Maulana Abul Kalam Azad University of Technology West Bengal (MAKAUT WB)
[Formerly Known as WBUT]
M.Sc. in Forensic Science
(Choice Based Credit System)
Course Structure:

<table>
<thead>
<tr>
<th>M.Sc in Forensic Science</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Duration</td>
<td>2 Years (4 Semesters)</td>
</tr>
<tr>
<td>Credit Point</td>
<td>108</td>
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<table>
<thead>
<tr>
<th></th>
<th>Theory</th>
<th>Practical / Field Work</th>
<th>Dissertation</th>
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<tbody>
<tr>
<td>Core Papers</td>
<td>61 Credits</td>
<td>23 Credits</td>
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<td>84 Credits</td>
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<tr>
<td>Elective Papers</td>
<td>4 Credits</td>
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<td>20 Credit</td>
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<td><strong>TOTAL</strong></td>
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</table>

With Specialization in :-

A) Forensic Ballistics
B) Forensic Documents Examination
C) Cyber Forensic
# Course Matrix

**Master of Forensic Science**

**M.Sc. Forensic Science**

## First Semester

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Name</th>
<th>Marks</th>
<th>Credit</th>
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</thead>
<tbody>
<tr>
<td>MSFS-101</td>
<td>Introduction to Forensic Science and Criminal Justice System</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
</tr>
<tr>
<td>MSFS-102</td>
<td>Analytical Instruments and Techniques</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
</tr>
<tr>
<td>MSFS-103</td>
<td>Evidence and It's Pattern</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
</tr>
<tr>
<td>MSFS-104</td>
<td>Crime Scene Management and Quality Assurance</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
</tr>
<tr>
<td>MSFS-105</td>
<td>Essentials of Statistics and Mathematics in Forensic Science</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
</tr>
</tbody>
</table>

**Practical Course**

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Name</th>
<th>Marks</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSFS-191</td>
<td>Pattern Evidence at Crime Scene and Photography</td>
<td>100</td>
<td>L 0 T 0 P 0 C 4 2</td>
</tr>
<tr>
<td>MSFS-192</td>
<td>Field Tests</td>
<td>100</td>
<td>L 0 T 0 P 0 C 4 2</td>
</tr>
<tr>
<td>MSFS-193</td>
<td>Tools and Techniques</td>
<td>100</td>
<td>L 0 T 0 P 0 C 4 2</td>
</tr>
<tr>
<td>Total</td>
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<td>800</td>
<td>L 15 T 5 P 12 C 26</td>
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## Second Semester

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Name</th>
<th>Marks</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSFS-201</td>
<td>Forensic Chemistry and Toxicology</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
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<tr>
<td>MSFS-202</td>
<td>Forensic Biology and Forensic Medicine</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
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<tr>
<td>MSFS-203</td>
<td>Forensic Questioned Documents</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
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<tr>
<td>MSFS-204</td>
<td>Forensic Ballistics and Forensic Physics</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
</tr>
<tr>
<td>MSFS-205</td>
<td>Cyber Crime</td>
<td>100</td>
<td>L 3 T 1 P 0 C 4</td>
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**Practical Course**

<table>
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<th>Paper Name</th>
<th>Marks</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MSFS-291</td>
<td>Forensic Toxicology, Chemistry, Biology and Forensic Medicine</td>
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<td>L 0 T 0 P 0 C 4 2</td>
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<tr>
<td>MSFS-292</td>
<td>Ballistics and Photography</td>
<td>100</td>
<td>L 0 T 0 P 0 C 4 2</td>
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<tr>
<td>MSFS-293</td>
<td>Documents Examination</td>
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<td>L 0 T 0 P 0 C 4 2</td>
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<td>L 15 T 5 P 12 C 26</td>
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## Third Semester

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Name</th>
<th>Marks</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MSFS-301A</td>
<td>Firearms, Ammunitions &amp; Instrumentation Techniques</td>
<td>100</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-301B</td>
<td>Questioned Documents and Handwriting Analysis</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-301C</td>
<td>Advanced Digital Forensics</td>
<td>100</td>
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<tr>
<td>MSFS-302A</td>
<td>Identification of Firearms, Range of Firing and Chemical Tests</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-302B</td>
<td>Mechanical Impressions</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-302C</td>
<td>Networks Security &amp; Forensics</td>
<td>100</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-303A</td>
<td>Wound Ballistics, Reconstruction &amp; Report Writing</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-303B</td>
<td>Bank Frauds and Forensic Accounting</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-303C</td>
<td>Mobile &amp; Wireless Device Forensics</td>
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<tr>
<td>MSFS-304A</td>
<td>Internal, External Ballistics &amp; Gun-shot Residue</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-304B</td>
<td>Digital &amp; Security Documents</td>
<td>100</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-304C</td>
<td>Cyber Laws &amp; Intellectual Property Rights</td>
<td>100</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-305</td>
<td>Elective</td>
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<tr>
<td><strong>Practical Course</strong></td>
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<tr>
<td>MSFS-391A</td>
<td>Applications of Instrumentation Techniques in Forensic Ballistics</td>
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<td>0 0 4 2</td>
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## Fourth Semester

<table>
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<tr>
<th>Paper Code</th>
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<tr>
<td>MSFS401</td>
<td>Research Methodology and Communication Skills</td>
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<tr>
<td>MSFS491</td>
<td>Dissertation</td>
<td>0 0 20 20</td>
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<tr>
<td>MSFS492</td>
<td>Internship</td>
<td>0 0 5 5</td>
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**Elective Papers- MSFS-305**

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Name</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MSFS-305A</td>
<td>Reconstruction of Crime Scene involving Firearms</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-305B</td>
<td>Allied Problems in Forensic Document Examinations</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-305C</td>
<td>Post Blast Investigation Techniques</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-305D</td>
<td>Forensic Evidence in Crime against Human Body</td>
<td>3 1 0 4</td>
</tr>
<tr>
<td>MSFS-305E</td>
<td>Photography and Forensic Image Analysis</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-305F</td>
<td>Cyber Crime and IT ACT</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-305G</td>
<td>Criminal Justice System</td>
<td>3 1 0 4</td>
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<tr>
<td>MSFS-305H</td>
<td>Policing and Law Enforcement</td>
<td>3 1 0 4</td>
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Semester – I
**Semester – I, Paper – I**

**M.Sc. in Forensic Science**

**MSFS101 – Introduction to Forensic Science and Criminal Justice System**

**Unit – I – Forensic Science**

Definition, Principles, History and Development, Scope of Forensic Science, FSLs and Forensic Science Institutions in India, Services provided by Forensic Science Investigators, Functions and Responsibilities of Forensic Scientists, Laboratory Information Management System, Chain of Custody of Samples, Security System and Safety Equipments.

**Unit – II – Criminal Justice System**

Crimes - Definition, Types, Causes, Theories and Prevention; Characteristics of Criminals.

Criminal Justice System – Structure of Police, Prosecution, Judicial Organization in India, Police and Forensic Scientist relationship w.r.t crime Investigation, Modus Operandi and its role in crime records, Court Testimony.

**Unit – III – Laws Related to Forensic Science**

Overview of IPC, Cr.P.C, Indian Evidence Act, IT Act, POSCO, RTI Act and Relevant sections of Cr.P.C – Section 291, 292, 293.

Sections of IPC related to Document examination- 29, 113b, Punishment of criminal conspiracy- 120b, IPC – 407, 413.

Prevention of Corruption Act Sections 7, 11, 13(1) (a) and 13(1) (b).

Unit – IV – Psychology and Investigative Techniques


Reference Books:

2. B. R. Sharma; “Forensic Science in criminal Investigation and Trails”, Universal pub., 2013
6. Indian Evidence Act
7. Indian Penal Code
8. Code of Criminal Procedure
Semester – I, Paper – II
M.Sc. in Forensic Science
MSFS102 – Analytical Instruments and Techniques

Unit – I – Basic Concepts of Method Validation

Introduction to measurement and instrumentation, methods of measurement. Performance characteristics of Instruments: static characteristics - accuracy, precision, sensitivity, linearity, reproducibility, repeatability, resolution, threshold, drift, stability, tolerance, range or span & dynamic characteristics - speed of response, measuring lag, fidelity, dynamic error, Limit of Detection, Limit of Quantitation.

Signal and Data: signal-to-noise ratio, source of noise, signal-to-noise enhancement.

Unit – II – Microscopy Techniques


Unit – III – Basic concepts of Spectroscopic techniques

Introduction to spectrophotometry, Interaction of electromagnetic radiations with matter: phenomena of absorption, emission, reflection, fluorescence, phosphorescence.

Detection of radiations: Photographic detectors, thermal detectors, photoelectric detectors.

Basic concepts of atomic spectra, energy levels, quantum numbers, designation of states, selection rules, atomic spectra.


Unit – IV – Separation and Detection Techniques

Chromatographic Techniques: General Principles, stationary phase, mobile phase, Classification of chromatographic techniques, Column chromatography, High Performance Liquid Chromatography.

Radio chemical techniques: Basic principles and theory introduction about nuclear reactions and radiations, Neutron sources, Neutron Activation Analysis. Basics of
Electrostatic Detection Apparatus, Centrifugation techniques, Electrophoretic techniques.

Reference Books:


Semester – I, Paper – III
M.Sc. in Forensic Science
MSFS103 – Evidence and It’s Pattern

Unit – I


Unit – II

Definition of documents under sec 29 IPC and Section 3, 45, 47 and 73 of IEA and Sections 292 and 293 of Cr.P.C, Forgery and its related sections of IPC. Scope of forensic document examination, classification of important and valuable documents, observation tests, Care, handling, preservation, marking, packing and forwarding of forensic documents- Do”s and Don”ts, maintaining chain of custody at crime scene and in the FSLs/CFSLs.

Unit – III

Tool marks- Types, Class and Individual Characteristics, Comparisons, Impression Marks, Compression Marks, Striated Marks, Combination of Impression and Striated Marks, Repetitive Marks, Materials for making Test Tool Marks, Methods of preparation of Test Tool Marks, Comparison of test and evidence tool marks, Rubber Stamp Impressions, Metallic Seal Impressions, Embossed Impressions and Indentation marks, Mechanical Impressions.

Cast, Engraved and Punched Marks – Methods of their restoration.

Glass: types of glass and their composition, manufacturing of various types of glass and their properties.

Soil- Formation, Types, Composition and physical properties.

Paints- Composition, Types, Manufacturing and physical properties of paints.

Fibre- Types, Constituents &their forensic importance.

Unit – IV
Impression Evidence: Types of Impression Evidence, Significance of Impression Evidence. Tyre Marks Comparison. Skid marks, Serial numbers restoration.

Audio: Basics of sound, human ear and voice, Sound recording and reproduction, Forensic significance of voice.

Basic principles and techniques of black & white and colour photography; Camera and lenses, exposing, development & printing, different kinds of developers & fixers, modern developments in photography; Digital photography, Working of SLR & DSLR Cameras and basics of Digital Imaging Photography, photomorphing, Crime Scene photography, Laboratory photography; Brief about speaker identification & tape authentication techniques and their applications in forensic science, Data Mining Techniques.

Videography: types of video cameras, recording of playback technique of analog video, recording and playback technique of analog video, basics of video codecs and file formats.

Steganography- Detection of steganography from media files.

Reference Books:


Semester – I, Paper – IV
M.Sc. in Forensic Science
MSFS104 – Crime Scene Management and Quality Assurance

Unit – I – General Principles of Crime Scene Investigation


Unit – II – General Guidelines for Evidence Collection

Evidence collection from crime scene, victim & deceased in cases of - Homicide Investigation; Investigation of - Death due to fall from height, Death due to burning, Rape, sexual offences and sex related homicide, Hanging (suicidal, accidental and homicidal), Drowning, Maternity/Paternity dispute cases, Deceased/Un-identified body, human remains, Human poisoning (fatal poisoning/survival), Animal Poisoning, Alcohol Poisoning, Fire/Arson, Petrol Adulteration, Trap Cases, Acid Attack Cases, Murder by Firearm, Forged Documents, Torn Documents, counterfeiting bank notes, Forgery in Passport, Charred Documents, Write Blockers, Imaging of Storage media and Capturing of volatile evidence in Computer fraud & Cybercrime, Audio & Video, CCTV footage, Paint, Glass, Soil, Fibre, Metals, Wildlife Crime.

Medico-legal aspects of firearm injury; Search, Seizure and Arrest under NDPS Act – Guidelines for IOs; Identification of Rapist in sexual assault cases, Mutilated bodies in mass disaster cases, Species of biological evidences material in poaching cases;

Unit – III – General Principles of Preservation and Packaging of Exhibits

Sources of Exhibits, Goals of Evidence Packaging- Protection of Evidence from possible hazards; Elements of Packaging Evidence – Packing Material, Sealing of Evidence; Precautions, General Directions, Directions for Specific type of Exhibits – Weapons and tools, Hair and Fibres, Blood and Bloodstains, Semen, Saliva, Dust or Soil, Arson Cases and Cases of Burning, Tool Marks, Exhibits for Ballistics Examination, Glass, Paint, Questioned Documents, Latent Fingerprints, Drug Samples. Packaging and transportation of Digital & Electronic Evidence

Unit – IV – Quality Assurance and Accreditation

Introduction, Quality Assurance and Accreditation; Importance of accreditation in Forensic science laboratories, NABL Guidelines for Accreditation of FSLs; Notification of Cyber Forensics labs of FSLs/CFSLs u/s 79A of IT Act.

Traceability and Validation of new methods, measurement of uncertainty, Equipment maintenance and Calibration, Standard Reference Materials and Certified Reference Material and their availability, Sampling Procedure and Data Handling in the lab, Sample disposal, Assessment, Interpretation and reporting of results; Proficiency testing.

Reference Books:


**Semester – I, Paper – V**
**M.Sc. in Forensic Science**
**MSFS105 – Essentials of Statistics and Mathematics in Forensic Science**

**Unit – I – Introduction to Mathematics and Statistics**

Number systems and their Representations, Units of measurement and their conversion, Dealing with Uncertainties in measurement, Basic Chemical calculations.

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.

Variance – Coefficient of variation, Moment, Coefficient of Regression, Correlated Measurements.

**Unit – II – Mathematical Functions in Forensic Science**

Mathematical Functions – Algebraic Functions, Polynomial Function, Quadratic Functions, Logarithmic Functions – Origin and Definition, Exponential Functions – Origin and Definition, Applications – pH Scale, Forensic Pharmacokinetics;

Trigonometric Functions: Trigonometric functions and rules in Forensic Science, Applications – Ricochet Analysis, Suicide, accident or murder, Bloodstain pattern and shape analysis, Aspects of Ballistics.

**Unit – II – Probability and Graph Theory in Forensic Science**


Graph Theory: Representation of data using graph, Linearizing equations, Construction and Calibration of graphs, Application – Shotgun pellet patterns in firearm incidents, Bloodstain formation, Determining time since death, Determining age from bone or tooth material.

**Unit – IV – Statistical Evaluation of Data and Evidence Significance**

**Reference Books:**


**Semester – I, Paper – VI (Practical – I)**

**M.Sc. in Forensic Science**

**MSFS191 – Pattern Evidence at Crime Scene and Photography**

1. Recording of evidence and collection of clues in hit and run cases by forensic photography and Sketching.

2. Lifting of Fingerprints & Footprints from different surfaces and analysis of the pattern details.

3. Recording of various evidence in cases of sexual offences/homicide/ property offence cases by forensic photography and Sketching.

4. Analysis of skid marks and tire tread impressions using photographic evidence and Sketching.


7. Use of oblique light, transmitted light and side light photography in cases of indented writing and document examination.

8. Photography of writings on unusual surfaces.

9. Determination of the fracture pattern, perforation and direction in glass evidence in burglary, firearms and hit & run cases.
10. Analysis of the impressions made by different tools on different surfaces using forensic photography.


12. Analysis of pattern evidence in fire, arson and sabotage cases.

**Semester – I, Paper – VII (Practical – II)**

**M.Sc. in Forensic Science**

**MSFS192 – Field Tests**

1. Field tests for the detection and identification of narcotic drugs.

2. Field tests for the detection and identification of blood stain evidence.

3. Field tests for the detection and identification of seminal stains.

4. Development of latent fingerprints on different surfaces followed by their lifting, preservation and comparison.

5. Recording of the fingerprints/palm prints/lip prints/bite-marks from the suspects in cases of forensic importance.

6. Lifting of gun-shot residue from shooter’s hand or clothing and identification of the powder residue by chemical test.

7. Field test for the detection of explosive material.

8. Field test for detection of indentation marks.


10. Field test for detection of counterfeit bank notes.

11. Lifting of Paint Samples from accident cases.

12. Collection of the broken glass evidence in burglary case to determine the direction of force.

**Semester – I, Paper – VIII (Practical – III)**

**M.Sc. in Forensic Science**
MSFS193 – Tools and Techniques

1. Preparation of the Normal, Molar and Standard & buffer solutions.
2. Determine the density of alcohol by using pyknometer.
4. Comparison of soil samples using microscopic and density-gradient distribution of particles method.
5. Microscopic examination of hair and fibres.
6. Examination of documents under stereo zoom microscope, UV rays, IR rays and oblique light.
7. To separate the dyes and inks/plant pigments/body fluids/explosives by thin layer chromatography.
8. Care, handling, preservation, marking, packing and forwarding of documents.
9. Laboratory equipment-handling of Stereo microscope, Stereo zoom Microscope, comparison microscope, Raman spectrophotometer.
10. Use of Vernier Callipers for internal & external diameter, Screw Gauge for thickness, Spherometers for curvature of surface and Laser device for accurate Distance Measurements.
11. Determination of GSM and thickness of papers.
12. Use of breath analyzer for measuring blood alcohol concentration.
Unit – I – Forensic Chemistry

Scope & significance of Forensic Chemistry, Types of cases/exhibits received for analysis.

Trap Cases: Collection, and Preliminary analysis of evidence in trap cases.

Alcoholic Beverages: Types of alcohols, country made liquor, illicit liquor, denatured spirits, Indian made foreign alcoholic and non-alcoholic beverages. Dyes: Scope & Significance of dyes in crime investigation, analysis of ink by TLC and UV visible spectrophotometry.

Petroleum products and their adulterations: Chemical composition of various fractions of Petroleum Products, Analysis of petrol, kerosene, diesel.

Unit – II – Forensic Toxicology

Forensic Toxicology - Scope and Significance. Classification of Poisons based on their mode of action, uses and origin. Poisons - Types, routes of administration, toxicity, sign and symptoms. Factors affecting the effect of poison, medico-legal aspects of poisoning cases. Common Poisoning in India: Pesticides: Different types and their formulations, identification of pesticides, standard or sub-standard or substituted pesticides.

Guidelines for collecting forensic evidences in poisoning cases at crime scene. Importance of Post mortem examination in poisoning cases. Sample preparation for the analysis of poisons in body tissues/fluids and analysis by various instrumental techniques.

Unit – III – Narcotic Drugs and Psychotropic Substances

Scope and significance NDPS drugs in forensic science, NDPS Act, Classification and characterization of NDPS drugs, Drug Law Enforcement, Search & Seizure, Sampling procedure, Forwarding of sample to FSL, Sample preparation for analysis, Preliminary analysis of drugs, Reporting of drug cases, Drug abuse, Drug addiction and its problems.

Unit – IV – Fire /Arson and Explosives
Fire: Introduction to Fire & Arson, origin of fire, Chemistry of Fire, Fire fighting operations, preservation of fire scene, collection of evidences, Seat of fire, cause of fire, motives, Analysis of fire debris, Case studies related to fire and Arson.

Explosive and Explosion: Scope & significance of explosive analysis in forensic science, Types of explosives, deflagration and detonation, explosive trains, collection, preservation and forwarding of exhibits, preliminary analysis of explosives. Do’s and Don’ts. Case studies related to explosives.

Reference Books:


Semester – II, Paper – II
M.Sc. in Forensic Science
MSFS202 – Forensic Biology and Forensic Medicine
Unit – I
Identification of Urine stains: Physical examination, Odor Test, Urea nitrate crystal test and creatinine test.
Identification of vomit stains: Detection of Mucus, Free HCL and Endothelial cells.
Identification of faecal stains: Microscopic detection of undigested food particles, vegetables material and muscle fibers, Urobilinogen Test.
Diatoms and Pollen grains- their identification and Forensic Significance. Microorganism in biological warfare.

Unit – II

Unit – III
Microorganism responsible for food poisoning. Collection, preservation and forwarding of samples – vomit, stool, stomach wash and residual food.

Unit – IV

Reference Books:


**Semester – II, Paper – III**
**M.Sc. in Forensic Science**
**MSFS203 – Forensic Questioned Documents**

**Unit – I**

Unit – II

Handwriting Examination- Development of handwriting, master pattern, physiology of handwriting, different handwriting systems, matured/immature writings, different vernacular Indian languages and scripts, Simon New Comb theory of probability. Definition of natural variations and disguise. Various methods adopted for disguise. Importance of natural variation and disguise in handwriting examination.

Unit – III


Unit – IV


Reference Books:


**Semester – II, Paper – IV**

**M.Sc. in Forensic Science**

**MSFS204 – Forensic Ballistics and Forensic Physics**

**Unit – I**

History and development of firearms – their classification and characteristics, various components of small arms, smooth bore and rifled firearms, bore and caliber, shotgun barrels, chokes - their degrees and types; different automatic mechanisms used in small arms – blow back, recoil operated and gas operated mechanisms, rifling, class characteristics of rifled bore, purpose of rifling, methods to produce rifling; trigger and firing mechanism, trigger pull, accidental discharge of firearms, country-made firearms, improvised and imitation firearms.

Types of ammunition, nomenclature, percussion caps and their types, various priming composition, propellants, types of cartridge cases, their heads, various types of bullets and their compositional aspects.

Safety aspects about handling of firearms and ammunition.

**Unit – II**

Physical evidence available in crime involving firearms, handling of physical evidence at crime scene, principles and practice of identification of firearms, class and individual characteristics, various marks on fired cartridge cases and bullets, test firings, techniques of obtaining test materials, comparison microscope and matching of marks on evidence and test exhibits, automated bullet-cartridge identification system – IBIS and NIBIN.

Estimation of range of firing: burning, blackening, tattooing, spread of pellets, Walker’s test.
Gun-Shot Residue: Dermal nitrate test, why was it abandoned, mechanism of formation of gunshot residue, various methods of lifting of gunshot residue, detection of GSR by AAS.

Gun-Shot Injuries – caused by shotguns, rifles, revolvers, pistols, evaluation of gunshot injuries.

Knowledge of Arms Act.

**Unit – III**

Criminalistics and Forensic Engineering: Role of trace evidence analysis and source correspondence, Arson Investigation, Introduction to Nano-science

Advanced Physical Techniques: Introduction to Lasers, Advanced microscopy & 3D scanning; Introduction to Atomic Absorption & Emission Spectroscopy, Fourier transform and X-ray spectroscopy

Collision Investigation and Reconstruction: Causes and Prevention of Road Accidents, Liability to accidents, Communication on the road, Reconstruction and proactive measures.

**Unit - IV**

Forensic Voice Identification: Resonance and overtones, synthesis of complex waves, Place Theory of Hearing, Anatomy of Vocal Tract, Vocal Formants, analysis and recording of voice samples in trap/sting investigation.

Photography and Forensic Image analysis: Light and Illumination, Optics and Lenses, Zoom and close-up Photography, Introduction to forensic use of digital images, resolution, colour space, file formats, photo sensors, memory and media, computing images.

Forensic Video Analysis: Introduction to video, Video Cameras, Video images, Video Captures, CCTVs, Retrieval of images and their evidence analysis.

**Reference Books:**


Semester – II, Paper – V
M.Sc. in Forensic Science
MSFS205 – Cyber Crime

Unit – I – Introduction to Cyber Crime

Cyber Crime- Overview, Internal and External Attacks, Online and offline attacks.

Cybercrimes against Individuals – E-mail spoofing and other online frauds, Phishing and its forms, Spamming, Cyber defamation, Cyberstalking and harassment, Computer Sabotage, Pornographic offenses, Password Sniffing.

Cybercrime against organization – Unauthorized access of computer, Denial-of-service (DOS) attack, Distributed Denial of Service (DDoS) attack, Backdoors and Malwares (virus, Trojan horse, worms), E-mail Bombing, Salami Attack, Software Piracy, Industrial Espionage.


Unit – II – Introduction to Computers and Networking

Networking- Digital and Analog Signaling Methods, Network Types and Topologies, Different types of IP Addresses, Network Hardware Devices and Client/Server Computing.

**Unit – III – Basics of Information Security**


**Unit – IV – Introduction to Digital Forensics**


**Reference Books:**


**Semester – II, Paper – VI (Practical – I)**  
**M.Sc. in Forensic Science**  
**MSFS291 – Forensic Toxicology, Chemistry, Biology and Forensic Medicine**

1. Identification of blood stains using enzymatic and crystal tests  
2. Identification of seminal stains using presumptive test, crystal test and detection of spermatozoa  
3. Identification of saliva stains  
4. Identification of urine stains  
5. Microscopic Examination of Human and Animal Hairs  
6. Microscopic Examination of Vegetable Fibers  
7. Identification of commonly encountered inorganic poisons Arsenic, Antimony, Bismuth, Mercury by colour test and microscopic examination.  
8. Identification of ethyl alcohol and methyl alcohol by colour tests and microscopic examination.  
9. Identification and comparison of inks by TLC and UV visible spectrophotometry.  
10. Analysis of accelerants and incendiary in Arson cases by TLC and UV visible spectrophotometry.  
11. Identification of explosives by colour tests & group analysis.  
12. Identification of NDPS drugs by colour tests and TLC.

**Semester – II, Paper – VII (Practical – II)**  
**M.Sc. in Forensic Science**  
**MSFS292 – Ballistics and Photography**

1. Identification of measure and minor constituents of heterogeneous material evidence  
2. Recording of speech samples using cassette and digital voice recorder  
3. Sample preparation of calibration curve for UV studies  
4. Wet chemical print photography from film negatives  
5. Identification, measurement & photography of various components of a road  
6. Crime scene videography of simulated crime scene and recording logs of video camera settings  
7. Study of details of various small arms – caliber, choke, firing mechanisms, trigger pull, proof marks, etc.  
8. Study of details of Shotgun ammunitions and rifle ammunitions  
9. Determination of shot-size from diameter and weight of shots.
10. Examination of comparison of class and individual characteristics of fired bullets.
11. Examination and comparison of fired cartridge cases (caliber, firing pin marks, breech face marks, chamber marks, extractor and ejector marks)
12. Chemical tests for powder residue – Walker’s Test & barrel wash
13. Test for lead, copper around gunshot holes in different targets.

**Semester – II, Paper – VIII (Practical – III)**
**M.Sc. in Forensic Science**
**MSFS203 – Questioned Documents Examination**

1. Instrumentation Techniques – Documents Examinations
3. Secure configuration of ports and services of Windows.
4. Encrypting and Decrypting the partition using Bit locker.
5. Collection and preservation of Volatile data from standalone computer.
6. Imaging and recovery of deleted files and folders from storage media.
7. Secure Configuration of Ports and Services of Windows 7, 10 and onwards latest latest versions.
Semester – III
M.Sc. Forensic Science  
MSFS301A – Firearms, Ammunitions & Instrumentation Techniques

Unit – I

Classification and characteristics of firearms, various components of small arms, smooth bore and rifled firearms, relation between bore-number of shotguns and internal cross-sectional diameter of their barrel in inches, chokes: purpose, degrees & types, different types of shot guns – SBBL, DBBL, repeating shot guns and automatic shot guns, various automatic mechanisms used in rifled firearms – blow back, retarded blow back, short recoil operated, long recoil operated firearms, gas operated firearms, Assault rifles, class characteristics of rifled bore, purpose of rifling, types of rifling, methods to produce rifling, trigger and firing mechanism, trigger pull, accidental discharge of a firearm, cartridge feed mechanisms, barrel steels, proving of small arms - provisional and final, measurement of strength of barrel, techniques of dismantling and assembling of firearms, improvised/ country-made /imitative firearms and their constructional features.

Various marks on firearms, identification of firearms.

Comparative merits of shot guns of different bores, head space and its importance.

Unit – II

Types of ammunition, classification and constructional features of different types of cartridges, percussion cap and its various types, priming composition, modern developments.

Propellants and their compositions-black, smokeless and semi – smokeless powders, various chemicals added to propellants for their stabilization, for reducing flash, for making them non-hygroscopic and for conversion of degressive to progressive burning powders.

Use of brass/ copper for manufacture of cartridge cases, different shapes of cartridge cases and their heads-rimmed, rimless, semi-rimmed, belted and rebated. Shot gun ball ammunition.

Various types of bullets and compositional aspects, jacketed, non-jacketed, round nose, sharp pointed, boat-tailed, stream-lined, soft point, hollow point and other expanding bullets, Dum-Dum, pencil point, armor-piercing, tracer and incendiary bullets. Various types of wads loaded in shotgun cartridges, various processes associated with manufacture of small arms ammunition - both shot guns and all metal - drawing, cleaning, washing, cutting, construction of head etc.
Physical, ballistic and functional tests of ammunition - velocity, accuracy, pressure, sensitivity tests etc. calculation of figure of merit for various standard cartridges, various defects produced in cartridge cases as a result of firing. Headstamp markings – identification of origin.

**Unit – III**

Crimes committed by firearms, Various types of visible/invisible physical evidences available in crime involving firearms, Photography/Videography/ Sketching of crime scene, location, documentation, collection, packing, sealing, preservation and forwarding of exhibits in firearm cases, maintaining the authenticity and integrity of physical evidence, various legal requirements in the handling of clue materials, various precautions to be taken while handling the physical evidence, various problems including medico-legal problems arising in crime involving firearms, chain of custody, Reconstruction and enactment of scene of crime.

**Unit – IV**

Atomic Absorption Spectrometry: Instrumentation and techniques, interference in AAS, background correction method, quantitative analysis.

Atomic Emission Spectrometry (AES): Instrumentation and techniques, arc/spark emission, ICP-AES, Comparison of ICP vs AAS methods, quantitative analysis, applications.

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

Infra-red spectrophotometry: Dispersive and Fourier Transform Spectrophotometry (FTIR). Sample handling, quantitative analysis, interpretation of IR spectra, applications.

Raman Spectroscopy: Theory, instrumentation and sample handling, correlation of IR and Raman Spectroscopy, applications.


**Reference Books:**

Semester- III, Paper – II
M.Sc. Forensic Science
MSFS302A – Identification of Firearms, Range of Firing & Chemical Tests

Unit – I

Principles and practice of identification of firearms, ammunition and their components, how different parts of firearms acquire individual characteristics during their manufacture, types of marks produced during firing process on cartridge cases – firing pin marks, breech-face marks, chamber marks, extractor and ejector marks, marks on bullets, striation marks of lands and grooves, various factors affecting nature of these marks, measurement of rifling details, i.e., number/direction of lands and grooves, pitch of rifling etc. imprinted on fired bullets, determination of make/model of the suspected firearm, techniques of obtaining test materials from various types of weapons and process of their linkage with the fired ammunition, comparison microscope, photomicrography, non-submission of photomicrographs along with the report, presence of matching and non-matching characteristics on evidence and test cartridge cases and bullets, source correspondence, number of matching points, furnishing of opinion - definite positive, definite negative, no definite etc. writing of reports, automatic bullet and cartridge comparison systems, IBIS and NIBIN, linkage of fired shots with suspected shot gun, effects of erosion, corrosion etc., effect of human decomposition on bullet striations.

Unit – II

Determination of range of firing, burning, scorching, blackening, tattooing, metallic fouling, GSR distribution and dispersion of pellets, factors affecting these phenomena, the stringing of shots, effect of stringing on pattern, cartwheel pattern, balling, determination of range of firing in case of country-made firearms, characteristics of contact shots, distinction between blackening and lead/dirt ring, abrasion, Walker’s test around gun-shot holes in clothes, tests of presence of tattooing around gun-shot holes in skin/head, IR photography of tattooing around gun-shot holes in dark-coloured clothes, use of various instrumentation techniques for estimation of range of firing, effective, killing and extreme ranges.

Unit – III

Testing of barrel wash, chemical tests for testing of lead/copper around gun-shot holes in clothes, skin and other objects, use of instrumentation techniques in identification of gun-shot holes.

Determination of time elapsed since firing, usefulness, different methods employed and their limitations, attempts based on analysis of residue inside the barrel left after the firing of cartridges loaded with black/smokeless powders, attempts based on analysis of CO, CO2, nitrogen oxides, etc., reasons for not being able to estimate time elapsed since firing.
Use of instrumentation techniques for analysis of propellant particles found on hands of shooter, fired cartridge case, barrel and target

**Unit – IV**

Restoration of erased numbers, methods of marking-cast, punch and engraved, methods used for removal of serial numbers, theory behind number restoration, restoration of marks on cast iron, Aluminum, brass, wood, leather etc., chemical methods of restoration (etching), reagents used for various metals, electrolytic methods of restoration-reagents used, ultrasonic cavitation for restoration, magnetic particle method for restoration, other methods of restoration, laser etched serial numbers and bar codes and their restoration, recording of restored marks.

Ballistics Data Measurement System.

**Reference Books:**


Semester- III, Paper – IV
M.Sc. Forensic Science
MSFS303A– Wound Ballistics, Reconstruction & Report Writing

Unit – I


Unit – II

Physical Aspects of Gun-shot Injuries: Analysis of gun-shot wound production, motion of projectile in dense medium – both spherical and elongated projectiles, cavitation – temporary and permanent cavities, tissue simulants, preparation of gel-block, methods of measurement of various wound ballistics parameters, drag coefficients, diameter of temporary and permanent cavities and their volumes as a result of energy lost in wound production, stopping power, relative stopping power.

Unit – III

Reconstruction of sequence of events involved in a shooting case, theory and practice of shooting reconstruction, scientific method of shooting reconstruction, suicidal/murder/accident/self-defence/encounter cases/self-inflicted injuries caused by friendly hands. All considerations during direct investigation of shooting incident or without the benefit of original crime scene investigation. Importance of scene of occurrence, photographs, sketching, medico-legal reports, firearms and ammunition,
basic ballistic facts, laboratory examination reports, high velocity impact blood splatter, etc.

Study of X-ray plates in firearm cases.

Documentation and evaluation of bullet holes in various targets, ricochet marks, pellet pattern, estimation of angle of impact, bullet holes in tires and other plastic markings, shooting in glass – fractures, determination of entry/exit holes, direction of firing, sequence of shots.

Plotting of gun-shot injuries on body – diagrams, evaluation of gun-shot injuries to determine wounds of entry/exit, direction of firing, number of rounds fired, etc.
Determination of number of participants/firearms involved, their locations, positions, orientation at the moment of firing, discussion of some important & complicated cases.

Unit – IV

Report writing, work-sheet writing, components of reports, report formats in respect of visits to crime scene involving firearms and with respect to laboratory findings.

Court testimony, admissibility of expert testimony. Pre-court preparations and court appearance, examination - in chief, cross-examination, re-examinations, discussion of complicated cases.

Arms Act, Arms Rules, Prohibited and Non-prohibited firearms and ammunition. All sections of Arms Act, Examination and Reporting of cases under the Arms Act. Various court rulings relevant to Forensic Ballistics.

Reference Book:


Semester- III, Paper – III
M.Sc. Forensic Science
MSFS304A – Internal, External Ballistics & Gun-shot Residue

Unit – I


Thermochemistry of propellants – Calculation of heat of explosion, specific heats of propellant gases, explosion temperature, pressure and volume of gases produced by burning of single-base and double-base propellants.

Unit – II

Internal Ballistics of Firearms: Definition, ignition of propellants, shape and size of propellant grains, degressive and progressive shapes, degressive and progressive burning, manner of burning, all-burnt position. Force constant – energy equation, various factors affecting internal ballistics, lock time, ignition time, barrel time, erosion, corrosion and gas cutting, theory of recoil, methods of measurement of recoil, internal ballistics of shot-guns. Le Duc’s Method.

Intermediate Ballistics: Definition. Effects on the motion of projectile and firearm, gas flow field near the muzzle, flash, blast, silencers.

Unit – III

External Ballistics: Equations of motion of projectile, principal problem of exterior ballistics, vacuum trajectory – calculation of various elements, effect of air resistance on trajectory, points of difference between trajectories in air and vacuum, Nature of air-resistance phenomena, base-drag, yaw, cross-wind force, over-turning moments, stability – fin stabilization and gyroscopic stability, stability factor, nutation and precessional motions of bullets, drift, Magnus effect, Greenhill formula, shape of
projectile – form factor, ballistic coefficient, calculation of trajectories of various small arm bullets, calculation of trajectories of shotgun projectile, use of Ballistic tables, Automated system of trajectory computation. Falling bullets – limiting velocity, drop, use of lead as bullet material.

**Unit – IV**

Gun-shot Residue: Identification of shooter– dermal nitrate test and its abandonment, Harrison and Gilroy test, Price test, mechanism of its formation, plume, morphology and size of GSR particles– regular, nodular and unique, source of GSR, specific areas of GSR deposition, collection of GSR – various methods, GSR retention, analysis of AAS, NAA, SEM/EDXA, ICP-MS, ASV. Environmental contaminants in GSR considerations, time taken for GSR particles to remain airborne, importance in chemical investigation.

**Reference Books:**

2. Sharma, B.R.; “Firearms in Criminal Investigation & Trials”, Universal

**Semester- III, Paper – V (Practical – I)**

M.Sc. Forensic Science

**MSFS391A – Applications of Instrumentation Techniques in Forensic Ballistics**

1. Photography and sketching of crime scene involving firearms (3 practical).
2. Collection, preservation and packing of exhibits.
3. To dismantle and assemble all types of small arms, and to record their data, lock mechanism and trigger pull.
4. To open all types of cartridges, study and record their data.
5. Determination of shot size from diameter and weight of shots/pellets.
6. To prepare sulphur cast of inside of barrels and study the rifling details, caliber, size of bore, etc.
7. Opening of parcels, various precautions, preparations of observation sheet, marking of exhibits.
8. To determine / measure rifling details on fired bullets – determination of make/model of suspected firearms firing the bullet.

**Semester- III, Paper – VII (Practical – III)**

M.Sc. Forensic Science

**MSFS392A – Documentation of Crime Scene involving Firearm, handling or Evidentiary Clues**

1. TLC/ HPTLC of propellants loaded in shotguns, rifle and handgun cartridges.
2. Identification of shooter – gun-shot residue analysis by AAS.
3. Identification of suspected gun-shot holes by AAS.
4. IR spectra of propellants loaded in shotgun, rifle and handgun cartridges.
5. Analysis of propellants by HPLC.
6. FTIR analysis of propellants loaded in shotgun, rifles and handgun cartridges.
7. FTIR analysis of propellant particles found inside the barrel, fired cartridge case and around gun-shot hole in targets – comparison of results.
8. GC Analysis of propellants.

**Semester- III, Paper – VI (Practical – II)**

M.Sc. Forensic Science

**MSFS393A – Forensic Ballistics-Identification of Firearms, Range of Firing, Chemical Tests**
1. Restoration of erased serial numbers on firearms.
2. To perform chemical tests of powder residues (Walker’s Test) around gunshot holes in fabrics.
3. To perform spot tests around holes suspected to have been caused by passage of jacketed/ non-jacketed projectiles.
4. To test barrel wash.
5. Linkage of evidence cartridge cases with suspected firearm – examination under Comparison Microscope.
7. Measurement of spread of pellets fired from shotguns and determination of range of firing.
8. Given evidence pattern of tattooing, suspected firearm and ammunitions recovered from accused – to conduct test firings and estimate range of firing.
9. Reconstruction of sequence of events in shooting incidents.
10. To conduct firing in plate glass and study direction of firing, sequence of shots.

**Semester- III, Paper – I**
**M.Sc. Forensic Science**
**MSFS301B – Questioned Documents and Handwriting Analysis**

**Unit – I**

Handwriting/signature examination- principles of handwriting identification, General characteristics and their estimation- line quality, speed ,slant, shading, rhythm, size, skill, movement, alignment, relative size and proportion, pen lifts, pen pressure, pen position, pen pause, hiatus, commencing and terminal strokes, connecting strokes, individual characteristics of handwriting and their estimation, rare/occasional and accidental features in handwriting, effect of posture, emotion, illness, age and drugs/alcohol on handwriting, effect of mother tongue on foreign script, examination and interse comparison of English alphabets and numerals, procurement of handwriting standards- specimens and contemporaneous writings, process of comparison of like with like, best standards for comparison with disputed documents.

**Unit – II**

Detection and decipherment of various alterations- obliterations, additions, overwriting, mechanical and chemical erasures and secret writings, simple forgery, traced forgery, simulated forgery, forgery by trickery, forgery by transplantation using scanners and colour printers, inherent signs of forgery. Detection and Decipherment of mechanical impressions - rubber stamp impressions, seal
impressions, embossed impressions, indentations. Fixing authorship of forged writings and signatures, tremors of forgery and genuineness, case studies. Use of state-of-the art equipment for non-destructive methods of analysis.

Unit – III

Examination of anonymous letters- Identification of writer of the letter, Features indicating religion, region, sex and educational background of the writer, Importance of preserving envelope containing anonymous letters, Types of anonymous letters and various methods used for their communication, Case studies. Linguistics, stylistics, forensic stylistics- Definition, Methodology, Use in personal identification, Application in different Indian vernacular languages, Limitations, Case studies.

Unit – IV

Determination of relative age of writing and signatures, determination of relative age by examination of signatures/rubber stamp impression in chronological order, Determination of relative age of document by - Examination of writing paper and ink, Examination of sequence of intersecting strokes, Addition of text with ink or typescript, Anachronistic features and their importance. Stabilization of charred documents- Decipherment of charred documents, Reconstruction of torn documents, Case studies.

Reference Books:


**Semester- III, Paper – II**

**M.Sc. Forensic Science**

**MSFS302B – Mechanical Impressions**

**Unit – I**

Working of standard mechanical and electrical typewriters and examination of typescripts therein, identifying features of standard typewriters, features arising due to defects in main machine and fonts. Working and examination of electric, electronic and daisywheel printer, high speed mainframe line printer (drum and chain print heads), Cheque writers, Identification of typist of typescripts. Use of state-of-the art equipment for non-destructive methods of analysis.

**Unit – II**

Types of computer printers, Working of computer printers- dot matrix printers, ink jet printer, laser jet printers, thermal printers, digital offset printers, Identifying features of different computer printouts, methods of identification of toners and inks used in printing. Examination and identification of digitally manipulated documents using computers and printers, Case studies.

**Unit – III**

Principle and working of different conventional printing processes- letterpress, offset printing, Intaglio Printing, Flexography printing, Thermography printing, Digital printing and Screen printing, Various type of security printing, Identifying features of the printed matter of various printing processes.

**Unit – IV**
Examination of black and white and colour photocopies and their identifying features, process of collection of sample photocopies for the purpose of comparison, examination of fax message, scanned documents, carbon copies and carbonless copies. Difference between Photocopies, Computer Printouts and Scanned copies. Case studies.

Reference Books:


Semester- III, Paper – IV  
M.Sc. Forensic Science  
MSFS303B – Bank Frauds and Forensic Accounting  

Unit – I

Types of companies and role of key managerial personnel, Basic accounting principles. Types of banks, Bank instruments-legal tenders, bank notes, FDRs,
Cheques/drafts, Bank guarantee, Bonds and certificates. Types of accounts – Saving account, Current account, account opening forms, credentials of introducers, guarantor, D Mat accounts, Public Provident fund, Recurring Deposits, and special accounts, Alterations in Pass Books, Credit Debit/ATM card frauds, Ledger entries, Withdrawal slips, Cheques, Documents for loan, Bank guarantee, Corporate frauds and banking frauds-Case studies.

**Unit – II**

Difference between audit and investigations, skills of a fraud investigator, conducting fraud investigation. Investigation of external fraud schemes-corporate espionage, investment schemes, pyramid or Ponzi schemes, securities fraud, hidden income or assets, insurance fraud and bankruptcy fraud, evaluating frauds, fraud deterrence, money laundering, types of money laundering. Case studies, investigative techniques- corporate background checks, individual background checks, digital data analysis, computer forensics, interviewing witnesses and suspects, confirmation with customers and vendors. File maintenance and professional standards.

**Unit – III**

Investigation of asset misappropriation schemes- cash receipt schemes, disbursement schemes, non-cash schemes- investigation of financial statement frauds, revenue overstatement, asset overstatement, liability and expense understatement, reserve manipulation, misrepresentation or omission of information, improper recording of mergers and acquisitions, off- balance sheet items, forensic data analytics and tools available for background checks. Scrutiny of forensic documents. Fraud deterrence. Forensic discovery and analysis of digital evidence.

**Unit – IV**

Reporting and Litigation- Background information, Investigation procedures, opinion, attachments, draft reports. Preparing for testimony, Deposition testimony, Trial testimony & other issues in moving forward as a company. Preventing future frauds, marketing a fraud investigation practice, Litigation processes and examination of financial records.

**Reference Books:**


Semester- III, Paper – III
M.Sc. Forensic Science
MSFS304B– Digital & Security Documents

Unit – I


Unit – II

Examination of judicial/ non-judicial stamp papers, revenue stamps, postal stamps and special stamps and their security features- watermarks, wire marks, UV features, security fibers, security thread, perforations and high-quality printing. Methods of detection of forged stamp papers/security documents. Examination of the security features of plastic cards- credit cards, debit card, PAN card, Aadhar card, smart card and other plastic cards. Methods of detection of fake plastic cards, electronic transactions. Case studies.

Unit – III


Unit – IV
Quality management in document laboratory, safety management in document laboratories, various formats used for recording, chain of custody, Laboratory examination and report writings, NABL guidelines for Accreditation of document laboratories, best practices in document laboratories. Report writing including different types of opinions on handwriting, mechanical impressions, computer printers, photocopies and alterations. Importance of no opinion and qualified opinion, marking of demonstrative photographs and preparation of juxta pose charts, reasons for opinion expressed, Debonair of expert in court room, examination in chief, cross examination by defense and cross examination by expert, moot courts and various court rulings.

**Reference Books:**


**Semester- III, Paper – V (Practical – I)**

**M.Sc. Forensic Science**

**MSFS391B – Handwriting and Mechanical Impressions**

1. Identification of normal / disguised writings.
2. Detection of various types of forgeries.
3. Examination of anonymous letters
5. Effect of writing instruments, posture and emotions on handwriting.

6. Examination of alterations, additions, obliterations, overwriting and erasures, secret writings.

7. Examination of rubber stamp impressions and other mechanical impressions.

8. Examination of typescripts.

9. Examination of charred documents and torn documents.

10. Examination of sequence of strokes.

**Semester- III, Paper – VI (Practical – II)**

**M.Sc. Forensic Science**

**MSFS392B – Examination of Electronically Printed Documents & Counterfeits**

1. Examination of computer printouts.

2. Examination of photocopies and scanned documents.

3. Examination of fax copies.


5. Examination of Travel Documents – Indian Passports and Visas.

6. Examination of Plastic Cards.

7. Examination of Stamp Papers and Lottery Tickets.

8. Determination of Relative Age of documents.

**Semester- III, Paper – VII (Practical – III)**

**M.Sc. Forensic Science**

**MSFS393B – Analysis of Digital Documents and Bank Instruments**

1. Pre-search consideration.

2. Imaging and Hashing of Digital Evidences.

3. Recovery of deleted files and folders from storage media and their analysis.

4. Automated signature verification system.
5. Preparation of synopsis

6. Various formats of writing of expert’s report and reasons thereof

7. Examination of judicial/non-judicial stamp paper.

8. Examination of Bank instruments.

**Semester- III, Paper – I**  
**M.Sc. Forensic Science**  
**MSFS301C – Advanced Digital Forensics**

**Unit – I – Digital Evidence Analysis**


**Unit – II – Windows Forensic**


**Unit – III – Linux and Mac Forensics**

Linux system and Artifacts – Use of built-in command line tools for forensic investigation – dd, dcfdisk, fdisk, mkfs, mount, unmount, md5sum, sha1sum, dmseg; Ownership and Permissions, Hidden files, User Accounts and Logs.
Mounting of hard disk having forensic image, Use of „FIND” command for searching and timeline analysis of files.

Mac OS system and Artifacts - System startup and services, Hidden directories, System Logs and user Artifacts.

**Unit – IV – Cloud and IoT Forensics**


Technical Dimension- Data Collection, Live Forensics, Evidence Segregation, virtualized environments and proactive measures. Organizational Dimension- Internal staffing, External Dependency Chains, Service Level Agreement, Multiple Jurisdictions and Tenancy. Investigative tools in the virtualized environment. Analysis- correlation, reconstruction, time synchronization, logs, metadata, timelines.

**Reference Books:**

Unit – I – Overview of Networking


Unit – II – Threats, Vulnerabilities and Attacks


Unit – III – Network Security


Unit – IV – Network Forensics


Reference Books:

7. Samir Datt; “Learning Network Forensics – Identify and Safeguard your Networks against both Internal and External Threats, hackers and malware attacks”, PACKT Publishing, 2016

**Semester- III, Paper – III**

**M.Sc. Forensic Science**

**MSFS303C – Mobile and Wireless Device Forensics**

**Unit – I – Introduction to Mobile and Wireless Technologies**

Asynchronous Transfer Mode (ATM), Wireless Application Protocol (WAP). Cellular technologies including Advanced Mobile Phone System (AMPS), Imode, Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) including features and relative strengths. Functions of Subscriber Identity Module (SIM), International Mobile Equipment Identity (IMEI), Bluetooth and Mobile Payment Gateways. Understanding of the mobile phone operating systems – Android, iOS, Windows.

**Unit – II – Mobile and Wireless Devices Security**


Unit – III – Overview of Mobile Forensics


Unit – IV – Android and iOS Device Forensics

Android Forensics – Procedures for handling android device, imaging android USB mass storage devices, Logical and physical data extraction techniques. Data recovery techniques. Forensic tools used. CDR and IPDR analysis.

iOS Forensics – File Systems, iOS architecture, Data stored in iPhones, Crosscontamination and Syncing, Data extraction - Extracting Image Geo-Tags, Data Analysis and Recovery - SQLite databases, Forensic Tools used.

Reference Books:


Semester- III, Paper – IV
M.Sc. Forensic Science
MSFS304C – Cyber Laws and Intellectual Property Rights
Unit – I


Unit – II


Unit – III


Unit – IV


Reference Books:

2. Vikas Vashishth.; “Law and practice of intellectual property in India”
8. The Copyright Act, 1957

Semester – III, Paper – V (Practical – I)
M.Sc. Forensic Science
MSFS391C – Advance Digital Forensics

1. Acquisition and Preservation of Volatile data from Standalone Computer.
2. Imaging of data storage media devices.
3. Recovery of deleted files and folders.
5. Windows Registry and Log Data Analysis
6. Investigation and analysis of slack space and ADS.
7. Password recovery of encrypted files and folders.
8. Tracking the source of emails.
10. Collection and analysis of evidence from Social Media.
11. Analysis of Malwares.

Semester- III, Paper – VI (Practical – II)
M.Sc. Forensic Science
MSFS392C– Network Security and Forensics

1. Port Scanning using Nmap.
2. Vulnerability Assessment using Vulnerability Scanner.
4. Working with Sniffers for monitoring network communications (Ethereal).
5. Performing Sniffers for monitoring network communications (Ethereal).
7. Man-in-the-middle attack using Ettercap and Driftnet.
8. Configuration of firewalls.
10. Collection of evidence from CCTV DVR.
12. Configuration of server security.

Semester- III, Paper – VII (Practical – III)
M.Sc. Forensic Science

MSFS393C – Mobile and Wireless Device Forensics

1. Analysis of evidences in mobile SIM cards, memory cards etc.
2. Call Details Record (CDR) analysis.
3. Internet Protocol Details Record (IPDR) analysis.
4. Tracking the present and past locations of a mobile phone.
5. Analysis of SQLite Databases.
6. Data Acquisition from Android Phones.
7. Analysis of extracted data in Android Phones.
8. Data Acquisition from iOS devices.
10. Password Cracking of Mobile Phones.
11. Analysis of mobile apps.
12. Cracking password of Wi-Fi routers

Elective Papers- MSFS-305
Semester- III, Elective Paper – I
M.Sc. Forensic Science
MSFS305A – Reconstruction of Crime Scene Involving Firearms

Unit – I

Reconstruction of Crime Scene Involving Firearms – Pre, during and post incident investigation, Scientific Method of Investigation.

Importance of firearm and ammunition involved in crime, various types of firearms and ammunition.

Country-made/Improvised firearms, Imitation firearms.
Unit – II

Importance of internal and external ballistics for reconstruction. Theories of internal ballistics, velocity-space curve, pressure-space curve, maximum pressure, muzzle velocity.

Trajectory calculations, Air-resistance, Ballistic Tables, Linkage of fired ammunition with suspected firearms, estimation of range of firing.

Unit – III

Terminal Ballistic and Wound Ballistics. Impact of bullet on various targets like wall, glass, furniture, etc. Traces carried by bullets, ricochet phenomena, passage of bullets in glass.

Gun-shot injuries caused by different firearms, identification of injuries, wounds of entrance, exit and bullet track, direction of firing, number of rounds fired, etc. Relative positions of accused and victims.

Unit – IV

Case studies pertaining to Forensic Ballistics

Reference Books:


Semester- III, Elective Paper – II
M.Sc. Forensic Science
MSFS305B – Allied Problems in Forensic Document Examination

Unit – I

Non-destructive, and destructive methods of examination of forensic documents, document consciousness. Examination of charred and torn documents, Paper and inks-Types of writing papers, paper fibers, ingredients of paper, tagging materials. Writing inks-carbon inks, fountain pen inks, ball point pen inks, fiber tip pen ink and gel pen inks and their composition, and their analysis Types of writing instruments and their features.

Unit – II

Various writing features- terminology and definitions. principles of handwriting identifications. General and individual writing features and their definitions, Importance of natural variations and disguise in writings, Effect of various external factors on hand writings- e.g. writing instruments, emotions, illness, posture and intoxication on handwriting. Types of forgeries-Inherent signs of genuineness and forgery. Genuine and forged writings /signatures. Digitally manipulated computer printouts, Simon New Comb theory of probability, Examination of anonymous letters and identification of its sender, forensic stylistics and its application in personal identification.

Unit – III

Types of mechanical impressions- rubber stamp impressions, seal impressions, embossed impressions, indentations, obliterations, additions, overwriting, mechanical and chemical erasures and secret writings, steganography, case studies, Principles and working of standard type writers, classification of standard type writers, Check writers and their identification, features of main machine and fonts. Working and examination of electric, electronic and daisywheel printer, high speed mainframe line printer (drum and chain print heads), Cheque writers, identification of typist of typescripts.

Unit – IV

Working principles and examination of Computer printouts, dot matrix, ink jet and laser jet printouts. Principle and Working of different conventional printing

Reference Books:


Semester- III, Elective Paper – III
M.Sc. Forensic Science
MSFS305C – Post Blast Investigation Techniques

Unit – I – Introduction to Effects of Explosions


Unit – II – Improvised Explosive Devices
Introduction to IEDs, Categories of IEDs and their delivery, Bomb Threats, Bomb threat checklist, Initial response to Bomb scene, Explosive Detectors, Seat of Explosion team, Photographer, Physical Evidence and Discovery Search team, Finger-print expert, Evidence Custodian, Immediate area investigative team, Communications Liaisons, Media Relations and Final survey.

**Unit – III – Bomb Scene Investigation**

Crime Scene Documentation, Search of crime Scene, Collection and preservation of residues and Blast Materials from crime scene and their safety handing, Role of Bomb Squad, Use of field kit for detection of explosives or explosion residues, Evaluation, Assessment and Reconstruction of sequence of events and preparation of reports, Presentation of Evidence in the Court of Law, Queries of Investigating Officers.

**Unit – IV – Suspect Identification**

Bombing Signature, Sequence of events, Damage caused, IEDs used in the blast, Location of the IEDs, Initiating Device, Footprint, Fingerprint, Sources of Information, Preliminary Reports, Police Reports, Technician’s Reports, Forensic Laboratory Reports, Photographs, Diagrams, Sketches, Formal Statements, Press Release, Newspaper Articles, Intelligence Reports, Victim of the blast as suspect.

**Reference Books:**

2. Saferstein R; “Criminalistics: An Introduction to forensic Science”.

**Semester- III, Elective Paper – IV**

**M.Sc. Forensic Science**

**MSFS305D – Forensic Evidence in Crime against Human Body**

**Unit – I – Scientific Investigation in Murder, Assault, Accident and Death due to fall from height**

Observation at the scene of crime and human body for the evidence materials likely to be found, their collection, preservation and packaging. Queries to be raised to the medico-legal expert and forensic expert. Discussion on Illustrative cases

**Unit – II – Scientific Investigation in Sexual Offence cases**

Handling of Child or differently abled victim (if alive), Observation at the scene of crime for the evidence materials likely to be found, their collection, preservation and packaging. Queries to be raised to the medico-legal expert and forensic expert. Discussion on Illustrative cases.

**Unit – III – Scientific Investigation in Burning and Vitriolage cases**

Observation at the place of occurrence and body of victim for the evidence material likely to be found, their collection, preservation and packaging. Queries to be raised to the medico-legal expert and forensic expert. Distinguishing homicidal, suicidal and accidental burning. Differences between ante-mortem and post-mortem burns. Discussion on Illustrative cases.

**Unit – IV – Scientific Investigation in Drowning, Hanging and Strangulation cases**

Types of Drowning, Types of hanging, Observation at the place of occurrence and body of victim for the evidence material likely to be found, their collection, preservation and packaging. Queries to be raised to the medico-legal expert and forensic expert. Differences between hanging and strangulation, Differences between ante-mortem and post-mortem hanging. Discussion on Illustrative cases

**Reference Books:**

**Semester- III, Elective Paper – V**

**M.Sc. Forensic Science**

**MSFS305E – Photography and Forensic Image Analysis**

**Unit – I**

Principle in conventional and digital photography, Advantages and disadvantages of analog and digital photography.

Construction of digital image sensor, pixel, resolution and sharpness, ISO settings, etc., auto focusing, auto winding, burst modes in DSLR and DX coding systems, Photo editing and enhancement software, Digital image file formats.

**Unit – II**

Image processing, identification of digital/manipulated photograph, photogrammetry, radiography, photography using scientific equipment, demonstrative photography. Modern developments in photography, scanning and printing technologies.


**Unit – III**

Photography for presentation of evidence in the court of law.

Unit – IV


Reference Books:


Semester – III, Elective Paper – VI
M.Sc. Forensic Science
MSFS305F – Cyber Crime and IT ACT

Unit – I – Symmetric and Asymmetric Cryptosystem

Introduction to Symmetric and Asymmetric Cryptosystems. Introduction to Cryptanalysis - Differential Cryptanalysis, Linear Cryptanalysis.
Various types of attacks including Cipher Text-Only attack, Known-Plaintext Attack, Chosen-Plaintext Attack, Chosen-Cipher Text Attack.

**Unit – II – Internet Security and Cryptanalysis**


**Unit – III – Introduction to Information Security Audit**

Importance of ISO 27001 & other auditing standards for IT, IS Auditing Standards, IS Auditing Guidelines, Classification of Audits, Audit Programs and Audit methodology, Communication of Audit Results, Audit report Structure and Contents, Requirements for Audit Documentation, Cyber Security Auditors empanelment by CERT-In.

**Unit – IV – Risk Management**


**Reference Books:**


Semester- III, Elective Paper – VII
M.Sc. Forensic Science
MSFS305G – Criminal Justice System

Unit – I – Criminology

Concept, Nature and Scope of criminology, Historical development of Criminology, Criminology and other social sciences, Criminology and criminal justice system.

Unit – II – Crime

Definition of crime (social, legal and psychological), Sin, Tort and Deviance, Crime in ancient and medieval India, Crime in modern India, General and casual factors of crime.

Unit – III – Criminal Typologies and Crime Trends

Criminal Typologies, Crime correlates- Age, Gender and Media.


Unit – IV – Introduction Criminal Justice System

CJS: Concept, Development and Purpose, Accusatorial and Inquisitorial Models of Criminal, Justice System; Reforms in CJS, Co-ordination in CJS.

Unit – V – Prosecution System

Meaning, Purpose and Relevance, Development & Relevance of Prosecution in India, Prosecution Organization in the States, Relationship between Police and Prosecution, Prosecution in Lower Court and Prosecution in Appellate.
Reference Books:


Semester- III, Elective Paper – VIII
M.Sc. Forensic Science
MSFS305H – Policing and Law Enforcement

Unit – I – Fundamentals of Police Administration

History of Police and Policing in Modern India (1857 onwards), Role of Police in Independent India, Constitutional provisions regarding police in India.

Unit – II – Organization and Structure of Indian Police

Unit – III – Police Investigation: Procedures and Function

Executive powers and duties of police officers in the investigation of crime, Procedure in investigation, Investigation of crimes and relations with Courts/Magistrate, Specialties of Investigation – Homicides, Property Offences, Crimes against women, Economic Offences, Communal violence, Custodial violence, Cybercrime. Use of technology in crime, investigation. Citizen’s rights during investigation.

Unit – IV – Image of Police

Police Sub-culture, Dimensions of Police accountability in India – Courts, Executive Magistrates, State Government, UNCAC, Citizens/Community. Police public Relations in India and Abroad – Peace Committee, Village Police system, Koban (Japan), Police Board (UK), Sheriff (USA). Need for improving police image, Programmes for redressal of public grievances, Judicial Trend: The Supreme Court on Policing.

Unit – V – Case Connection

How to investigate and write case report.

Reference Books:

13. Indian Police Journal published by Bureau of Police Research and Development.

Fourth Semester
Unit – I – Introduction to Research Methodology

Research Methodology- Introduction, Types of Research (Basic, Applied, & Need based), Importance.

Essential Steps in Research- Identifying and defining the problem, Research Project planning, Information Sources- Scientific Journals, Periodicals, books and other publications. Design of the Experimental Hypothesis, Variables in the Experiment, Evolution and Application of different techniques, Evaluation of Results, Comparison with existing methodologies, Validation of findings.

Need for Literature Review, Fallacy of scenario building, falsification and verification, formulation of research questions, Scope for future research.
Different systems of Citing References- Harvard system, Vancouver system, Chicago system, MLA and APA system, Footnote Reference system.

Introduction to research report & its components, typing and formatting of research report including placement and numbering of figures and tables. Ethical issues in conducting research.

Unit – II – Research Modeling and Experimental Design


Experimental Design: Introduction, observation, basic principle of experiments, experimental error, replication, generalization, controls, randomization, measurement, a few common experimental designs. Application of computer in research- MS- Office and SPSS.

Unit – III – Basics of Communication and Presentation Skills


Presentation Skills, Interviews, Public Speaking, Preparing the Speech, Organizing the Speech, Special Occasion Speeches, Group Discussion.

Unit – IV – Writing Skills

Types of writings (Expository, Descriptive, Analytic, Argumentative, Narrative etc.) and their main features; Memos and Notices; Formal Report, Writing of Expert opinion and use of appropriate terminology & words, Writing of Worksheets.
Scientific and Impersonal Attitude; Plain Statements, Definitions; Description and Explanations (of objects, instruments, Processes, Scientific Principles, etc.), Interpretation and use of charts, graphs and tables in technical writing.

**Reference Books:**


**Semester- IV, Paper – II**

**MSFS-491 Dissertation**

**M.Sc. Forensic Science**

Project work and case base studies in subject areas and need based problem studies within the forensic science specialization areas.

**Semester- IV, Paper – III**

**MSFS-492 Internship**

**M.Sc. Forensic Science**

Handling of Forensic Science Evidences from Crime Scene to Court Room and cases studies through expert contact and internship.