# SCHEME OF EXAMINATION M.SC. FORENSIC SCIENCE

(4 SEMESTER COURSE)

TO BE IMPLEMENTED FROM THE SESSION 2013-2014 IN PHASED MANNER

<table>
<thead>
<tr>
<th>SEMESTER – I</th>
<th>Ext. Marks</th>
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<tbody>
<tr>
<td>Paper-F.Sc.-I</td>
<td>General Forensic Science</td>
<td>75</td>
<td>15</td>
<td>90</td>
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<tr>
<td>Paper- F.Sc.-II</td>
<td>Instrumental Analysis (Physical)</td>
<td>75</td>
<td>15</td>
<td>90</td>
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<tr>
<td>Paper- F.Sc.-III</td>
<td>Forensic Biology</td>
<td>75</td>
<td>15</td>
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<tr>
<td>Paper- F.Sc.-IV</td>
<td>Forensic Chemistry and Toxicology</td>
<td>75</td>
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<tr>
<td>Paper- F.Sc.-V</td>
<td>Practical based on F.Sc.-I &amp; F.Sc.-II</td>
<td>Examination to be held annually along with paper F.Sc. XI</td>
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<tr>
<td>Paper- F.Sc.-VI</td>
<td>Practical based on F.Sc.-III &amp; F.Sc.-IV</td>
<td>Examination to be held annually along with paper F.Sc. XII</td>
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<tr>
<td>Paper-F.Sc.-VII</td>
<td>Forensic Serology</td>
<td>75</td>
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<tr>
<td>Paper- F.Sc.-VIII</td>
<td>Instrumental Analysis (Biochemical)</td>
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<td>Paper- F.Sc.-IX</td>
<td>Document Forensics</td>
<td>75</td>
<td>15</td>
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<tr>
<td>Paper- F.Sc.-X</td>
<td>Finger Prints &amp; Impressions</td>
<td>75</td>
<td>15</td>
<td>90</td>
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<td>Paper- F.Sc.-XI</td>
<td>Practical based on F.Sc.-V, F.Sc.-VII &amp; F.Sc.-VIII</td>
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<td>Paper- F.Sc.-XII</td>
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<tr>
<td>Paper-F.Sc.-XIII</td>
<td>Ballistics and Fire arms</td>
<td>75</td>
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<td>Paper-F.Sc.-XIV</td>
<td>Forensic Psychology</td>
<td>75</td>
<td>15</td>
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<tr>
<td>Paper-F.Sc.-XV</td>
<td>DNA Profiling</td>
<td>75</td>
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<td>Paper-F.Sc.-XVI</td>
<td>Recent Advances in Forensics</td>
<td>75</td>
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<td>Paper-F.Sc.-XVII</td>
<td>Practical based on F.Sc. XIII &amp; XIV</td>
<td>Examination to be held annually in Semester – IV</td>
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<td>Practical based on F.Sc. XV &amp; XVI</td>
<td>Examination to be held annually in Semester – IV</td>
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<td>Training and Project Report</td>
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<td>Project Report Evaluation (Viva-Voce)</td>
<td>50</td>
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<td><strong>Total</strong></td>
<td>460</td>
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A

I. **Forensic Science**: Introduction, definition, Scope and branches of forensic science. Basic principles of forensic science. Organizational set up of Forensic Science Laboratories – Central F.S.L. and State F.S.L.

II. **Crime Scene Investigation**: Crime scene characteristics, sketching, photography, location, collection and preservation of exhibits/evidences. Physical evidence; types, significance and analysis. Constitution of validity of Forensic evidence.

III. Investigation of sexual offenses.

IV. **Photography**: Basic principles and techniques, exposing, developing and printing. Recent developments in photography, digital photography, videography, crime scene photography and laboratory photography.

V. **Medical Jurisprudence**: History of Forensic Medicine, Legal procedure in criminal courts, medical evidence, and medical witness, legal and Ethical Aspects of Medical practice, Medicolegal aspects of death causes.

VI. **Report Writing and Evidence Evaluation**: Components of reports and reports formats in respect of crime scene and lab, findings, court testimony, admissibility of expert testimony, pre-court preparation and court appearance.

**Suggested Books**

PAPER-F.Sc.-II : INSTRUMENTAL ANALYSIS (PHYSICAL)

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A


II. Spectrophotometery : Basic principles of spectrophotometery, UV-Visible, spectroscopy, Fluorescence and Phosphorescence Spectrophotometery, Atomic absorption Spectroscopy, NMR Spectroscopy, Mass Spectroscopy; Infrared Spectrophotometery, their forensic applications.

B

III. Basic Principles of Electrophoreses, Electrophoretic, techniques; immunoelectrophoresis, isoelectric focusing.

IV. Chromatography: Basic principles, Instrumentation and theory of thin layer chromatography, Gas chromatography and liquid chromatography and their forensic applications.

V. Centrifugation, cold and ultracentrifuges basic principle, instrumentation, G-value & relationship between RPM & g., applications of analytical centrifugation.

VI. Computers: Introduction, History of Digital computer, computer programming, computer scanners, imaging softwares (Photo paint, Photoshop etc.), software piracy; Networked cyber crimes; unauthorized access, hacking, computer viruses, computer security, internet applications in forensic science; concept, meaning and attributes of cyber space

Suggested Books
PAPER-F.Sc.-III : FORENSIC BIOLOGY

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. Fundamentals of Biology, Biological Evidence: Nature, location, collection, identification, evaluation and importance of hair, fibres, grains, seeds, leaves, wood, diatoms etc. Role of Forensic Biologists.

II. Wildlife Forensics: Wildlife species in traditional medicine, trade in wild life material, identification of pugmarks of various animals. Forensic Entomology: Insects of Forensic Importance, role of insects in forensic investigations, collection of entomological evidence from scene of crime, Forensic entomologist as expert witness. Legal perspectives of wildlife and agricultural cases.

III. Semen composition, function and morphology of spermatozoa, sex determination and y chromosome, heterochromatin, autosomal genes in male sex determination. Forensic significance of semen evaluation & tests for identification.

B

IV. Forensic Anthropology: Human skeleton, comparative skeletal anatomy of domestic and wild animals (dog, cat, monkey, camel, fowl, frog etc.); Identification of bones, age and sex determination from skeletal remains.

V. Forensic Odontology: Comparative anatomy of teeth, types, and functions of teeth, congenital abnormalities and diseases of teeth – their significance in personal identification; collection, preservation and forensic significance of bite marks.


Suggested Books
1. Chowdhri, S., Forensic Biology B.P.R. &D, Govt. of India.
Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsary. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

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I. Introduction to Forensic Chemistry, Colour & Spot test, inorganic analysis, micro-chemical methods of analysis, analysis of beverages, alcoholic & non-alcoholic, medicinal preparations containing alcohol and drugs as constituents, examination of petroleum products.

II. Chemistry of fire, Analysis of trace evidence – cosmetics dyes, paints pigments, quantitative and qualitative forensic analysis of organic and inorganic industrial products, chemical fertilizers, insecticides, metallic & non-metallic products.

III. Toxico-kinetics, Biotransformation, cellular sites of action, Reproductive toxicology and teratology, Respiratory toxicology, cardiovascular toxicology, Hepatic toxicology, Immunotoxicology.

B

IV. Forensic Toxicology: Poisons, classification of poisons, sign and symptoms of common poisons, antidotes, collection of samples.

V. Drugs: Drugs of abuse, classification and identification. Nacro analysis and brain fingerprinting techniques.

VI. Explosives: Classification, composition and characteristics of explosives, pyrotechniques, IEDs, explosion process and affects, types of hazards, effect of blast waves on structure.

Suggested Books


PAPER-F.Sc.-V: (PRACTICALS BASED ON PAPERS-F.Sc.-I & F.Sc.-II)

(Examination to be held annually along with Paper: F.Sc.-XI)

I. Demonstration of crime scene and laboratory photography.

II. Sketching and preservation of mock crime scene.

III. Report Writing in respect of crime scene.

IV. Various types of microscopes – their components and working.

V. Introduction and practical demonstration of spectrophotometers, electrophoretic apparatus, chromatography.

VI. Electrophoretic techniques – Preparations of gels, media, buffers and determinations of enzymes polymorphisms.

VII. Computer: Introduction, use of scanners, imaging softwares and internet.

VIII. Estimation of pigments by spectrophotometry.

IX. Chemical analysis poisons, beverages collection of forensic evidences from scene of crime:
   (a) Biological
   (b) Physical
PAPER-F.Sc.-VI : (PRACTICALS BASED ON PAPERS F.Sc.-III & F.Sc.-IV)
(Examination to be held annually along with Paper-F.Sc.-XII)

I. Study of human hair and comparison of hair from different parts of body/feathers of birds/plants fibers.

II. Study of life history of insects of Forensic importance.

III. Identification and study of human skeleton and skeleton of other animals.

IV. Study of Dentition types and comparison of bite marks.

V. Study of symptoms of common poisons.

VI. Analysis of presence of toxicants like pesticides etc. from samples.

VII. Visit to Forensic Science laboratory and preparation of report.

VIII. Acid phosphates test for semen testing.

IX. Fructose test of semen.

X. Morphology of spermatozoa/sperm count.

XI. Techniques to study drumstics and barr bodies.
Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. Human blood groups: Introduction, ABO blood group system, and grouping methods, ABO subgroups, inheritance of ABO groups, blood group specific substances in tissues and body fluids.

II. Rh system: Rh blood group system and Rh typing methods, ant-D antibodies detection methods, Rh antigens and inheritance, Rh sub-typing, Rh genes and antigens.

III. ABO variants: Rare alleles, genes modifying the expression of A and B genes, Cis AB, biochemistry of ABO system.

IV. Other blood group systems: MN, Ss, Kell, Duffy, Kid systems etc., red cell agglutination phenomena: Auto-, Bacterigenic, Pan and Pseudo-agglutination.

B

V. HLA system: Genetics and nomenclature, tissue typing and screening for HLA antibodies.

VI. Forensics applications of blood groups: Cases of doubtful paternity – General principles, blood group systems used in problems of parentage; suitability and reliability of results; identification of stains from individuals, grouping of blood stains, detectable blood group markers in blood stains, deterioration of blood stains.

VII. Procedure in case work; grouping of stains from other body fluids, mixture of stains, ABH grouping from body fragments.

Suggested Books
PAPER-F.Sc.-VIII : INSTRUMENTAL ANALYSIS (BIOCHEMICAL)

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. General Principles of Biological/Biochemical Analysis, Enzyme techniques, Immunochemical techniques, Radio chemical techniques.

II. Microscopic and microbiological techniques, identification of microscopic organisms, sterilization, Media preparation, standard plate count technique.

III. Diatoms identification, isolation and forensic significance.

B

IV. Human lymphocyte culture techniques: Design and working of tissue culture laboratory, culture media preparation, short term culture, cell harvesting, flow cytometry, automated karyotyping with image analysis.

V. Principle of Polygraph, method of lie detection.

VI. Molecular biology techniques, preparation of culture media, isolation of DNA, RNA, purification, restriction, amplification, PCR, estimation & PCR.

VII. Immunochemical techniques, immunodiagnostics, RIA, Elisa, Elispot, Immuno-histochemistry.

Suggested Books
Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. Document Examination, Classification. Ways of procurement handling and marking of documents various types of documents – genuine and forged documents, holographic documents, basic tools needed for forensic documents examination and their use.

II. Handwriting: characteristics, identification, and analysis of handwriting, examinations of signatures – characteristics of genuine and forged signatures.

III. Examination of travel documents and prediction of printers and printing devices (Typewriters).

B

IV. Examination of built up documents, various types of forgeries and their detection, various types of printing of security documents, examination of counterfeit currency notes.

V. Determination of age of Documents, forensic linguistics and an introduction to computer forensics. Examination of built up documents, printing & security documents.

VI. Discovery of facts by comparison with known material, prevention and collection of handwriting standards, care, handling and preservation of documents, reproduction of documents, preparation for trail.

Suggested Books


PAPER-F.Sc.-X : FINGER PRINTS AND IMPRESSIONS

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. History and Development of Fingerprints, classification of fingerprints, Henry system and single digit classification, formation of ridges pattern types and areas, fingerprint Bureau.

II. Chance fingerprints, latent and visible fingerprints, methods of development of fingerprints (Conventional methods). Taking of fingerprints from living and dead persons, preserving, lifting, photography, digital transmission and comparison of fingerprints, Automatic fingerprint identification system.

III. Dermatoglyphics and clinical disorders.

B

IV. Foot Prints: Gait pattern, casting of foot prints, lifting of latent foot prints.
V. Lip prints: nature, location, collection and evaluation.
VI. Ear prints: Forensic significance, location, collection & evaluation.
VII. Examination of handwriting, seal impression and other mechanical impressions.

Suggested Books
PAPER-F.Sc.-XI : (PRACTICALS BASED ON PAPERS V, VII & VIII)
(Examination of papers F.Sc.-V & F.Sc.-XI)

Total Marks: 100
Practical Examination : 80
Internal Assessment : 20
Time: 6 Hours

I. Demonstration of ABO and Rh blood groups from whole blood.

II. Examination of dried blood stains – identification and grouping.

III. Extraction of DNA from blood, determination of DNA concentration and restriction enzyme digestion.

IV. Nuclear sexing from blood smears.

V. Short-term human lymphocyte culture and preparation of karyotype.

VI. Preparation of media sterilization techniques maintenance of microbial culture and standard plate count.

VII. Estimation & identification of diatoms.
PAPER – XII : (PRACTICALS BASED ON PAPERS VI, IX & X)
(Examination of papers F.Sc.-VI & F.Sc.-XII)

Total Marks: 100
Practical Examination : 80
Internal Assessment : 20
Time: 6 Hours

I. Comparison of hand-writing in cases of forgery.

II. Examination of additions, alterations and obliterations in the documents.

III. Identification of writing inks by TLC.

IV. Finger print lifting from scene of crime; study and comparison of fingerprints.

V. Footprint casting and lifting of foot prints, comparison of foot prints.

VI. Collection and evaluation of lip-prints.

VII. Detection of counterfeit currency notes.

VIII. Stereomicroscopy of handwriting – 3D study.

IX. Casting & study of tyre impressions.
SEMESTER – III

PAPER-F.Sc.-XIII : BALLISTICS AND FIRE ARMS

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. Definition and background of Ballistics (internal and external ballistics), size, shape and ignition of propellants, factors affecting ballistics, ballistics coefficient and limiting velocity, Ballistics tables, measurements of trajectory parameters.

II. Terminal Ballistics, wound ballistics, their characteristics, methods of measurement, velocity and evaluation.

III. Analysis of shooting incidents: Theory of shooting reconstruction, mathematics of shooting reconstruction, Ejector pattern testing, shot pattern testing, function testing, determination of accuracy, Gun shot reside testing, bullet entry characteristics in tissue and clothing, blood on or in weapons, ricochet phenomena, bullet penetration phenomena. Legal aspect : case studies and relevant provisions of Arms Act, 1959.

B

IV. History and background of fire arms, their classification and characteristics, components of small arms, different systems and their functions, various, class characteristics, purpose and type of rifling cartridge fining mechanism.

V. Identification of origin, improvised/ country made / imitative fire arms and their constructional features.

VI. Classification and constructional features of different types of cartridges, ammunition, definition and types, various types of bullets and compositional aspects. Legal aspects of Ammunition.

Suggested Books
PAPER-F.Sc.-XIV : FORENSIC PSYCHOLOGY

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. Introduction to Forensic Psychology; scope & ethics; concepts, debates and practice, distinction between Forensic and therapeutic evaluation.

II. Public perceptions of Crime and Punishment status of sensational interests as indicator of possible risk.

III. Principle of Polygraph, methods of lie detection.

B

IV. Forensic Psychology Practice: Malingering, Competency evaluation, sanity evaluations, sentence mitigation, other evaluations, ethical implications, delinquency. Legal aspect of forensic psychology practice.

V. Domestic violence current issues in definitions and intervention.

VI. Genetic basis of Psychology.

VII. Brain fingerprinting techniques.

Suggested Books


PAPER-F.Sc.-XV : DNA PROFILING

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

Note:
1. Nine questions will be set in all.
2. Question No. 1, which will be objective/short answer type cover the entire syllabus, will be compulsory. The remaining eight questions will be set section wise selecting four questions from each section (A & B). The candidate will be required to attempt question No. 1 and four more selecting two questions from each section.
3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. The basics: Flow of genetic information, Topology of DNA; Satellite DNA, mini satellite, DNA and micro satellite DNA, Enzymes used in molecular genetics.

II. Blotting techniques: Southern, Northern, Western, dot-, slot- and vacuum blotting.

III. PCR: Basic features, types and applications.

IV. Basic Genotyping: SNPs and VNTR polymorphism and other classes of DNA polymorphism.

B

V. DNA Fingerprinting (DEP) technology: An overview, Applications of DFP in forensic investigations, zygosity determination, paternity disputes and other applications; DNA Profiling practice in India with special reference to criminal cases. Quality assurance measures of DFP technology.

VI. Nucleic acid hybridization: Preparation of nucleic acid probes for DNA profiling – Single locus and multilocus probes, and cDNA probes; Methods of labeling DNA – Radioactive and non-radioactive labeling; Principles of autoradiography; principles of nucleic acid hybridization and various assays. DNA Micro array technology.

VII. Analyzing DNA: sequencing, dideoxysequencing, Automated DNA sequencing and Micro array based re-sequencing.

Suggested Books
2. Kirby, DNA Fingerprinting Technology.
PAPER-F.Sc.-XVI : RECENT ADVANCES IN FORENSICS

Total Marks : 90
Theory Exam. Marks : 75
Internal Assessment : 15
Time : 3 hours

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3. As far as possible the questions should be divided into sub-parts and marks indicated part wise.

A

I. **Cyber Forensics:** Cyber law, common principles, classification of Cyber Crime and Law, Investigation of Cyber Crime, Search and Seizure of computer system, computer based evidence and Jurisdiction.

II. Fundamentals of Computer Security, Risk assessment and mitigation; Developing Secure computer system, security models, damage control, assessment and auditing, network security.

III. **Speaker and Tape authentication:** Voice production theory-vocal anatomy, speech signal processing and pattern recognition, basic factors of sound in speech, acoustics characteristics of speech signal.

B

IV. Intellectual property protection, policy relevant to information technology companies in India, Obscurity and Pornography on the Internet.

V. Forensic Art Illustration: Introduction, human face, drawing the face, finding and identifying the living, image assessment and modification, post mortem drawing, methods of superimposition, professional ethics and conduct, dealing with news media, forensic artist in court.

VI. **Fatality Forensics:** Introduction, cause, manner and characteristics of death, RTF investigation versus RTF reconstruction, Jurisdictional and Statutory considerations: Basic events; general classification of RTFs; Basic injury mechanisms.

**Suggested Books**

I. Characteristics of Firearms: Calibre, choke, trigger, pull, proof marks etc.

II. Examination and comparison of fired bullets: Calibre, rifling characteristics, probable type of firearms.

III. Chemical tests for powder residues (worker’s test) and Barrel wash.

IV. Detection of lie using Poly graph.

V. Ejector pattern testing.

VI. Shot pattern testing.

VII. Bullet entry characteristics in tissue & clothing.
PAPER-F.Sc.-XVIII : (PRACTICALS BASED ON PAPERS F.Sc.-XV & F.Sc.-XVI)
(Examinations to be held in Semester IV on annual basis)

I. Nuclear Sexing from blood smears.

II. Extraction of DNA

III. PCR amplification and gel electrophoresis.

IV. Survey of human genetic traits and calculation of allele frequencies.

V. Southern and Western blotting

VI. Case study of cyber crime: Report writing and evaluation.

**SEMESTER – IV**

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<td>80</td>
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<td>Paper-F.Sc.-XIX</td>
<td>Training and Project Report</td>
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