Fourth Semester					
FS-252 Work in in-house lab	0	0	0	0	5
FS-254 Attachment at designated outside lab	0	0	0	0	5
FS-256 Dissertation	0	0	0	0	20
Total Credits					**30**
Grand total of credits of Semester(1+II+III+IV)					**108**

w.e.f. 2005-200

M.Sc. Forensic Science

FS -101:FORENSICS, CRIME AND INVESTIGATIVE TECHNIQUES L-4,T-1,P-0,S -1 CREDITS-6

Unit – I

Forensic Science: Basic Principles and significance, History & Development of Forensic Science, Organizational Structure of Forensic Science Laboratories/ Institutions.

Criminal Justice System: Structure of Police, Prosecution & Judicial Organizations, Introduction to IPC and Cr.P.C – Section 291, 292 & 293, Indian Evidence Act – Introduction & Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 159

Unit – II

Crime: Definition & causation, crime scene, types of crime scene, protection and recording of crime scene, search of physical clues, preservation, packing and forwarding of physical clues, processing of crime scene, Blood spattering / Pattern analysis

Unit – III

Investigative techniques: Criminals, criminal behaviour, modus operandi, criminal profiling, portrait parley, polygraphy, narco-analysis, brain fingerprinting, voice stress analysis and speaker profiling

Unit – IV

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

Probability: Theory, Classical definition of Probability. Basic terms - Events, Trials, Mutually exclusive events, Favourable events, Exhaustive events etc., Baye's Theorems of probability, Addition Theorem, Multiplication Theorem, Conditional Probability & Coincidence Probabilities.

Variance- Coefficient of Variation, Moment, Skew-ness and Kurtosis, binomial distribution, normal distribution, hyper geometric distribution, correlated measurements

Discriminating power- Derivation, evaluation of evidence by discriminating powers, combination of independent systems, correlated attributes, Transfer of evidence –Likelihood ratio, probability of guilt, correspondence probabilities, direction of transfer

Tests of hypothesis –Test of significant of attributes, Z-test of significance and coefficient of correlation, Small sample test, T-test, Paired Test, Chi-square test,

F Test for equality of variance, Large sample test. Normal Test

Suggested Readings

1. Nanda, B.B. and Tewari, 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., John Wiley & Sons (1999)
6. Bruce A. Arrigo; Introduction to Forensic Psychology, Academic press London (2000)
7. David L. Shapiro; Forensic Psychology Assessment and Investigative Approach, Allyn and Bacon Publisher (1991)

w.e.f. 2005-2006

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, 6th Ed., Wordsworth Thompson Learning (2001)

11. Barry, A.J. Fisher; Techniques of Crime Scene Investigation, 7th Ed, C.R.C. Press NY (2003)

12. Mordby, J Deed Reckoning; The Art of Forensic Detection, CRC Press LLC (2000)

13. Eckett, W.G & James S.H; Interpretation of Blood stains, Evidence of Crime scene, Elseiver Pub. NY (1989)

14. James S.H; Scientific & Legal applications of Blood stain pattern Identification, CRC Press (1998)

15. John, D. Deehan, Kirk's Fire Investigation, 5th Edn., Prentice Hall (2002)

16. Turrey B; Criminal Profiling - An Introduction to Behavioral Evidence Analysis, Acad. Press London (1999)

17. Sharma, B.R; Forensic Science in Criminal Investigation & Trails, Universal Publication Co. (2003)

18. K. Ramakant; Elementary Statistics in a world of applications, 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 & Dhiraj Lal; The Indian Penal Code, 28th Ed. Wadhwa & Co. Nagpur (2002)

22. C.R. Swansan, L Terrib & R.W Taylor; Police Administration, Prentice Hall USA (1998)

23. Ram Ahuja; Criminology, Rewal Pub. Jaipur (2000)

24. M Meguire, R Morgan & R Reiner; Oxford Handbook of Criminology, 2nd Ed., 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. (1998)

27. J.A. Seigel, R.J Sukoo & G.C Knupfer; Encyclopedia of Forensic Science, Vol. I, II & III, Acad Press (2000)

28. Bridges BC; Criminal Investigation, Practical Finger Printing, Thumb Impressions, Hand writing Expert testimony opinion Evidence, University Book Agency, Allahabad (2000)

29. Bennet, Waynew; Criminal Investigation, Wadsworth Pub. Co. California (2000)

30. Gross, Dr Hans; Criminal Investigation- A Practical textbook for Magistrates, Police officers and Lawyers: Universal Law Pub. Co.(2000).

31. Bell, William R; Practical Criminal Investigations in correctional facilities, CRC Press London (2001)

32. Lyman M.D; Criminal Investigation- The art and the science, Prentice Hall (2002)

w.e.f. 2005-2006

Master of Forensic Science
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Unit-I

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, ? -rays and ß-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, radiation filters

Detection of radiations; photographic detectors, thermal detectors, photoelectric detectors etc.,

Atomic spectra, energy levels, quantum numbers and designation of states, selection rules, qualitative discussions of atomic spectra.

Elements of X- ray spectrometry- fluorescence, energy Dispersive X-ray analysis (EDX), wavelength Dispersive X-ray analysis (WDX), X-ray diffraction, Augur effect

Unit-II

Basic Concepts - Atomic & Molecular Spectroscopy-II

Molecular spectra: qualitative discussions of molecular binding, molecular orbital, types of molecular energies, qualitative discussions of rotational, vibrational and electronic spectra, spectra of polyatomic molecules, IR spectroscopy- correlation of infra red spectra with molecular structure, Fourier Transform, infrared and Raman spectroscopy, fluorescence and phosphorescence spectrophotometry.

Unit-III

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

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

X-ray spectroscopy: X-ray absorption and fluorescence methods, X-ray diffraction, Auger emission spectroscopy (AES), electron spectroscopy for chemical analysis (ESCA)

w.e.f. 2005-2006

Unit-IV

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

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

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

Nuclear Magnetic Resonance spectroscopy: Basic principles, theory and Instrumentation

Suggested readings

1. James W. Robinson; Atomic Spectroscopy, 2nd Edn. 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. Hobart H. Willard, Lynne L. Merrett Jr, John A Dean Frank A. Settle Jr; Instrumental Methods of Analysis, 7th Edn, 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, McGraw Hill Inc. (1995)
9. K.C.Thompson & R.J. Renolds; Atomic Absorption Fluorescence & Flame Emission Spectroscopy, A Practical Approach, 2nd Edn. Charles Griffin & Co. (1978)
10. Robert M .Silverstein & Francis X Webster; Spectrometric Identification of Organic Compounds ,6th Edn., 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 Edn, Tata McGraw-Hill Pub. Co. New Delhi, (1994)
13. Colin N. Banwell & Elaine M, Mc. Cash; Fundamentals of Molecular Spectroscopy 4th Edn, Tata McGraw-Hill Pub. Co. New Delhi (1995)
14. R.Murugeshan; Optic & Spectroscopy, S.Chand & Co. (1998)
15. Jack L Koeing; Spectroscopy of Polymers, 2nd Edn., Elsevier pub. Co. (1999)
16. Kamlesh Bansal; Analytical Spectroscopy Campus, Books International (2000)
17. P.S.Kalri; Spectroscopy of Organic Compounds, 4th Edn, New Age International Pub. (2001)

w.e.f. 2005-2006

18. Douglas A. Skoog, F.James Holler & Timothy A. Nieman; Principles of Instrumental Analysis, 5th Edn. Thomas Books Co. (2003)
19. D.R.Khanna & H.R. Gulati; Fundamentals of Optics Geometrical Physical & Quantum, 20th Edn., R. Chand & Co. (2002)

20. Francis A.Jenkins; Fundementals of Optics, 4th Edn., McGraw Hill Book Co. Auckland (1981)

21. K.Thyagarajan; Lasers Theory & Applications, Macmilan, India Delhi (2004)

22. H.D.Bist; Lasers and their applications in the Indian Context, Tata McGraw Hill Pub. Co, New Delhi (1985)

23. John D.Cutnell & Kenneth W Johnson; Physics 5th Edn., John Wiley & Sons Inc., NY. (2002)

24. E.R.Mengel; Laser Spectroscopy Techniques & applications, Marcel Dekker NY (1995)

25. E.R.Mengel; Fluorescence in Forensic Science in Encyclopedia of Analytical Chemistry, Wiley & sons (2000)

26. G.R. Chatwal; Analytical Spectroscopy 2nd Edn, Himalaya Pub. House (2002)

w.e.f. 2005-2006

Master of Science
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FS -105 INSTRUMENTAL METHODS -BIOLOGICAL & CHEMICAL L-4,T-1,P-0,S-0 CREDITS -5

Unit-I

General Principles of Biological/ Bio-chemical Analysis
pH and buffers, Physiological solution, Cell and tissue culture, Cell fractionation, Biological variations etc.

Centrifugation Techniques
Basic principles of sedimentation, Various types of centrifuges, Density gradient centrifugation, Preparative centrifugation, Analysis of sub-cellular fractions, Ultra-centrifuge - Refrigerated Centrifuges

Microscopy
Basic principles, Simple and Compound microscope, Comparison microscope, Phase contrast Microscope, Stereoscopic microscope, Polarizing microscope, Fluorescent Microscopy, Infra red Microscopy, Scanning Electron Microscope (SEM) & Transmission Electron Microscope (TEM)

Enzyme Techniques
Enzyme kinetics, Purification and protein estimation, Enzyme assay technique, Visible & ultraviolet Spectrophotometric methods, Luminescence method, Radio-isotope method, Immuno-chemical method, Automated enzyme analysis, Immobilized enzymes.

Unit-II
Immuno-chemical Technique
General principles, Production of antibodies, Precipitin reaction, Gel immuno-diffusion, Immuno-electrophoresis, complement fixation, Radio Immuno Assay (RIA), ELISA, Fluorescence immuno assay.

Chromatographic Techniques
General principles, Paper chromatography, column chromatography, TLC, Adsorption chromatography, Partition chromatography, Gas chromatography, Gas- liquid chromatography, Ion-exchange chromatography, Exclusion (permeation) chromatography, Affinity chromatography, HPLC, HPTLC, Capillary Chromatography, Interfacing GC with IR spectrometry

Electrophoretic Technique
General principles, Factors affecting electrophoresis, Low voltage thin sheet electrophoresis, High voltage electrophoresis, Sodium dodecylsulphate (SDS) polyacrylamide gel electrophoresis, Isoelectric focusing (IEF), Isoelectrophoresis, Preparative electrophoresis, Horizontal and Vertical Electrophoresis

Unit-III
Electrochemical Techniques
Principles, Electron transport processes, Ion-selective electrodes (ISE) and gas sensors, Oxidation-reduction (Redox) potentials, Biosensors, Anodic shipping Voltametry

Molecular Biology Techniques
Outline of Genetic Manipulations, Enzymes and in genetic manipulation, Cloning procedures, Isolation of specific nucleic acid sequences – complementary DNA, Gene libraries, Colony hybridisation, Nick translation, Oligo nucleolide probes, Expression of genes.

Unit-IV
Mass Spectrometry
Sample flow, Ionization methods, Mass analyzer, Vaccum systems, Data handling, Correlation of mass spectra and molecular structure, Fourier transform mass spectrometry, Tandem mass spectrometry, Inductively coupled plasma MS (ICP-MS), Ion Microprobe Mass Analyzer (IMMA), HR GCMS, LCMS,

Secondary Mass Spectrometry, Laser Mass spectrometry, Fast Atom bombardment and liquid secondary Ion Mass spectrometry, High performance liquid chromatography, Electrospray ionization mass spectrometry
Computer aided Analysis - Introduction, Computer organization - Hardware, Circuits for interfacing computers to Instruments, Computer Organization - software, Data representation, The Automated Laboratory.

Measurements, Signals and Data

Introduction, Signal-to-noise ratio, Sensitivity and detection limit, Sources of noise, Signal-to-noise enhancement, Evaluation and measurement, Accuracy and instrument calibration

Suggested Readings

1) Lindsay S; High Performance Liquid Chromatography, Wiley & Sons NY (1992)

2) Baker DR.; Capillary - Electrophoresis, NY (1995)

3) Handbook of TLC, 2nd Ed, Marcel Dekker; NY (1995)

4) Jarris, KE, A.L. Gray etal, Handbook of Inductively Coupled Plasma Mass Spectrometry, Glasgow Blockie, (1992)

5) Maclaffrty F.W. & F. Turecek; Interpretation of Mass spectra, 4th Ed., Mill Valley, CA Univ Science Books, (1993)

6) Chapmen J R; Practical Organic Mass Spectrometry - A Guide for Chemical and Biochemical Analysis, Wiley & Sons , NY (1993)

7) H.H Willard etal; Instrumental Methods of Analysis CBS Pub. and Distributors, Delhi (1986)

8) Bryan L.William & Keith Wilson; Principles & Techniques of Practical Biochemistry, Edward Arnold Pub. (1975)

9) Keith Wilson & John Walker; Practical Biochemistry- Principles & Techniques, 5th Ed., Cambridge University Press (2000)

10) David. L.Nelson & Michael M, Cox Lenninges; Principles of Biochemistry, 4th Ed., Freeman Pub. (2005).

11) Leremy M.Beig, John L. Tymoczko, Lubert Stryes; Biochemistry5th Ed., Freeman Pub. (2003)

12) Genes VIII, Lewin International Edition, Pearson Prentice Hall,(2004)

13) Watson Gillman, Witkowski, Zolles; Recombinant DNA, 2nd Ed., Scientific American Books, (1998)

14) George M. Malacinski; Essentials of Molecular Biology, 4th Ed. Jones and Bartlet Pub. (2003).

15) Daniel L. Nartl & Elizabeth W. Jones; Genetics - Principles and Analysis, 4th Ed., Jones & Bartlet Pub (1998)

16) Gardnes & Snustd; Principles of Genetics 6th Ed., John Wiley & Sons (1981)

17) D.M.Weir; Hand Book of Experimental Immunology,2nd Ed., Blackwell Pub. (1973)

18) Ivan M.Roett; Essential Immunology, 6th Ed., Blackwell Pub. (1988).

w.e.f. 2005-2006

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FS -107 FORENSIC BALLISTICS AND PHOTOGRAPHY L-4, T-1,P-0, S -1 CREDITS-6

Unit – I

History and development of Firearms, their classification and characteristics, various components of small arms, smooth bore and rifled firearms, different automatic mechanisms in small arms, rifling – various class characteristics, purpose of rifling, types of rifling and methods to produce rifling, trigger and firing mechanisms, cartridge-firing mechanism, Projectile velocity determination, techniques of dismantling/assembling of firearms, identification of origin, improvised/ country-made/ imitative firearms and their constructional features.

Types of ammunition, classification and constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, velocity and pressure characteristics under different conditions, various types of bullets and compositional aspects, latest trends in their manufacturing and design, smooth bore firearm projectiles, identification of origin, improvised ammunition and safety aspects for handling firearms and ammunition.

Unit II

Internal and External Ballistics: Definition, ignition of propellants, shape and size of propellants, manner of burning, various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting, theory of recoil, methods of measurement of recoil, equation of motion of projectile, principal problem of exterior ballistics, vacuum trajectory, effect of air resistance on trajectory, base drag, yaw, shape of projectile and stability, trajectory computation, ballistic coefficient and limiting velocity, Ballistics tables, measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballistics data.

Terminal Ballistics – Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, Tumbling of bullets, effect of instability of bullet, effect of intermediate targets, influence of range, Cavitation – temporary and permanent cavities, Ricochet and its effects, stopping power, Wound Ballistics; Threshold velocity for penetration of skin/flesh/bones, preparation of gel block, penetration of projectiles in gel block and other targets, nature of wounds of entry, exit, andtrack with various ranges and velocities with various types of projectiles, explosive wounds, 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.

Unit – III

Principles and practice of identification of firearms, ammunition and their components, 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 lands and grooves, identification of various parts of firearms, techniques for obtaining test material from various types of weapons and their linkage with fired ammunition, class and individual characteristics, determination of range of fire- burning, scorching, blackening, tattooing and metal fouling, shots dispersion and GSR distribution, time of firing – different method employed, and their limitations, stereo & comparison microscopy, automatic bullet and cartridge comparison system.

Analysis of Gunshot Residues –Mechanism of formation of GSR, source and collection, spot test, chemical test, identification of shooter and instrumental methods of GSR Analysis, Management and reconstruction of crime scene; suicide, murder and accidental and self defence cases, Arms Act, Report writing and court findings.

w.e.f. 2005-2006

Unit IV

Photography; Basic principles and techniques of Black & White and colour photography, cameras and lenses, exposing, developments and printing, Different kinds of developers and fixers, modern developments in photography, linkage of cameras and film negatives, digital photography, How digital camera works and basics of digital imaging. videography/high speed videography, crime scene and laboratory photography.

Suggested readings:

BALLISTICS

1) J. Howard Mathews, Charles C. Thomas; Firearms Identification, Vol.-I,II & III, 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; Hand book of Firearms and Ballistics, John Willey England (1997)

5) TA. Warlow; Firearms- The Law and Forensic Ballistics Taylor and Francis London (1996)

6) Karl G. Sellier etal; Wound Ballistics and The Scientific Background, Elsevier Pub. Co.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 Pub. Co., Harrisburg, PA (1982)

9) Gary J. Ordog; Management of Gunshot Wounds, Elsevier Pub. Co., NY (1983)

10) Working Procedures Manual, Ballistics, BPR &D New Delhi (2000)

11) Schlooeble A J and Exline L.D; Current Methods in Forensic Gunshot Residue Analysis, CRC Press NY (2000)

12) Andrasko J and Stalong S; Time since discharge of Rifles, Jornal of Forensic Science, Vol-45, No-6, pp, 1250-1255 (2000)

13) Terry J Gander James; Infantry Weapons, James Information Group Sentinal House Surrey UK (2004-2005)

14) Terry J. Gander James; Ammunitions Handbook, James Information Group Santinal House, Surrey UK(2004-2005)

PHOTOGRAPHY

1. Henry Horeustein; Colour Photography -A working Manual, Little Brown Co.Boston (1995)

2. B.H.E. Jacobson, Ray GG Attridge; The Manual of Photography, Focal Press, London (1988)

3. Jahne B; Digital Image Processing, Heidelberg Springer (1996)

4. Workinson J; Art of Digital Video, Oxford Focal Press (1994)

5. Upton, Kobre, Brill; Photography, Pearson Education, Inc (2002)

6. H.L. Blitzer and J.Jacobia; Forensic Digital Imaging and Photography, Academic Press (2002)

7. David R.Redsicker; The Practical Methodology of Forensic Photography- 2nd Ed. CRC Press LLC (2001)

8. R.E. Jacobson, S.F.Ray, G.G.Attridge, N.R. Oxford; The Manual of Photography - Photographic and Digital Imaging, 9th Ed., Focal Press (2000)

w.e.f. 2005-2006

FS -151 PRACTICALS - INSTRUMENTAL METHODS -PHYSICAL, CHEMICAL & BIOLOGICAL AND CRIME SCENE

L-0, T-0, P-4, S -0 CREDITS-2

INSTRUMENTAL METHODS-PHYSICAL,CHEMICAL & BIOLOGICAL

1. Experiments on UV absorption of drugs / dyes.
2. Experiments on IR spectra of paints / drugs.
3. Experiments on GC Analysis of Arson Exhibits and volatile substances.
4. Experiments on GC Analysis of Alcohol.
5. Experiments on Electrophoretic analysis of Biological substances.
6. Comparison of polythene films by IR spectrophotometry.

CRIME SCENE

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).

FS - 153 PRACTICALS - FORENSIC BALLISTICS, PHOTOGRAPHY L-0, T-0, P-4, S -0 CREDITS-2

BALLISTICS

1) Characteristics of Firearms – Calibre, Choke, Trigger pull, Proof marks etc.

2) Examination and Comparison of fired bullets – Calibre, rifling characteristics, probable type of firearms

3) Examination and Comparison of fired Cartridges/cases (Calibre, firing pin, breech face, Extractor / Ejector marks etc.)

4) Determination of shot number from size and weight of shots.

5) Identification of propellants.

6) Chemical tests for powder residues (Walker's test) and Barrel wash.

7) Examination of air guns / rifles as per Arms Act 1959.

8) Determination of Velocity and Energy of Projectiles.

PHOTOGRAPHY

1) Photography of objects – Close-up, normal, telephoto and processing.

2) Document and Finger print Photography.

3) Photomicrography, Macro photography, Transmitted light Photography and UV fluorescence Photography

4) Photography with different filters for developing contrasts

5) Black and white film developing

6) Black and white contact print and Enlargement.

7) Hands-on-Practice on digital Camera

8) Hands-on-Practice on Video Camera.

FS -102 FINGER PRINTS AND IMPRESSIONS **L-4, T-1, P-0, S -0 CREDITS -5**

Unit – I

History and Development of Fingerprints, formation of ridges, pattern types, pattern areas, classification of fingerprints- Henry System of Classification, Single digit Classification, Extension of Henry System, Search of fingerprints, Fingerprint Bureau.

Unit – II

Chance Fingerprints, Latent & Visible Fingerprints, Plastic Fingerprints, Composition of Sweat, Development of latent fingerprints, conventional methods of development of fingerprints – fluorescent method, magnetic powder method, fuming method, chemical method etc., digital imaging and enhancement, application of laser and other radiations to develop latent fingerprints, metal deposition method and development of latent prints on skin.

Unit – III

Taking of finger prints from living and dead persons, preserving and lifting of fingerprints, photography of fingerprints, digital transmission, comparison of fingerprints, basis of comparison, class characteristics, individual characteristics, various types of ridge characteristics, Automatic fingerprint identification system

Unit – IV

Foot prints – Importance, Gait pattern, Casting of footprints in different medium, electrostatic lifting of latent footprints, Taking of control samples.

Tyre marks/prints and skid marks, Taking of control samples.

Lip Prints – Nature, location, collection and evaluation.

Bite Marks – Forensic Significance, Photography, Lifting and preservation of bite marks and evaluation.

Ear Prints - Forensic Significance, location, collection and evaluation

Taking of control samples of footprints, lip prints and Ear prints for comparison

Suggested Readings

1. David R. Ashbaugh; Quantitative and Qualitative Friction Ridge Analysis, CRC Press (1999)
2. E. Roland Menzel; Fingerprint Detection with Lasers, 2nd Ed., Marcel Dekker, Inc. USA (1999)
3. James F. Cowger; Friction Ridge skin, CRC Press London, (1993)
4. Mehta, M.K; Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi Pub. Bombay (1980)
5. Moenssens; Finger Prints Techniques, Chitton Book Co.. Philadelphia, NY (1975)
6. Chatterjee S.K.; Speculation in Finger Print Identification, Jantralekha Printing Works, Kolkata (1981)
7. Cowger, James F; Friction ridge skin- Comparison and Identification of fingerprints, CRC Press, NY (1993)
8. Cook Nancy; Classifying Finger Prints, Innovative learning pub. Mento Park (1995)
9. Cossidy M.J; Footwear Identification, Royal Canadian Mounted Police, Ontario, Canada (1980)
10. J A Seigel, P.J Saukoo and G C Knupfer; Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press (2000)
11. Smith B.C, Holland MM, Sweel DL & Dizinno. A; DNA & Forensic Odontology- Manual of Forensic Odontology, Colorado Springs, USA (1995)

w.e.f. 12005-2006

12. w.e.f. 2005-2006
13. Hillison, S; Dental Anthropology, Cambridge Univ. Press, UK (1996)

14. Kasprzak J; Possibilities of Cheiloscopy in Forensic Science (1980)

15. Iannarelli, A V; Ear Identification, Forensic Identification series, Paramount (1989).

16. Henry C. Lee & R. E. Ganesslen; Advances in Finger Print Technology, CRC Press, London (1991).

17. Saxena, B.L.; Law and techniques relating to identification of handwriting, disputed documents, finger prints, foots and detection of forgeries, Central Law Agency, Allahabad (1990)

18. Hardless, H.R; Disputed documents examination and finger-prints Identification (with Illustrations, Sketches, Diagrams, Photos etc), Law Book Co. Allahabad (1995)

19. Menzel, E Roland; Fingerprint detection with lasers, Marcel Dekker, NY (1999)

20. Jain L C; Intelligent Biometric Techniques in Fingerprint and face recognition, CRC Press Ohio (1999)

21. Bridges B C; Criminal Inverstigation, Practical fingerprinting, Thumb Impressions, Hand writing expert testimony opinion Evidence, University Book Agency, Allahabd (2000)

22. Maltoni, Davide; Handbook of fingerprint recognition, Springer Verlag, NY (2003)

23. Ratha Nalini; Automatic Fingerprint recognition system, Springer Pub., NY (2004)

24. Champod, Christophie; Fingerprints and other ridge skin Impressions, CRC Press London (2004)

w.e.f. 2005-2006

Master of Science
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FS -104 QUESTIONED DOCUMENTS **L-4, T-1, P-0, S -0 CREDITS -5**

Unit – I
Nature and problems of document examination, classification of Forensic documents- Specimen/Admitted writings/Typewritings etc.; handling, preservation and marking of documents; importance of natural variations and disguise in writing; various types of Forensic Documents- genuine and Forged documents, holographic documents; principle of handwriting identification; basic tools needed for Forensic Document Examination & their use, analysis of paper & inks

Unit – II
Various writing features and their estimation, general characteristics of handwriting, individual characteristics of handwriting, various types of forgeries and their detection, examination of signatures-characteristics of genuine and forged signatures, identification of forger, identification of writer of anonymous letters and application of Forensic Stylistics/Linguistics in the identification of writer, examination of built-up documents and determination of sequence of strokes.

Unit – III
Determination of age of documents by examination of signatures, paper, ink etc., identification of typescripts-identification of typist, various types of printing processes, identification of printed matter including printing of security documents and currency notes, identification of electronic typewriters, dot matrix, inkjet & laser jet printers, examination of black & white and colour photocopies, fax messages & carbon copies.

Unit – IV
Examination of alterations, erasures, overwritings, additions and obliterations, decipherment of secret writings, indentations & Charred documents, physical matching of documents, examination of seal'rubber & other mechanical impressions, examination of counterfeit currency notes, Indian Passports/Visas, Stamp Papers, Postal Stamps etc., examination of fake credit cards, e-documents, digital signatures, an introduction to computer forensics, Preliminary examination of documents, opinion writing and reasons for opinion.

Suggested Readings

1. Rev ED, Ordway Hilton; Scientific Examination of Questioned Documents, Elsevier, NY (1982)
2. Albert S. Osborn; Questioned Documents, 2nd Ed., Universal Law Pub., Delhi (1998)
3. Albert S Osborn; The Problem of Proof, 2nd Ed., Universal Law Pub. Delhi (1998)
4. Charles C. Thomas; I.S. Q.D. Identification System for Questioned Documents, Billy Prior Bates Springfield, Illinois, USA (1971)
5. Wilson R. Harrison; Suspect Documents Their Scientific Examination, Universal Law Pub. Delhi Indian Reprint (2001)
6. Hard less H.R; Disputed Documents, Handwriting and Thumbs – Print Identification, profusely illustrated, Law Book, Allahabad (1988)
7. Morris Ron N; Forensic Handwriting Identification, Acad Press, London (2001)
8. Kurtz Sheila; Grapholypes a new Plant on Handwriting Analysis, Crown Pub. Inc., USA (1983)

w.e.f. 2005-2006

9. Lerinson Jay; Questioned Documents, Acad Press, London (2001)

10. Mcmenamin, Gerald R; Forensic Linguistics - Advances in Forensic Stylistics, CRC Press, Washington, D.C. (2002)

11. Ellen David; Questioned Documents- Scientific Examination, Taylor & Francis, Washington (1997)

12. Roy A Huber, A.M. Headrick; Handwriting Identification- Facts and Fundamental, CRC Press (1999)

13. Andrea McNichol, Jeffrey A, Nelson; Handwriting Analysis-Putting It to Work for You, Jaico Books, Delhi (1994)

14. Vacca John R; Computer Forensics, Computer Crime Scene Investigation, Firewall Medial, An imprint of Laxmi Pub. (2002)

15. Casey Eoghan; Handbook of Computer Crime Investigation, Forensic Tools & Technology, Academic Press (2002)

w.e.f. 2005-2006

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FS -106 FORENSIC CHEMISTRY AND EXPLOSIVES **L-4, T-1, P-O, S-1 CREDITS-6**

Unit-I

Forensic Chemistry: Introduction, types of cases/exhibits, preliminary screening, presumptive test (colour and spot test), inorganic analysis, micro-chemical methods of analysis, Examination procedures involving standard methods and instrumental techniques, analysis of beverages: alcoholic and non-alcoholic, country made liquor, illicit liquor and medicinal preparations containing alcohol and drugs as constituents, drugs of abuse: introduction, classification of drugs of abuse, drugs of abuse in sports, narcotics drugs and psychotropic substances, designers drugs and their forensic examination, Drugs and Cosmetic Act, Excise Act, NDPS Act.

Unit-II

Examination of petroleum products: distillation and fractionation, various fractions and their commercial uses, standard methods of analysis of petroleum products for adulteration, Arson: chemistry of fire, investigation and evaluation of clue material, analysis of arson exhibits by instrumental methods: Management of Arson cases, Analysis of trace evidence: cosmetics, dyes, Trap related evidence materials, paints, pigments, fibres, oils, fats, greases, industrial dusts, chemicals and plant material.

Unit-III

Quantitative and qualitative forensic analysis of organic and inorganic Industrial products, chemical fertilizers, insecticides, metallic and non metallic products, consumer items such as gold, silver, tobacco, tea, sugars, salts, acids and alkalis etc.

Unit-IV

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, Explosives Act.

Suggested Readings

1) Maudham Bassett etal; Vogel's Textbook of Quantitative Chemical Analysis, 6th Ed., Longman Essex (2004)

2) I. L. Finar; Organic Chemistry Vol. II Pearson Education (Singapore)

3) R.T. Morrison, R.N. Boyd; Organic Chemistry, 6th Ed., Prentice Hall, New Delhi (2003)

4) Brean S.Furniss etal; A.I Vogel Textbook of Practical Organic Chemistry, Addison Wesley Longman, Edinburg (1998)

5) A. Burger; Medicinal Chemistry, Vol. II, Wiley Interscience, NY (1970)

6) D A Skoog, D.M. West , F.J. Holler; Analytical Chemistry- An Introduction, 7th Ed., Saunders College Pub. Philadelphia, USA (2000)

7) Boudreau JE, etal; Arson & Arson Investigation, Survey & Assessment National Institute of Law Enforcement, U.S. Deptt of Justice, US Govt Printing Press (1977)

8) Dettean J D; Kirk's Fire Investigation, 5th Ed., Prentice Hall, Eaglewood Cliffs, N.J (2002)

w.e.f. 2005-2006

9) Yinon Jitrin; Modern Methods & Application in Analysis of Explosives, John Wiley & Sons ,England (1993)

10) Working Procedure Manual- Chemistry, Explosives and Narcotics, BPR&D Pub. (2000)

11) C.A. Watson; Official and standardized Methods of Analysis. Royal Society of Chemistry, UK (1994).

12) Feigl; Spot Test in Inorganic Analysis, Elsevier Pub. New Delhi (2005)

13) Feigl; Spot Test in Organic Analysis, Elsevier Pub., New Delhi (2005)

14) Silverman; Organic Chemistry of Drug Design & Drug action, Elsevier Pub. New Delhi (2005)

15) Abraham Burger; Medicinal Chemistry & Drug Discovery, 6 Vol Set, 6th Ed., John Wiley & Sons, NY (2004.)

w.e.f. 2005-2006

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FS -108 FORENSIC TOXICOLOGY AND PHARMACOLOGY L-4, T-1, P-0, S -1 CREDITS-6

Unit I

Forensic Toxicology- Introduction and concept of forensic toxicological examination and its significance

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

Unit-II

Extraction, Isolation and clean-up procedures: using conventional as well as modern techniques such as solid phase micro-extraction techniques, separation of poisons and drugs using chromatographic and electrophoretic techniques, identification and estimation of poisons and drugs using chromatographic and Spectrophotometric and other instrumental methods, significance of analytical studies with respect to Forensic examination.

Unit-III

Examination of metallic poisons, volatile poisons, snake venom, insects bites, poisons involving animal poisoning cases and their examination, interpretation of toxicological findings and preparation of reports, limitations of methods and trouble shooting in toxicological examinations, disposal of analyzed samples, some interesting cases of common and specific poisons and their importance in view of the specific scientific approach in examinations

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.

Suggested Readings

1. Curry A.S; Analytical Methods in Human Toxicology, Part II, CRC Press Ohio (1986)
2. Clark, E.G.C.; Isolation and Identification of Drugs, Vol. I and Vol. II, Academic Press, (1986).
3. Sunshine I; Year book of Toxicology, CRC Press Series, USA (1989 – 93).
4. Michael J. Deverlanko etal: Hand Book of Toxicology CRC Press, USA (1995)
5. Prakash M. etal; Methods in Toxicology Anmol Publication, New Delhi (1998)
6. Parikh C.K; Text Book of Medical Jurisprudence Forensic Medicines and Toxicology. CBS Pub. New Delhi (1999)
7. Balraj S. Parmar etal; Pesticide Formulation, CBS Publishers, New Delhi (2004)
8. Reiss C etal; Advance in Molecular Toxicology, Utrecht, Netherlands (1998)
9. Morgan B.J.T; Statistics in Toxicology, Clarendon Press, Oxford (1996)
10. Jorg Rombke etal; Applied & Ecotoxicology Lewis publishers NY (1995)
11. Shayne C.Gad etal; Acute Toxicology Testing Academic Press California USA (1998)
12. Chadha PV; Hand Book of Forensic Medicine and Toxicology, Jaypee Brothers New Delhi (2004)
13. Turner Paul; Recent Advances in Pharmacology & Toxicology, Churchill Livingstone, Elenburgh (1989)

w.e.f. 2005-2006

14. Modi, Jaisingh P; Textbook of Medical jurisprudence & Toxicology, M.M. Tripathi Pub. (2001)

15. Cravey R.H, Baselt, R.C; Introduction to Forensic Toxicology, Biochemical Pub. Davis C A (1981)

16. Working Procedure Manual - Toxicology, BPR&D Publication (2000)

17. Ballantyne B; General and Applied Toxicology Vol-1-3 2nd Ed., Macmillan, NY (2000)

18. Gossel T.A; Principles of Clinical Toxicology 3rd Ed., Roven, NY (1994)

19. Grossel S S; Handbook of Highly Toxic Materials handling and Management, Marcel Dekker NY (1995)

20. Niesink RJM; Toxicology- Principles and Applications, CRC Press (1996)

w.e.f. 2005-2006

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FS -152 PRACTICALS - QUESTIONED DOCUMENTS, FINGER PRINTS AND IMPRESSIONS
L-0, T-0, P-4, S -0 CREDITS-2

QUESTIONED DOCUMENTS

1. Identification of normal/disguise writing.
2. Detection of forgeries including traced and simulated forgery and built up documents.
3. Examination of rubber stamp and other mechanical impression.
4. Examination of typescripts and printed matters.
5. Examination alterations -additions, overwriting & obliteration in the documents.
6. Examination of erasures-mechanical and chemical erasures.
7. Decipherment of indented writings, secret writings and charred documents.
8. Examination of ink by TLC and spectrophotometry.
9. Examination of paper.
10. Examination of security documents- Currency notes, Indian Passports, Stamp Papers, lottery tickets etc.

FINGERPRINTS

1. To take plain and rolled inked fingerprints and to identify patterns
2. To perform ridge tracing and ridge counting
3. To identify ridge characteristics
4. To compare the finger prints
5. To develop latent fingerprints with powder, fuming and chemical methods.
6. Lifting of fingerprints.

IMPRESSIONS

1. Foot print tracing, casting and comparing
2. Tyre print tracing, casting and comparing

w.e.f. 2005-2006

FS -154 PRACTICALS - FORENSIC CHEMISTRY & TOXICOLOGY L-0, T-0 ,P-4, S-0 CREDITS-2

1. Analysis of alcoholic liquor as per BIS specifications.
2. Analysis of explosives/explosion residues (Qualitative).
3. Detection and determination of Narcotic Drugs and Psychotropic substances eg. Opiates, cannabis, Barbiturates, Benzodiazepines and Amphetamines by spot colour tests, chromatographic methods.
4. Systematic extraction and identification of acidic and basic drugs from viscera (simulated samples).
5. Detection of metallic poisons (Arsenic and mercury) in Viscera and food samples (simulated samples).
6. Analysis of Viscera (simulated sample) for organochloro/ organo phosphorous pesticides by chromatographic and spectroscopic methods
7. Identification of Vegetable poisons (Dhatura, Nuxvomica, etc.).
8. Identification of methanol mixed in ethanol
9. Examination of Petroleum Products such as Petrol, HSD, Kerosene as per BIS specifications.
10. Arson residue analysis
11. Analysis of phenolphthalein (Qualitative) in bribe trap cases.
12. Quantitative analysis of drugs by spectrophotometry.

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FS -201 FORENSIC PHYSICS **L-4, T-1, P-0, S -0 CREDITS -5**

Unit-I

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

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

Unit-II

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

Miscellaneous clue materials: physical, chemical and instrumental methods of examination of strings/ropes, fibres, threads & fabrics, wires/cables, seals, counterfeit coins, physical matches of broken objects Forensic examination of Electrical Appliances / Installations

Unit-III

Building material: Types of cement and their composition, Determination of adulterants by physical, chemical and instrumental methods, Examination of brick, Analysis of Bitumen & road materials, Analysis of Cement Mortar and Cement concrete & stones,

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, Photographic examination of tool marks and cut marks on clothes and walls etc.

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

Unit-IV

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

Suggested Readings

1. C.E.O Hara and J.W. Osterburg; An Introduction to Criminalistic, Indiana University Press, Blomington (1972)
2. R. Saferstein; Forensic Science Handbook, Vol.-I,II, Prentice Hall, NJ (1988)
3. Jenkins and White; Fundamentals of Optics 4th Ed., McGraw Hill (1981)
4. Philip Rose; Forensic Speaker Identification, Taylor and Francis, Forensic Science Series, London (2002)
5. Bengold & Nelson Moryson; Speech and Audio signal processing, John Wiley & Sons, USA (1999)
6. Nickolls LC; Scientific Investigation of Crime, Bulterw est, London (1956)

w.e.f. 2005-2006

7. Raymond C Murray & John C.F Tedrew; Forensic Geology, Prentice Hall NJ (1991)

8. Working Procedure Manual : Physics BPR&D Publication (2000)

9. B. Caddy; Forensic Examination of Glass and Paints Analysis and Interpretation ISBN 0784 05749 (2001)

10. Oscar Tosi; Voice Identification-Theory of Legal Applications, University Park Press, Baltimore (1979)

11. Bengold & Nelson Morgan; Speech and Audio Signal Processing, John Wiley & Sons, USA (1999)

12. James Michael Curran, Tachia Natilie Hicks and John S. Buckleton; Forensic Interpretation of Glass Evidence, CRC Press (2000)

13. David A. Crown; The Forensic Examination of Paints and Pigments, Toylor & Francis, NY (2001)

14. .J.Walls; Forensic Science-An Introduction to Scientific Crime Detection 2nd Ed.,Universal, 1st Indian Reprint (2002).

15. Richard Saferstein; Criminalistics-An Introduction to Forensic Science 5th Ed., Prentice Hall (1995).

16. Jay A.Siegel, Pekka J Saukko and Geoffrey C. Kooupfer; Encyclopedia of Forensic Science, Academic Pres s (2000).

17. E.R.Mengel; Forensic Physics in 2002 year book, McGrawhill Encyclopedia of Science & Technology.

18. R.W. Moncrieff; Man-Made Fibres 6th Ed.,Newnes Butterworths (1975)

19. J.E.Booth; Principles of Textile Testing-An Introduction to Physical Methods of testing textile Fibres, Yarns and Fabrics. 3rd Ed., CBS Pub. & Distributors (1996).

20. Katharine Paddock Hess; Textile Fibres and their use, 6th Ed.,Oxford & IBH Pub.,Co. (1974)

21. A.B. Wildman; The Microscopy of Animal Textile Fibres. Wool Industries Research Association (1954).

22. Elliot B. Grover and D.S. Hamby; Handbook of Textile testing and Quality Control, Wiley Eastern Pvt. Ltd. (1969)

23. Dorothy Catling and John Grayson; Identification of vegetable Fibres, Chapman and Hall (1982)

24. John H.Skinkle; Textile Testing- Physical Chemical and Microscopial, 2nd Ed.,Revised and Enlarged, D.B. Taraporevala Sons and Co. (1972).

25. J.Gordon Cook; Handbook of Textile Fibres. Vol-I, Natural Fibres,5th Ed., Merrow (1993)

26. B.P.Saville; Physical Testing of Textiles, The Text ile Institute CRC Press and wood head Pub., (2000)

27. AATCC Technical Manual of American Association of Textile Chemists and Colorists, Vol-75 (2000), American Association of Textile Chemists and Colorists, USA

28. W.E.Morton and J.W. S. Hearle; Physical Properties of Textile Fibres, 3rd Ed., The textile Institute, 1993 (Re printed 1997)

29. Roger Brown; Handbook of Polymer Testing- Physical Methods, Marcel Dekker, Inc. (1999)

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FS -203 FORENSIC BIOLOGY **L-4, T-1, P-0, S-0 CREDITS -5**

Unit I

Fundamentals of Biology

Scope of Forensic Biology, Cell Biology - structure and function of cell, Basic concepts of anatomy and physiology of digestive, respiratory, skeleton, nervous, excretory and reproductive system etc.

Body Fluids/ Stains and Tissues:

Introduction to various types of body fluids & tissues – Morphology, histology, and functions, Identification and examination of blood stains –physical, biochemical and spectroscopy method, Identification of seminal stains – physical florescence, biochemical and microscopic examination, Morphological structure of spermatozoa of human and animals, confirmatory test for a spermic semen- p-30, Identification of lochial and menstrual stains by microscopic, biochemical and electrophoretic method, Identification and examination of other body fluids/stains-vaginal, saliva, urine, pus, faeces, vomit, milk, sweat and tears etc.

Unit – II

Forensic Anthropology

Identification of bones - morphological, anatomical and chemical characteristics, Determination of age, sex, race, stature etc., forensic anthropometry /osteometry, determination of personal identity, superimposition technique- video image analysis, facial reconstruction, Identification of burnt bones, recovery and identification of skeletal remains in accident crimes and mass disasters.

Forensic Odontology – Dentition pattern, types and structure of teeth, age determination- identity of person, role in mass disaster, disease of teeth and their significance in personal identification.

Forensic Medicine

Medico-legal aspects of death - Asphyxia, starvation, electrocution and accidental and drowning cases, Determination of time since death by various methods including histopathological methods, determination of age of living person, Injuries- ante-mortem and post-mortem injuries, aging of injury, artificial injury.

Unit – III

Hair and Fibres

Morphology and biochemistry of human and animal hair, and its microscopic examination, determination of origin race, sex, site, Types of fibres – forensic aspects of fibre examination- fluorescent, optical properties, refractive index, birefringence, dye analysis etc identification and comparison of man–made and natural fibre.

Forensic Botany

Various types of wood, timber varieties, seeds and leaves– their identification and matching. Diatoms - Types morphology, methods of isolation from different tissue and forensic importance of planktons- especially diatom, forensic significance in drowning cases. Study and identification of pollen grains, Identification of starch grains, powder and stains of spices etc, Paper and Paper Pulp identification, Microscopic and biochemical examination of pulp material etc. Isolation, classification and identification of microbial organism

UNIT – IV

Forensic Entomology

General Entomology Significance of terrestrial and aquatic insects in forensic investigations and their role in crime detection, insect's succession and its relationship to determine time since. Impact of ecological factors on insect's developments

w.e.f. 2005-2006

Wild life Forensic

Introduction and Importance of wild life, Protected and endangered species of Animals and Plants, Wild life species - Identification and examination of physical evidence by conventional and modem methods, Identification of Pug marks of various animals, census of wild life population. Wildlife / Environment Protection Act.

Suggested Readings

1) E. J. Gardner, M. J. Simmons and D. P. Snustad; Principles of Genetics, John Wiley, NY (1991)

2) Richard Saferstein; Forensic Science Hand Book, Prentice Hall, Englewood Cliff, NJ (1982)

3) P. L. Williams and R. Warwick; Gray's Anatomy, Churchill Livingston, London (1980)

4) Biology Methods Manual, Metropolitan Police Forensic Science Laboratory, London (1978)

5) B.P. Pandey; Plant Anatomy, S. Chand & Co., New Delhi (1998)

6) Edwin H, Mc Caney; Human Genetics- The Molecular Revolution, Jones & Bartlett Pub. London, (1993)

7) Albert's B Bray, D Lewis, J Roberts K & Watson J.D; Molecular Biology of Cell, 2nd Ed., Garland Pub. NY (1989)

8) B. Lewin; Gene-VIII Pearson Prentice Hall. NJ (2004)

9) Clifford B.J; The examination and Typing of Bloodstains in the Crime Laboratory, US Court Printing Press (1971)

10) Morrison Robert D; Environmental Forensics Principles and Applications, CRC Press, NY (2000)

11) Ball Simon; Environmental Law – The law and policy relating to protection of environment, Universal Law Pub Co, Delhi, (1991)

12) Catts E.P & Haskell NH; Entomology and death- A procedural guide , Joyce's Print Shop (1990)

13) Smith DGV; A manual of Forensic Entomology Ithaca NY Camstock Univ. Press, USA (1986)

14) Byrd J H & Castner J L; Forensic Entomology, The Utility of Arthropods in legal Investigation, CRC Press, USA (2000)

w.e.f. 2005-2006

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FS-205 FORENSIC SEROLOGY AND DNA PROFILING L-4,T-1,P-O,S -1 CREDITS-6

Unit I

Serology & Immunology

Structure and function of Carbohydrates, fats and proteins, serum proteins, cellular proteins, Haemoglobin and its variants, Haptoglobins – Various types, HLA, Polymorphic enzymes and their forensic significance.

Basic concepts of Genetics- Mendelian genetics, Genotypes, Phenotypes, mutation, multiple alleles, genetic variants, biochemical genetics, Gene structure, its frequency determination, Gene mapping and Gene Expression, Genetic markers and their forensic significance.

Immunology: Immune system, immune response, innate and acquired immunity, Antigens, haptenes and adjuvants, Immunoglobulin- types, physico-chemical properties and function, raising of anti-sera, Lectins - their forensic significance, Buffers and serological reagents, methods of sterilization employed for serological work

Unit-II

Determination of Origin of species

Determination of human and animal origin from bones, hair, flesh, nails, skin, teeth body tissue, fluids/ stains viz. blood, menstrual blood, semen, saliva, sweat, tear, pus, vomit, etc., through immuno-diffusion and immuno - electrophoresis, cross reactivity among closely related species

Serogenetic markers

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 etc., blood group specific ABH substances, determination of secretor/non secretor status, Lewis antigen, Bombay Blood group, Polymorphic enzymes typing- PGM, GLO-I, ESD, EAP, AK, ADA etc., and their forensic significance, HLA typing, Role of serogenetic markers in individualization, paternity disputes etc

Unit – III

DNA Profiling Structure, functions & Analysis

History of DNA fingerprinting, Human genetics – Heredity, Alleles, Mutations & 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, Interpretation, Allele frequency determination, Match probability – Database, Quality control, Certification and Accreditation.

Unit - IV

Forensic Significance of DNA profiling

Applications in disputed paternity cases, child swapping, Missing person's identity – civil immigration, veterinary & wild life and Agriculture cases, legal perspectives – legal standards for admissibility of DNA profiling – procedural & ethical concerns, status of development of DNA profiling in India & abroad. New & Future technologies – DNA chips, SNPS, DNA cloning, limitations of DNA profiling.

Suggested Readings

1. George V. Burns; The Science of Genetics - An Introduction to heredity, Macmillan (1980)
2. Eldon J Gardner; Human Heredity - John Wiley & sons, USA (1983)
3. D.L. Hartl, D.Friedfelder and L.A.Synder; Basic Genetics, Jones and Bartlet, USA (1988)
4. M.Krawczak and J. Schmidtke; DNA Finger Printing, Bios Scientific Oxford UK (1994)

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5. D.M.Glover and B.D. Hames; DNA cloning, vols. 1 to 4, Oxford University Press, UK (1995)

6. David Freidfielder ; Molecular Biology, Narosa USA (1995)

7. Jorg T. Epplen Thomas Lubjuhin; DNA Profiling and DNA Fingerprinting , Birkhauser Verlag, Basel (1995)

8. Lewin B; Genes VIII International Ed., Pearson Prentice Hall, (2004)

9. Daniel L. Hartl & Elizabeth W. Jones; Genetics - Principle & Analysis, 4th Ed., Jones & Bartlet Pub. (1998)

10. Edwin H, McConkey, Heeman; Genetics - The Molecular Revolution, Jones & Bartlet Pub. (1993)

11. K.C.Malhotra; Statistical Methods in Human Population Genetics, Indian Statistical Institute, Calcutta (1988)

12. W.W. Daniel; Biostatistics , John Wiley & Sons, USA (1995)

13. Kirby Lorne T; DNA Fingerprinting- An Introduction, W.H Freeman & Co. NY (1990)

14. Easteal Simon; DNA Profiling, Principles, Pitfalls and Potential, Harwood Acad. Pub. (1993)

15. Calledine CR; Understanding DNA the molecule and How it works, Acad. Press, London (1992)

16. Working Procedure Manual : DNA BPR&D Pub. (2000)

w.e.f. 2005-2006

FS -207 RECENT ADVANCES, QUALITY MANAGEMENT AND EVIDENCE EVALUATION

L-4, T-1, P-0, S-1 CREDITS-6

Unit – I

Cyber forensics

Fundamentals of computers, hardware and accessories, operating system, software,
Cyber Crimes- definition, IT laws- Introduction, internet, hacking, virus, obscenity, pornography, programme manipulation, software piracy, intellectual property and computer security etc, Encryption and Decryption methods

Search and seizures of evidence

Investigation of cyber crimes and tools for analysis

Other Advances

Pattern Recognition & Biometrics - Face, Iris & retinal imaging, Speech recognition, finger for palm print, gait pattern, signatures, Pattern comparison, Computer simulation, Image processing - Image capturing, Image restoration & enhancement. Image editing, Compression Technique - Proactive Forensic science.

Unit II

Quality management (ISO/IEC/NABL)

General requirements for the competence of testing and calibration laboratories - Introduction, Scope, Management requirements: Organisation, Quality System, Document Control, Review of requests, Tenders and contracts, Subcontracting of tests and calibrations, Purchasing services and supplies, Service to the clients, Complaints, Corrective and preventive actions, Control of records, Internal Audits; Technical requirements: General, Personnel, Accommodation and environmental conditions, Test and calibration methods and method validation, Equipment, measurement traceability, Sampling, Handling of test and calibration items, assuring the quality of test and calibration results and reporting the results.

Laboratory Management

Laboratory information management system, validation and safety equipments

Unit-III

Report writing and Evidence evaluation

Components of reports and Report formats in respect of Crime Scene and Laboratory findings
Court Testimony- admissibility of expert testimony, pre Court preparations & Court appearance, Examination in chief, cross examination and re-examination, Ethics in Forensic Science

Unit-IV

Cases of special Importance

Pertaining to forensic examination (Biology, serology, chemistry, toxicology) documents, fingerprints, ballistics, photography and physics, Voice identifications, Tape authentication & Computer frauds pertaining to forensic examination of cases

Suggested Readings

1. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E).

2. Willard Merritt, Dean & Settle; Instrumental Methods of Analysis,7th Ed., CBS Pub. & Distributors, New Delhi (1986)

3. Tewari R K, Sastry P K and Ravikumar K. V; Computer Crime & Computer Forensics, Select Pub. New Delhi. (2003)

4. V.D. Dudeja; Cyber Crimes & Law Vol. 2, Common Wealth Pub. (2002)

5. Deepti Chopra & Keith Merrill; Cyber Cops, Cyber Criminals & Internet, Ilk International ,New Delhi (2002)

6. David Icove, Karl Seger & William Vonstorch; Computer Crime, O'Reilly & Amocialcis Inc. (1995)

7. Eoghan Corey; Computer Crime Investigation, Academic Press (2002)

8. Bernd Jahne; Digital Image Processing, Springer Verlag (1993)

9. John C Russ; Image Processing, CRC Press (1999)

10. L C Jain, H Hallic, I Hayaush, S. B Lee & S Tulsui; Intelligent Biometric Techniques in fingerprint and Face Recognition, CRC Press (1999).

11. Mario Deva RGAS; The Total Quality Management, NCC Blackwell Pub. (1995)

12. John R Vacca; Computer Forensics, Firewall Media Pub. New Delhi (2002)

13. Albert J.Marcell Jr. and Robert S. Green Field; Cyber Crime, A Field manual for collecting examining and preserving Evidence of Computer Crime. CRC Press (2002)

14. Jams St. Clair; Crime Laboratory Management,Academic Press/ Elsevier (2002)

w.e.f. 2005-2006

Master of Science
GGS Indraprastha University

FS -251 PRACTICALS - FORENSIC PHYSICS **L-0, T-0, P-4, S -0 CREDITS-2**

Experiments on

1. Density gradient analysis of soil samples.
2. Comparison of identity of small glass pieces by flotation method.
3. Restoration of erased identification marks.
4. Determination of refractive index of glass and liquids.
5. Comparison of broken Glass bangles
6. Physical matching of broken pieces of different objects.
7. Comparison of strings/ threads/ropes
8. Physical / Chemical analysis of Paint samples
9. Comparison of Tool marks.
10. Imaging of hard disc, restoration of deleted files, password cracking and e-mail tracking.

w.e.f. 2005-2006

FS -253 PRACTICALS - FORENSIC BIOLOGY, SEROLOGY AND DNA ISOLATION

L-0,T-0,P-4,S-0 CREDITS - 2

BIOLOGY

1. Morphological & Microscopic Examination of hair and fibres.
2. Microscopic and chemical comparison of paper pulp.
3. Examination of bloodstains: Physical and Chemical Tests; spectroscopic examination
4. Menstrual blood and its examination by microscopic and electrophoretic methods.
5. Identification of Diatoms, Identification of pollen grains and starch granules.
6. Determination of Age from skull, teeth, sex from skull, pelvic girdle & Clavicle, Stature from long bones.
7. Examination of seminal stains: crystal tests, chemical, biochemical, microscopical and electro-immuno-difussion test.
8. Examination of saliva and its stains: microscopical and chemical tests.
9. Faecal stains: chemical and microscopical examination, Testing of urine and sweat.

SEROLOGY

1) Determination of Species of Origin of blood, semen and saliva.
2) Grouping of blood stains by absorption elution, absorption inhibition and mixed agglutination techniques.
3) Determination of secretor status in saliva by inhibition techniques.
4) Experiments on Electrophoresis of red cell isozymes viz GLO, EsD, EAP and AK
5) DNA – Isolation from blood – purification and quantifications.
6) Preparation of Lectins and testing their activities against Body fluids & Tissues.

w.e.f. 2005-2006

Master of Forensic Seicne
GGS Indraprastha University

CODE- FS-252 ATTACHMENT- FSL/CFSL/GEQD/DISSERTATION Credit-30

The Student will selest one of the following specialisations.

- **i) Forensic Physics**
- **ii) Forensic Chemistry**
- **iii) Forensic Ballistics**
- **iv) Forensic Photography**
- **v) Documents Examinations**

Dissertation and lab attachment will be as per the requirement of specialisation.

THE SCHEME OF EXAMINATION FOR EACH SUBJECTS SHALL BE AS FOLLOWS

Subject	L	T	P	S	Total
FS-252 Work in in-house lab	0	0	0	0	5
FS-254 Attachment at a designated lab out side	0	0	0	0	5
FS-256 Dissertation	0	0	0	0	20
Total Credits					30

FS -202 Attachment- FSL/CFSL/GEQD/Dissertation **Credits- 30**

The student will select one of the following specialisations.

Forensic Physics

vi) Methods of examination of scene of crime, collection, preservation & forwarding of physical evidence for scientific examinations.

vii) Examination and comparison of glass, paint, soil, copper & aluminium wires/cables, textile materials like fires, thread, fabric and other polymeric materials, voice etc by physical & instrumental methods of analysis and their evidential value.

viii) Methods of writing report based on scientific examination of physical evidence and presentation of the same in the court of law, F.A- Q by defence counsel.

Forensic Chemistry

Role of chemist at Crime Scene Examination, Receipt and dispatch of cases in the Forensic Chemistry Division of FSL/CFSLs of the Country. Good laboratory practices based on NABL/ ISO Guidelines. Significance of using control, reagent blank & reference standards in chemical analysis of Forensic Exhibits. Latest techniques used for extraction, Isolation and clean up of the samples before analysis. Qualitative and quantiatative analysis of chemical compounds including analysis of trace evidence present in different matrixes using state-of –the-art sophisticated equipments. Trouble shooting in chemical analysis at each level. Interpretation of technical/analytical data and forming of expert opinions for the law courts. Testimony of experts in the court.

Forensic Ballistics

- Range determination from spread of pellets fired from country made firearms
- To Study the effect of Range on spread of pellets fired from 12 bore shot gun using ammunition loaded with power-piston.
- To study the pattern of tattooing in case of firing from country made firearms.
- To develop an appropriate method of GSR collection in Indian conditions
- Study Og GSR suing various instrumentation techniques.
- Study of wound ballistics of AK-47 rifle/cartridge
- Study of wound ballistics of 5.56/cartridge.
- Determination of direction of firing
- Determination of number of rounds fired
- Reconstruction of sequence of events in crime involving firearms.
- Collection of case laws related to Forensic Ballistics.
- Linkage of suspected cartridge case firearm with bullet hole.
- Study of mechanism of country –made pistols manufactured in different parts of the country
- Study of reasons of acquittals of firearm cases & remedies.
- To study the effects of variations in bullet weight and propellant weight on interior ballistics of small arms.
- Determination of position of firer
- To study the shotgun ammunition manufactured by various private companies and their ballistics

w.e.f. 2005-2006

Forensic Photography

i) Photography in identification of docile and hostile human objects.
ii) Systematic photography of crime scene- Road accidents, homicide, suicide cases, burglary cases etc.
iii) Finger print photography- Multicolour surface, on mirror, revenue stamp
iv) Computerized face re-construction
v) Matching of facial photography with the skull by super imposition techniques.

Documents Examination

Basic light sources-use of scientific equipments and their handling, Examination of paper, Examination of inks, Detection and decipherment of alterations including additions, overwriting, obliterations and mechanical/chemical erasures, Detection and decipherment of secret writings/indentations, charred documents & torn documents, Examination of Disguised/distorted writings/signatures, Identification of writing and signatures, Detection of forgery and fixing the authorship of forged writings/ signatures, Examination of anonymous letters, Application of forensic stylistics & linguistics in personal identification, Identification of type-writings(Standard/electric/electronic typewriters), Identification of computer printouts and printers, Examination of photo copies(Black & White, colour), scanned documents and FAX messages, Identification of mechanical impressions(rubber stamp/seal impressions), Identification of printed matter, determination of age of documents, Forgery in credit cards and their examination, Examination of security documents including currency notes, passports and other travel documents, Computer forensics- recovery of deleted files/folders from storage media, e-mail tracking and documentation, Recent advances in forensic document examination, Opinion writing- reasons for opinion, Expert evidence in trial courts, Moot court & XX-examination.

M.Sc. FORENSIC SCIENCE

ster I	Marks		Semester II	Marks		Semester – III		Marks
Paper I FS101	General Forensics - Crime & Investigative Techniques	100	Paper VII FS102	Fingerprint & Impressions	100	Paper XIII FS201	Forensic Physics	100
Paper II FS103	Instrumental Methods – Physical	100	Paper VIII FS104	Questioned Documents	100	Paper XIV FS203	Forensic Biology	100
Paper III FS105	Instrumental Methods Biological & Chemical	100	Paper IX FS106	Forensic Chemistry and Explosives	100	Paper XV FS205	Forensic Serology	100
Paper IV FS107	Forensic Ballistics photography	100	Paper X FS108	Forensic Toxicology and Pharmacology	100	Paper XVI FS207	Recent Advances, Quality Management & evidence evaluation	100
Practicals			Practicals			Practicals		
Paper V FS151	Instrumental Methods- Physicals, Biological & Chemical	100	Paper XI FS152	Fingerprint & Questioned Documents	100	Paper XVII FS251	Forensic Physics	100
Paper VI FS153	Crime Scene, Ballistics & photography	100	Paper XII FS154	Forensic Chemistry & Toxicology	100	Paper XVIII FS253	Forensic Biology & Serology	100
Total		600			600			600

FS- 252- In House lab
FS-254- Designate lab. Outside
FS-256- Dissertation.