

KURUKSHETRA UNIVERSITY KURUKSHETRA

Syllabus for M.Sc. (5-Year Integrated) Forensic Science SEMESTER 5th and 6th

**Under Multiple Entry-Exit, Internship and
CBCS-LOCF in accordance to NEP-2020
w.e.f. 2025-26**

Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-5 MCC-9 4 credit (Scheme A, B&C)	23-FSC- 501	Fingerprints and Impressions	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn basic concepts of fingerprint science 2. Select appropriate chemical and physical techniques for fingerprint detection on various surfaces. 3. Record rolled and plain fingerprints using standard methods. 4. Utilize methods for casting, lifting, and enhancing impressions.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Fingerprints and Palm Prints: Fingerprints as evidence: History and Development of fingerprints, principles of fingerprints. Dermatoglyphics, formation of ridges, sweat glands, composition of Sweat, Fingerprints patterns, Pattern Areas. Classification of fingerprints-Henry System of classification, Single digit Classification, Extension of Henry system, Fingerprint Bureau. AFIS (Automated Fingerprint Identification System).							12
II	Development and recording of fingerprints: Search for Fingerprints, Chance Fingerprints, and Latent Fingerprints. Various methods of development of fingerprints: conventional methods, physical and chemical methods, florescent method, Magnetic Powder method, fuming method, physical developer. Application of laser and other radiations to develop latent fingerprints, metal deposition method and development of latent prints on skin. Taking fingerprints from living and dead persons, preserving and lifting of developed fingerprints, photography of fingerprints.							11
III	Evaluation of fingerprints: Ridge counting and ridge tracing, class and individual characteristics, various types of ridge characteristics. Third level detail, comparison of palm prints on the basis of individual ridge characteristics. Other Prints and Marks: Lip Prints- Nature, Location, collection and evaluation, taking control samples, Forensic Significance. Ear Prints- Nature, Location, collection and evaluation, taking control samples, Forensic Significance.							11
IV	Impressions and Prints: Footprints: class and individual characteristics of footprints, and Importance, Gait Pattern, Taking Control samples. Tyre Marks/ prints: introduction and characteristics, taking control samples, Forensic Significance. Collection, tracing, lifting, casting of impressions, enhancement of footwear impressions, analysis and							11

	comparison of foot impressions and molds.	
V Practical	Practical 1. Recording of Fingerprints Using Ink and Digital Methods. 2. Study and Classification of Fingerprint Patterns: Identification of loops, whorls, and arches 3. Ridge Detail and Minutiae Identification: Marking and naming minutiae points (e.g., bifurcation, ridge ending). 4. Ridge counting and tracing exercises. 5. To develop latent fingerprints with powders, fuming and chemical methods. 6. To preserve and lift developed Fingerprints. 7. To compare fingerprints.	30
Suggested Reading:		
1. Cammins H. and Middle C.: Fingerprints Palms & Soles, Dover Publications. 2. Bodariak W. J: Footwear Impression, Evidences, Elsevier Science Publication Co. New York. 3. Sharma B. R.: Footprints, Tracks and Trials, Central Law Agency, Allahabad. 4. James F. Cowger; Friction Ridge skin CRC Press London. 5. Mehta, M.K: Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi (P) Ltd, Bombay.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
MCC-10 4 credit (Scheme B&C)	B23-FSC-502	Analytical Techniques used in Forensic Science-II	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Understand various sample preparation techniques used in forensic analysis. 2. Learn and handle chromatographic techniques. 3. Learn different spectroscopic techniques used in forensic science. 4. Learn different spectroscopic techniques used in forensic science.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Sample Separation Techniques: General Idea and Basic Principle of Distillation and Various Types of Distillation Techniques. Centrifugation; Centrifuge and its Types. Filtration, Evaporation, and Crystallization. Solvent Extraction Techniques Like LLE, SPE, Micro SPE, and Distribution Law.							12
II	General Idea of Chromatography; Theory and Classification of Chromatography, Principles, Working and Forensic Application of Planer Chromatography; TLC, HPTLC. General Principles, Working and Forensic Application of Column Chromatography General Idea on Working of HPLC and GC.							11
III	Basic Concept of Atomic and Molecular spectra, Basic Principle, Instrumentation and Forensic Application of Ultraviolet-Visible and Infrared Spectroscopy. Basic Principle, Instrumentation and Forensic Application of Atomic Absorption/Emission. X-Ray Spectrometry.							11
IV	Mass spectroscopy: principle, working, and applications. Electrophoresis—Gel Electrophoresis, Isoelectric Focusing, and Capillary Electrophoresis: basic principles and applications.							11

V Practical	Practical 1. Isolation of Non-Volatile Poison by Solvent Extraction. 2. Extraction of Ethanol by Simple Distillation. 3. Measurement of Absorption maxima of organic solvent by UV Visible Spectrophotometer. 4. Calculation of Strength of some organic Solvent by UV Visible Spectrophotometer. 5. Demonstrate electrophoresis. 6. Separation of some dyes by Thin Layer Chromatography.	30
	Suggested Readings: 1. B.K. Sharma. Instrumental Methods of Chemical Analysis. Goel Publishing House, 26th Edition (2007) 2. G. Chatwal and S. Anand. Instrumental Methods of Chemical Analysis. 7th Edition Himalaya Publishing House	

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-2 4 credit Select one Option (Scheme B&C)	B23-FSC-503	Forensic Biology and Wildlife Forensics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. The significance of biological and serological evidence. 2. The forensic importance of hair evidence. 3. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations. 4. How wildlife forensics aid in conserving natural resources. 5. Examine the Biological and Wildlife evidence.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Biological Evidence Nature and importance of biological evidence - Significance of hair evidence. Transfer, persistence and recovery of hair evidence. Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair.							12
II	Types of Biological Evidence Types and identification of microbial organisms of forensic significance - Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance.							11
III	Wildlife Forensics Wildlife Forensics - Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants.							11
IV	Wildlife Evidence Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.							11
V Practical	Practical 1. To perform precipitin test for species of origin determination. 2. To perform an Immunodiffusion test for species of origin. 3. To determine blood groups from fresh blood and various body fluids with Absorption-inhibition, mixed agglutination, and absorption-elution techniques. 4. Crystal Tests for Blood. 5. To prepare gel plates for electrophoresis.							30

	6. Examination of diatoms. 7. Examination of hair of different animals such as cat, dog, cow, horse, and goat. 8. Blood Spatter Pattern Analysis. 9. Examination of Different types of woods	
--	---	--

Suggested Reading:

Suggested Readings:

1. Boorman, K. E.; Dodd, B. E. and Lincoln, P. J. (1988): Blood Group Serology. Churchill Livingstone.
2. Chatterjee, C. C. (1975): Human Physiology. CBS Publisher, India
3. Chowdhuri, S. (1971): Forensic Biology. B P R & D, Govt. of India.
4. Culliford, B. J. (1971): Examination and Typing of Blood Stains in the Crime Laboratory. US Dept. of Justice, Washington.
5. Dunsford, I.; Bowley, C. C. and Race, R. R. (1967): Blood Grouping Techniques. Oliver & Boyd, Edinburgh.
6. Eckert, W. G. and James, S.H. (1999): Interpretation of Blood Stain Evidence at Crime Scenes, 2nd ed. CRC Press, New York.
7. Giblet, E. R. (1969): Genetic Markers in Human Blood. Blackwell Scientific, Oxford.
8. Harris, H. and Hopkinson, D. A. (1976): Handbook of Enzyme Electrophoresis in Human Genetics. North Holland, Amsterdam.

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-2 4 credit Select one Option (Scheme B&C)	B23-FSC-504	Basics of Forensic Ballistics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
<u>Course Learning Outcomes (CLOs): At the end of the course the student should be able to:</u> 1. Identify firearms and their firing mechanisms. 2. Identify and characterised the fired and unfired ammunition. 3. Forensic identification and evaluation of firearm evidence. 4. Learn about the types and nature of firearm injuries. 5. Analyse gunshot residue.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Introduction to Forensic Ballistics: Basics concept of forensic ballistic, its definition, History and development of Forensic Ballistics, Role of Forensic Ballistics Expert. Introduction to firearms: Parts of firearms and its function, Firearm safety, Assembly and disassembly of firearms, Firearms characteristics & classification of firearms. Bore and caliber, choke, rifling – class characteristics of rifled bore. Rifled firearms, shot guns & Non-standard: Improvised, Country-made, Imitative firearms, identification of origin.							12
II	Introduction to Ammunition: Definition of Ammunition, Ammunition & its constructional parts, Introduction to Shotgun ammunition and Rifle Ammunition, Classifications of Ammunition based on constructional features, Bullet and its types, Case studies related to firearm cases. Indian Firearm Act: Introduction to Act, Basic concepts of chapters described in Act, Prohibited & Non-Prohibited Firearms calibres.							11
III	Types of ballistics & their aspects: Internal ballistics: General problems: Heat problems, Pressure, Recoil, Vibration & Jump, Barrel Fouling. External ballistics: Trajectory formation, Parameters involved in exterior ballistics. Terminal/Wound ballistics: Effect of projectile on target based on: nature of target, bullet shape, striking velocity, striking angle and nature of target, intermediate targets, range, etc., Basic concepts of wound ballistics Characterization & evaluation of firearm injuries.							11

IV	Identification of firearm and fired ammunition: principles, Class characteristics & Individual characteristics (Identifiable marks) produced during firing process on cartridge cases & projectiles and their linkage with firearms. Analysis of GSR –Composition of GSR, Location & Collection, Mechanism of formation, Chemical & Instrumental techniques involved in analysis, Shooter Identification Technique. Determination of range of fire & its related phenomena, Techniques involved in ballistic studies, Stereo and comparison microscopy, BDAS, IBIS.	11
V Practical	Practical 1. Characteristics of Firearms-Caliber, Choke, Trigger pull, and Proof marks. 2. Examination and comparison of the fired bullet with reference to caliber, and rifling characteristics. 3. Examination and comparison of fired cartridge case by comparison microscope 4. Determination of shot numbers from size and weight of shots 5. Identification of propellants 6. Chemical tests for powder residue and barrel wash 7. Determination of angle and direction of fire on different surfaces	30

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-3 4 credit Select one Option (Scheme B&C)	B23-FSC-505	Basics of Immunology and Serology	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Understand basics of immunology. 2. Learn about different immunological assays of forensic interest. 3. Examine blood evidences. 4. Examination, and evaluation of body fluids								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Overview of immunology: Phylogeny of immune system, Innate and acquired immunity, clonal nature of immune response, Cells and Organs of the immune system: Hematopoiesis and differentiation, B – Lymphocytes, T- Lymphocytes, Macrophages, Dendritic cells, Natural Killer cells, Lymphokine activated killer cells, Eosinophils, Neutrophils and Mast cells, Organization and structure of lymphoid organs; Structure and properties of Antigen and Antibodies; Types of Antibodies.							12
II	Immunological techniques: Antigen-Antibodies Interaction; Different techniques to study antigen-antibody interactions: Immunodiffusion, Radioimmunoassay, Immuno electrophoresis, ELISA, Immunohistochemistry, Flow cytometry, development of dot blot, development of monoclonal antibodies and polyclonal antibodies, hybridoma technology.							11
III	Basic forensic Serology: Blood and its composition, Hemoglobin and its variants, Blood Typing/Grouping - 'ABO' system and its significance in forensic investigation., Other blood group antigens - 'Rh sub types', MN, and Bombay blood group, Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption inhibition, Absorption-elution and mixed agglutination techniques, determination of secretor/nonsecretor tatus.							11
IV	Forensic Characterization of Semen: Formation, Composition, Morphology of spermatozoa, forensic significance, Presumptive and Confirmatory tests (including Azoospermic semen stains). Individualization (Blood Grouping, seminal fluid isozymes typing, forensic significance, Collection and analysis of evidences in Rape cases.							11

	Composition and Identification of other biological fluids like Saliva, Urine, and Vaginal secretion, and their forensic significance.	
V Practical	Practical 1. Identification of blood 2. Immunodiffusion 3. Perform ELISA 4. ABO TYPING from fresh blood, and dried blood stains 5. Perform tests for seminal stains. 6. Perform tests for saliva, urine, and menstrual blood stains	30

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-5								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-3 4 credits Select one Option (Scheme B&C)	B23-FSC-506	Advance Digital Forensics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to:								
- Learn various digital evidence and digital techniques. - Answer the legal questions on computer/cybercrime. - Explain Forensic Accounting, cyberspace, cryptography, encryption and their breakdown. - Understand about offences and penalties under Information Technology Act, 2000. - Compile reports & testify in the Court.								
Instructions for Paper-Setter - Nine questions will be set in all. All questions will carry equal marks. - Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Digital forensics: introduction of digital forensic, objective, various branches of digital forensic, digital crimes. Digital Evidence: types and sources of digital evidence, challenging aspects of digital evidence, computer image verification and authentication, Digital image watermarking and its application in forensic science, DOS and Windows boot process, how to recover deleted files, data recovery. Digital signature digital signature and authentication, digital signature generation and verification, certification of public keys, certification of authority.							12
II	Seizure of computers: Preparations to be made before seizure, Actions at the scene, Treatment of exhibits, bitstream (exact copies) of the original media, Establishing a case in computer forensics, Investigation: Investigating on various imaging methods. Instruction on the acquisition, collection and seizure of magnetic media. How to best acquire, collect or seize the various operating systems. qualities and ethics of good forensic investigator. Passwords and encryption techniques: Importance of keeping a log, Explanation of passwords keys and hashes. Steganography and cryptography: Introduction, types and use.							11

III	Computer Forensics in Forensic Accounting: Auditing and fraud detection, Internal fraud versus external fraud, Data mining and fraud detection, Fraud detection tools and techniques. Current Practice: Introduction, Secure boot, write blockers and forensic platforms, Disk file organization, Disk and file imaging and analysis, File deletion, media sanitization, Mobile telephones, Discovery of electronic evidence, Forensic tools, EnCase. ILook Investigator, CFIT, Emerging procedures and standards, Seizure and analysis of electronic evidence. Documenting and Reporting, Evaluation and Interpretation of Results, Reporting Conclusions, Case Records.	11
IV	Cyber law: Introduction to Disaster Recovery (DR) planning, Category to Cyber-crime, Cyber Law, IT Act 2000 and its amendments, International Cyber Laws, Cyber Ethics, Child Sexual Abuse Material related to cyber domain, various acts related to social media, privacy and security on cyber domain, Case Studies.	11
V Practical	Practical 1. To identify, seize and preserve digital evidence from crime scenes. 2. To detect deletions, obliterations and modifications of files using encase software. 3. To perform acquisition of any drive (HDD, SSD, USB) using FTKImager. 4. To use symmetric and asymmetric keys for protection of digital record. 5. To perform primary level analysis using HxDeditor. 6. Recovering and Inspecting deleted files using any tool. 7. To study and analyse web browsing history. 8. To study cache and cookies analysis.	30
Learning resources:		
1. Joakim et,al. Fundamentals of Digital Forensics, A Guide to Theory, Research and Applications. 2024. 2. A Practical Guide to Computer Forensics Investigations, 2015, by Darren R. Hayes.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
CC-6 MCC-11 4 credits (Scheme A, B&C)	B23-FSC-601	Computer Forensics and Biometrics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to:								
1. Learn Basics of computer crime. 2. Forensic analysis of different mobile device uses in crime. 3. Analysis of fabricated image and videos. 4. Understand concept of Network Security and Investigation 5. Learn about biometric systems.								
Instructions for Paper-Setter								
1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Introduction to Computers, Software, Hardware, Computer Input-Output Devices, Windows, Basic Computer Terminology, Internet, Networking, Computer Storage, Computer Ethics and Application Programs etc. Cyber Forensic Basics- Introduction to Cyber Forensics, Storage Fundamentals, File System Concepts, Data Recovery, Operating System Software.							12
II	Mobile forensic: definition, use, types of mobile operating systems, process of mobile device forensic, challenges associated with mobile phone forensics, data acquisition, tools for mobile forensic analysis, cloud data acquisition and physical data extraction. Video/Image Forensics- Video/image processing and enhancement, common image enhancement techniques, Video authentication, collection, handling and preservation of video files, Introduction to CCTV Forensics.							11
III	Computers and Networking: Concept of Network Security and Investigation, Basic of Security Planning, Intrusion Triangle, Removing Intrusion Opportunities, Importance of Physical Security, Work Station and Network Devices, Protection of Removable Storage Disks.							11
IV	Biometrics: Introduction to biometrics, Various types of biometric methods, Characteristics of biometrics, Advantages and disadvantages General Biometric System (Identification and Verification), difficulties in implementation of biometrics, Applications of biometrics.							11

V Practical	Practical 1. To identify, seize and preserve digital evidence from crime scenes. 2. To trace routes followed by e-mails and chats. 3. To identify the IP address of the sender of e-mails. 4. To demonstrate concealment techniques using cryptographic PGP. 5. To identify encrypted files. 6. To identify hidden files. 7. To use digital signatures for securing e-mail and online transactions. 8. To perform detailed analysis of Forensic Image using Forensic Toolkit. 9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards. 10. To carry out imaging of hard disks.	30
Learning Resources:		
1 R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, <i>Computer Crimes and Computer Forensics</i>, Select Publishers, New Delhi (2003). 2. Darren R. Hayes: Practical Guide to Computer Forensics Investigations, A (Pearson IT Cybersecurity Curriculum (ITCC)) 1st Edition. 3. William Oettinger: Learn Computer Forensics: A beginner's guide to searching, analysing, and securing digital evidence 1st Edition. 4. Harlan Carvey: Investigating Windows Systems 1st Edition.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
MCC-12 4 credit (Scheme B&C)	B23-FSC-602	Serology and DNA Forensics	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to:								
1. Understand basic of forensic serology. 2. Analyse different body fluids. 3. Understand the basic concepts of human genetics. 4. Understand the usefulness of genetic markers in forensic investigation. 5. Understand the legal importance of DNA profiling in various scenarios in India and abroad.								
Instructions for Paper-Setter								
1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Serology Introduction to forensic serology, Cell structure and functions. haemoglobin and its variants, haptoglobins, blood groups-history, biochemistry and genetics of ABO. Blood identification. Methods of ABO blood grouping from fresh blood and biological stains, body fluids, determination of secretor status, determination of origin of species.							12
II	Other body fluids Semen stains: introduction, composition of semen fluids, and forensic analysis. Identification Origin of Species: Determination of Human and Animal Origin Form Bones, Hair, Flesh, Nails, Skin, Teeth, Body Tissue, and body fluids, Vomit etc., Through Immuno-Diffusion and Immuno-Electrophoresis, Cross Reactivity Among Closely Related Species.							11
III	DNA Profiling Double helical structure of DNA, alternate forms of DNA double helix, denaturation and renaturation of DNA, DNA binding proteins, factors affecting DNA stability, types and structure of RNA. Chemical nature of DNA and RNA. Nature and structure of human genome and its diversity. mt-DNA, and Y-Chromosomes.							11
IV	DNA Polymorphism Concept of gene – Conventional and modern views. Concept of sequence variation - VNTRs, STRs, Mini STRs, SNPs. Detection techniques - RFLP, PCR amplifications, Amp-FLP, sequence polymorphism, Y-STR, Mitochondrial DNA. Disputed paternity cases. Missing person identity,							11

	population genetics and legal admissibility of DNA evidence.	
V Practical	Practical 1. Examination of blood stains: Physical and Chemical tests; spectroscopic examination 2. Examination of body fluids (Saliva, vomit, urine, semen, sweat) 3. Determination of species of origin from blood. 4. Blood grouping from fresh and dried blood stains 5. Determination of secretor status 6. DNA isolation from biological samples, quantitation and profiling	30
Learning Resources:		
1. Butler, J; Advanced Topics in Forensic DNA Typing: Methodology, 1st Ed., Academic Press, London, 2009. 2. Easteal, et al.; DNA Profiling: Principles, Pitfalls and Potential, Harwood Academic Publishers, New Jersey, 1991. 3. Primorac, D.& Schanfield, M; Forensic DNA Applications: An Interdisciplinary Perspective, CRC Press, New York, 2014. 4. Rudin, N. & Inman, K; An Introduction to Forensic DNA Analysis, Second Ed.,CRC press, New York, 2001. 5. Spencer, C; Genetic testimony: a guide to forensic DNA profiling, Pearson, New Delhi, 2004.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-4 4 credit Select one Option (Scheme B&C)	B23-FSC-603	Victimology	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Understand the basic of victimology. 2. Understand the theories of victim. 3. Understand different class of victims. 4. Learn basic principles of justice for victims of crime								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Victimology: Definition, Origin, Victimology in India. Role of Victim Crime, Types of Victims, Compensation to Victims, and Restitution.							12
II	Emerging Concerns for the Victims of Crime, three theories of victims- Precipitation theory, life style theory, and deviant place theory. Classification of Victims Victims of Sexual Offences Women as Victims of Dowry and Domestic Violence Ordinary Crime Victims.							11
III	Problems of Victims in the Criminal Justice System. Victims of Political Violence (Terrorism, Communal Violence, Caste Carnages etc. Victims of Environmental Pollution. Victims of Accidents.							11
IV	Victim Offender Relationship, Victim Surveys, Victim Offender Mediation Programs. UN Declaration on Basic Principles of Justice for Victims of Crime and Abuse of Power. Victimological Research in India.							11

V Practical	Practical 1. Field visit • police station. • Near jail • Juvenile court 2. Prepare case study report. 3. Practicing victim support. 4. Procedure to Interview the victim and interrogate the Suspect. 5. Procedure to conduct search and seizure operations. 6. Recording of Police Station records including FIR, GD, Charge Sheet etc.	30
	Learning Resources:	
	1. Chockalingam, M. 1985. Readings in Victimology. Madras. 2. Irwin Waller, 2010: Rights for Victims of Crime: Rebalancing justice. Rowman and Little Field Publisher, USA	

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-4 4 credit Select one Option (Scheme B&C)	B23-FSC-604	Forensic Photography	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn basics of photography. 2. Learn Machansin and working of digital photography. 3. Perform photography of forensic evidences. 4. Prepare Photographs for Court Presentation.								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Basics of forensic photography: History and development of forensic photography. Principles of Photography, black & white and color photography, types of cameras, camera lenses, shutter speed, white balance, depth of field, resolution, ISO, film, exposing, development, and scanners and printing techniques. Basics of Light and Optics: Light temperature and sources of light; Light intensity and angles; Fundamentals of optics in forensic photography.							12
II	Modern development in photography: Digital photography, components, working, and basic principles of digital camera; and accessories for forensic photography. UV, IR, fluorescence illumination guided photography; scale photography. Transmitted, and oblique light photography. Microphotography, and macrophotography.							11
III	Crime scene and evidence photography: principles, overall photograph, midrange photography, taking close up photograph, photography of footprints, tyre marks, blood stains, toolmarks and bite marks photography. Fingerprints photography. Photography of Motor Vehicle Accident Scene, and fire arson cases. Photographic Aspect of Physical Injuries, and Fatalities. Videography use of videography in forensic scene. Dron photography, Underwater and Surveillance photography.							11

IV	Photography in Forensics and Court Presentation: Digital photography software and file formats (jpg, gif, bmp, tiff, raw, etc.); Image enhancement techniques, photogrammetry, and digital watermarking; CCTV image enhancement and manipulation detection; Preparation of photographic evidence for court presentations and expert testimony.	11
V Practical	Practical 1. Handling of SLR/ Digital camera. 2. To perform Crime scene photography using the overall photography method. 3. To perform Mid-range photography techniques at a simulated crime scene. 4. To perform Close-up photography of physical and biological evidence. 5. Perform of UV and IR photography for evidence documentation. 6. Perform microphotography for diatoms, fiber, and hair. 7. Preparing a forensic photography report and presenting photographic evidence in a mock trial.	30
Learning Resources:		
1. Freeman, M. (2008). The Complete Guide to Digital Photography. 2. Gernsheim, H. (2016). A Concise History of Photography. Dover Publications. 3. Lark Books. Farrell, I. (2013). Complete Guide to Digital Photography. Quercus Publications. 4. Mancini, K. (2016). Fundamentals of Forensic Photography: Practical Techniques for Evidence Documentation on Location and in the Laboratory. CRC Press. 5. Marsh, N. (2014). Forensic Photography: A Practitioner's Guide. 6. Redsicker, D. R. (1994). The Practical Methodology of Forensic Photography. CRC Press. 7. Robinson, E. M. (2016). Crime Scene Photography (3rd ed.). Academic Press. 8. Weiss, S. (2009). Handbook of Forensic Photography. Academic Press.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-5 4 credit Select one Option (Scheme B&C)	B23-FSC-605	Forensic Pharmacology	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
<u>Course Learning Outcomes (CLOs):</u> At the end of the course the student should be able to: 1. Learn the basics of pharmacology. 2. Learn concepts of forensic pharmacology. 3. Understand the action of various drugs. 4. Pharmaceutical drugs analysis.								
Instructions for Paper-Setter 3. Nine questions will be set in all. All questions will carry equal marks. 4. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Basic Principles of Forensic Pharmacy: Introduction to Pharmacology and Forensic Pharmacy, Branches of Pharmacology, Scope of Forensic Pharmacy, Pharmacopoeias IP, USP, EP, pharmacognosy, pharmacovigilance. Nature and Source of drug, forms of drugs, classification of drugs, Prodrug and soft drug concept, Drug synthesis.							12
II	Concepts of Pharmacology: Pharmacokinetics, Route of administration of Drugs, distribution, elimination, Factor affecting the effects of Drug, Ferguson’s principle, Adverse drug reactions, Bioavailability, Bioequivalence and Bioaccumulation, drug half-life, Dose response relationship. Metabolism: Phase–I and Phase–II mechanism, different conjugates/prosthetic groups use in phase-II reaction, Pharmacokinetic drug interactions, various biological barriers.							11
III	Pharmacology of Different drugs: Pharmacology of neurotransmitters like GABA, Dopamine. Pharmacology of ethanol and methanol, amphetamines, barbiturates and benzediazapine compounds. Case Studies							11

IV	Pharmacology of Narcotics substances: opiates like morphine, codeine, thebaine, heroin, cocaine. Detection methods of metabolites of different prohibited drugs like HPLC, GC-MS, NMR.	11
V Practical	Practical 1. Preparation of standard and working solutions. 2. Plotting of calibration curve and quantification using UV-Vis Spectroscopy 3. Perform LLE based extraction of drugs 4. Analysis of drugs and metabolites by LC-MS 5. Determining Limit of Detection & Limit of Quantitation of drug by UV-VIS 6. Concept & Parts identification of GC, GCMS, HPLC	30
Learning Resources		
1. Klaassen, C. D. Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th Ed, McGraw-Hill, 1995. 2. Moffat, A.C. Osselton, D. M. Widdop, B. Clarke's Analysis of Drugs and Poisons in pharmaceuticals, body fluids and postmortem materials. 3. Bogusz, M. J. Hand Book of Analytical Separations, Vol. 2: Forensic Science, 1st ed., Elsevier Science ,2000. 4. Rang, P.H., Dale, M.M., Ritter, M.J.: Pharmacology, 4th ed., Harcourt/Churchill Livingstone, 2000. 5. Paranjape, H.M., Bothara, G.K., Jain, M.M: Fundamentals of Pharmacology, 1st ed. Nirali Prakashan, 1990. 6. Budhiraja, R.D. Elementary Pharmacology and Toxicology, Popular Prakashan, 2nd ed.,1999.		

M.SC. (5-YEAR INTEGRATED) FORENSIC SCIENCE: SEMESTER-6								
Course Type	Course Code	Name of the Course	Credit	Contact Hours/ Week	Internal Assessment marks	End Term Marks	Max. Marks	Exam Duration
DSE-5 4 credit Select one Option (Scheme B&C)	B23-FSC-606	Quality Management System	3	3	20	50	70	3 hrs.
		Practical	1	2	10	20	30	4 hrs.
Level of the course: 300-399								
Pre-requisite for the course (if any): Any Science Subject at 4.0 Level (Class XII)								
Course Learning Outcomes (CLOs): At the end of the course the student should be able to: 1. Learn about different organization working to control FSL quality. 2. Understand reequipments for Forensic Science labs accreditation. 3. Calibration of tools and techniques. 4. Organize management review								
Instructions for Paper-Setter 1. Nine questions will be set in all. All questions will carry equal marks. 2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.								
UNIT	TOPICS							CONTACT HOURS
I	Introduction to Quality management Systems: Introduction, Scope, Quality, Quality Assurance, Quality Control and Accreditation; Importance of accreditation in Forensic science laboratories. Guide lines of International Organization for Standardization (ISO) ISO/IEC 17025:2017, NABL 113:2008, for accreditation of FSLs, Bureau of Indian Standards (BIS). Notification of Cyber Forensics labs of FSLs/CFSLs u/s 79A of IT Act.							12
II	Forensic Quality Management System: introduction, Quality Management System, Quality Manual, Quality Manager, Quality Assurance, Quality Control, Quality Planning. Quality Audit: Internal and external Audits: Definition, Objectives, Organization of external audits, Planning of audit, Implementation of internal audits.							11
III	Management Requirements: organizational, document control, subcontracting of tests and calibrations, corrective and preventive actions. Traceability and Validation of new methods, measurement of uncertainty, Equipment maintenance and Calibration, Standard Reference Materials and Certified Reference Material and their availability.							11
IV	Management Review- Objectives, organization of management review, planning, implementation, records Proficiency Testing and							11

	Review Program. Assessor Guide: Assessor's role, Assessor assignment procedure, Procedure of assessment of new applicant laboratories. Sample disposal, Assessment, Interpretation and reporting of results. Lab safety	
V Practical	Practical 1. Prepare a report on the accreditation process as per NABL. 2. Prepare a report on the calibration of instruments present in departments. 3. Prepare a report on the internal audit in your departments. 4. Prepare a report on proficiency testing. 5. Prepare a report on control and reference samples required for forensic analysis.	30
Suggested readings:		
1. Directorate Of Forensic Science Services Forensic Science Laboratories Quality Manual in Accordance: ISO / IEC 17025:2017(E) 2. General requirements for the competence of testing and calibration laboratories, ISO / IEC 17025:2017. 3. NABL guidelines for accreditation of forensic science laboratory.		