PG Diploma

Scheme A1 (For Course of Science & Arts Discipline having major practicum component)

I YEAR PG Diploma Scheme A1						
Year/ Semester		**Courses Level**	**Core course/ Dissertation**	**Practicum Courses**	**Internship/ Apprenticeship / Seminar Or VAC (CHM/ EESC)**	**Total Credits**
First year	Sem I	400 400	CC- 11 (6 Credits) CC- 12 (6 Credits)	PC- 11 (4 Credits) PC- 12 (4 Credits)	**Internship/ Apprenticeship/ Seminar** (2 Credits)	22
	Sem II	400 400	CC- 21 (6 Credits) CC- 22 (6 Credits)	PC- 21 (4 Credits) PC- 22 (4 Credits)	**VAC (CHM/ EESC)** (2 Credits)	22

PG Diploma

Scheme A1 (For Course of Science & Arts Discipline having major practicum component)

Theory Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:	**Class:** M.Sc. I Semester	**Year: 2025**	**Session: 2025-26**
Subject: **Forensic Science**			
1	Course Code		
2	Course Title	**Forensic Science Investigation and Criminal Justice System: Theory**	
3	Course Type		
4	Pre-Requisite (if any)		
5	Course Learning Outcome (CLO)	**The fundamental principles and functions of forensic science and their significance to human society, the art of collecting, packaging, and preserving different types of physical and trace evidence at crime scenes, the importance of chain of custody, different types of crime scenes; various tools and techniques for analysis of different types of crime scene evidence and their processing in courts.**	
6	Credit Value	6	
7	Total Marks	Max. Marks:100	Minimum Passing Marks:40

Part B - Content of the Course

Total No. Of Lectures-Tutorial Practical (in hours per week):
L-T-P:

Unit	Topics	No. Of Lectures
I	**Foundations of Forensic Science and Ethical Framework:** The History and Development of Forensic Science, The Nature and Scope of Forensic Science. Organizational Structure of Forensic Science Laboratories at Central & State Level. Ethics in Forensic Science. Basic principles and its significance. **IKS: Concept of *Dharma*, *Nyaya* (justice), and *Satya* (truth)** • **Activity:** Create a timeline chart of key historical developments in forensic science. • Prepare a short write-up on the meaning of Dharma, Nyaya, and Satya with one forensic example each.	14
II	**Definition, Theories of Causation of Crime**: Pre-Classical and Neo-Classical, Constitutional, Geographical, Economic, Psychological, Sociological, Multiple Causation Approach. General Factors of Crime, Forms of Punishment in Brief, Radical Theory of Crime. Scene of Crime: Types, Protection of Scene of Crime, Crime Scene Documentation, Note Taking, Videography, Photography and Sketching Methods. Physical Evidence: Meaning, Types, Searching Methods, Collection and Preservation, Forwarding. chain of custody. Collection, Preservation, Packing and Forwarding of: Blood, Semen and Other Biological Stains, Firearm Exhibits, Documents, Fingerprint, Viscera, Hair & Fiber, Glass, Soil and Dust, Petroleum Products, Drugs and Poisons, etc. Investigation of the Following Crimes: Murder, Theft and House Breaking, Road Accident, Railways	22

	and Air Accidents, Arson, Sexual Assault Cases, Dowery Cases and Explosion Cases. • **Activity:** Make a chart comparing two types of physical evidence (e.g., glass vs. hair). • Draw a simple layout of a crime scene and mark search methods used (spiral, grid, etc.).	
III	**Elements of Crime Scene Management**- Information Management, Technology Management, Man-Power Management, and Logistic Management. An Introduction to Crime Scene Reconstruction, The Nature of Reconstruction, Physical Evidence and Reconstruction (Recognition, Identification, Individualization, and Reconstruction), Stages in Reconstruction, Types of Reconstruction, Pattern. Evidence in Reconstruction (Bloodstain Pattern Analysis for Reconstruction, Glass Fracture Pattern Fire Burn Patterns, Tire and Skid Mark Patterns), Shooting Scenes, Requirements for Reconstruction after Crime Scene Released, Writing a Reconstruction Report. • **Activity:** Prepare a labelled diagram of bloodstain pattern shapes and their interpretation. • Create a stepwise flowchart of how a crime scene is reconstructed post-analysis.	18
IV	**Bhartiya Nyaya Sanhita (2023)**: Introduction, General Exceptions, Offences against Person, Offences against Property, Attempt to Suicide, Sexual Offences. **Bhartiya Nagarik Suraksha Sanhita (2023):** Introduction and General Idea of Sections: 173, 174, 175, 176,177, 178,179, 180, 181, 192,193, 194, 195 and 196. **Bhartiya Sakshya Adhiniyam (2023):** Introduction and General Idea of Sections: 26, 39, 40, 41, 52, 53, 55, 72,140, 141,142 and 162. • **Activity:** Make a comparison chart of IPC sections and the new Bhartiya Nyaya Sanhita sections. • Prepare a table showing key sections from Bhartiya Sakshya Adhiniyam with real-world examples.	18
V	**Organization of Police in India**, Organization of Courts in Courts Cases, Prosecution, F.I.R., Case Diary, Interrogation of Suspects, Interview of Witness, and Procedure in Court as Per Bhartiya Nagarik Suraksha Sanhita: Trial of Summons, Trial of Warrant, and Summary Trial. Report Writing and Evidence Evaluation Report Formats of Crime Scene and Laboratory Findings court Testimony: Admissibility of Expert Testimony, Pre Court Preparation and Court Appearance • **Activity:** Create a table outlining the court trial process: summons, warrant, summary. • Write a mock crime scene report including chain of custody.	18
Keywords/Tags: Evidence Investigation, Forensics, Analysis, Justice		

Part C- Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: 1. Ahuja R. (2001). Criminology. India, Rawat Pub.

2. Aitken C.G.G. & Stoney, D.A. (1991). The Use of Statistics in Forensic Science. England,Ellis Harwood Limited.
3. Bowen R.T. (2016). Ethics and the Practice of Forensic Science. USA, CRC Press.
4. Burke R.H. (2013). An Introduction to Criminological Theory, 4th ed., UK, Routledge-Taylor & Francis Group.
5. Horswell J. (2016). The Practice of Crime Scene Investigation. USA, CRC Press.

6. Indian Penal Code, Criminal Procedure Code, Indian Evidence Act.
7. James, S.H., and Nordby, J.J. (2003). Forensic Science: An Introduction to Scientific and Investigative Techniques. USA, CRC Press.
8. James S.H. (2014). Forensic Science: An Introduction to Scientific and Investigative Techniques. UK,Taylor & Francis.
9. Nordby J. (1999). Dead Reckoning-The Art of Forensic Science Detection. USA, CRC Press.
10. O'Hara & Osterberg, (1949). An Introduction to Criminalistics. New York, The Macmillan Company.
11. Dr. N.M. Khandelwal, Dr. Pratapsinh Chauhan, (2023). Indian Knowledge System (Bhartiya Gyan Parampara). Himalaya Publishing House Pvt. Ltd.
12.Criminal justice administration. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/344

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 40 **University Exam (UE): 60**

Internal Assessment	**Marks**	**External Assessment**	**Marks**
Mid-Semester Test (MST)	20	Term End Exam	60
Teacher Assessment* (TA) and Class attendance	20		
Total	40		60

Teacher Assessment* Presentation/Assignment/Quiz/Group-Discussion etc.

Practical Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:			
Subject: **Forensic Science**	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26
1			
2	Course Code		
3	Course Title	**Forensic Science Investigation and Criminal Justice System: Practical**	
4	Course Type		
5	Pre-Requisite (if any)		
6	Course Learning Outcome (CLO)	**Crime scene management and photography; different searching methods of crime scenes; different methods of crime scene sketching; collection, packing, labelling, and forwarding of physical evidence from the crime scene to the forensic science laboratory, methods of crime scene reconstruction.**	
7	Credit Value	4	
Part B- Content of the Course			
	Total Marks	Max. Marks:100	Minimum Passing Marks:40
Total No. Of Lectures- Tutorial- Practical (in hours per week): L-T-P:			

Topics	**No. Of Lectures**
1. Demonstration of Crime Scene Management. 2. Photography of Scene of Crime Digital Camera. 3. Methods for Searching for Physical Evidence at the Scene of Crime. 4. Sketching of an Outdoor Scene of Crime (Homicide or Suicide). 5. Sketching of an Outdoor Scene of Crime (Accident). 6. Sketching of Indoor Scene of Crime (Theft or Dacoity or Robbery). 7. Sketching of an Indoor Scene of Crime (Murder or Suicide). 8. Sketching of a Mobile Scene of Crime (Hit & Run Case). 9. Collection, Packing, Labeling and Forwarding of Physical Evidence from Scene of Crime to Forensic Science Laboratory. 10. Reconstruction of a Scene of Crime. • **Activity:** Simulation of crime scene and practicing sketching of indoor and outdoor crime scenes by students themselves. • Mock crime scene setup for students to practice collection, packing, labelling, and forwarding of physical evidence, followed by preparation of comparative charts on traditional and modern forensic methods.	
Keywords/Tags: Evidence Investigation, Scene of Crime, Sketching, Searching	

Part C- Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: 1. Ahuja R. (2001). Criminology. India, Rawat Pub. 2. Aitken C.G.G. & Stoney, D.A. (1991). The Use of Statistics in Forensic Science. England,Ellis Harwood Limited. 3. Bowen R.T. (2016). Ethics and the Practice of Forensic Science. USA, CRC Press. 4. Burke R.H. (2013). An Introduction to Criminological Theory, 4th ed., UK, Routledge-Taylor & Francis Group. 5. Horswell J. (2016). The Practice of Crime Scene Investigation. USA, CRC Press. 6. Indian Penal Code, Criminal Procedure Code, Indian Evidence Act. 7. James, S.H., and Nordby, J.J. (2003). Forensic Science: An Introduction to Scientific and Investigative Techniques. USA, CRC Press. 8. James S.H. (2014). Forensic Science: An Introduction to Scientific and Investigative Techniques. UK,Taylor & Francis. 9. Nordby J. (1999). Dead Reckoning-The Art of Forensic Science Detection. USA, CRC Press. 10. O'Hara & Osterberg, (1949). An Introduction to Criminalistics. New York, The Macmillan Company.

Part D- Assessment and Evaluation			
Suggested Continuous Evaluation Methods: **Maximum Marks: 100** **Continuous Comprehensive Evaluation (CCE): 40**			**University Exam (UE): 60**
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Internal Test, Teacher Assessment* (TA) and Class Attendance	40	Term End Exam	60
Total	40		60

Teacher Assessment* Demonstration/Viva-Voce/Lab record etc.

Theory Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:	**Class:** M.Sc. I Semester	**Year: 2025**	**Session: 2025-26**
Subject: **Forensic Science**			

1	Course Code		
2	Course Title	**Forensic Physics, Ballistics & Cyber Theory**	
3	Course Type		
4	Pre-Requisite (if any)		
5	Course Learning Outcome (CLO)	**Understanding firearms and their ammunition, Different fields of forensic ballistics which include Internal Ballistics, External and Terminal ballistics, Methods of investigation in shooting cases.**	
6	Credit Value	6	
7	Total Marks	Max. Marks: 100	Minimum Passing Marks:40

Part B - Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week):
L-T-P:

Unit	Topics	No. Of Lectures
I	**Introduction:** Density, Refractive Index, Birefringence; Other Optical Properties of Crystalline Material. Examination of the Following- 1. Hair and Fiber 2. Soil 3. Dust 4. Paints 5. Glass 6. Glass Fracture 7. Tool Marks 8. Explosives Restoration of Erased / Obliterated Marks. Examination of Wire/ Cables, Counterfeit Coins. Physical Matching of Severed / Broken Objects. Speaker Identification and Tape Authentication: Voice Production Theory-Vocal Anatomy, Speech Signal Processing & Pattern Recognition- Basic Factors of Sound in Speech, Acoustic Characteristics of Speech Signal, Fourier Analysis, Frequency & Time Domain Representation of Speech Signal, Analogue to Digital Signal and Conversion, Fast Fourier Transform, Quantization, Digitization, and Speech Enhancement, Analysis of Audio-Video Signal for Authenticity, Introduction to the Techniques of Pattern Recognition and Comparison. • **Activity:** Draw labelled diagrams of different glass fracture patterns. • Prepare a basic table showing characteristics of authentic vs. tampered audio files.	14
II	**History and background, their classification and characteristics**, Shotgun and rifled firearms (including pistols, revolvers and assault rifles), Various Components of Firearms: Barrel: chamber,leed, bore (calibre and its nomenclature Rifling, Purpose of Rifling, Types of Rifling), Action: its components and various types including manual, semiautomatic and automatic stock Improvised/Country-Made/Imitative Firearms and their Constructional Features. Ammunition:,Classification and Constructional Features of Different Types of Cartridges, Types of Primers and Priming Composition, Propellants and their	22

	Compositions, Various Types of projectiles, Bullets and Compositional Aspects, Safety Aspects for Handling Firearms. **IKS: Traditional Indian warfare technologies: bows, arrows, catapults, and projectiles in Dhanurveda and Shastra Vidya.** • **Activity:** Create a chart comparing rifled vs. smooth bore firearms. • Make a diagram of a cartridge with labelled components.	
III	Definition, Ignition of Propellants, Shape and Size of Propellants, Manner of Burning, Various Factors affecting the Internal Ballistics, Theory of recoil, Exterior Ballistics, Vacuum Trajectory, Effect of external and internal factors on Trajectory of cylinder-conoidal bullets and shotgun projectiles, Ricochet bullets, maximum and effective range. Concept of wound formation, Temporary and Permanent Cavities, Threshold Velocity for Penetration of Skin/Flesh/Bones, Effect of various types of projectiles on hitting the target, effect of various factors on wound formation: function of bullet shape, striking velocity, striking angle of intermediate target, tumbling of bullets, effect of instability of bullets, effect of intermediate targets, influence of range, yaw, stopping power. • **Activity:** Draw a simplified trajectory diagram showing vacuum vs. air resistance. • Prepare a chart comparing entry and exit wounds.	18
IV	**Identification of Firearms** -Matching of crime and test: Principles and Practice of Identification of Firearms with fired projectiles in regular firearms and country made firearms. Gun-shot residue: its formation and analysis (chemical and instrumental methods), Reconstruction of crime scene: Range of fire, Time of Fire, Different Method Employed and their Limitations. **Firearm Injuries**- Nature of Wounds of Entry, Exit, and Initial Track with Various Ranges and Velocities with Evaluation of Injuries Caused by Shot-Gun, Rifle, Handguns, and Country Made Firearms, Post-Mortem and Antemortem Firearm Injuries. • **Activity:** Make a table showing different GSR tests (chemical/instrumental). • Draw a diagram showing how bullet striations are matched.	18
V	What is Computer Forensic? Basic Introduction to Computers, Hardware and Accessories, Operating Systems and Software. Cyber Crime- Definition, Crimes on Internet, Hacking, Virus, Worms, Cookies, Obscenity and Pornography. Programme Manipulation. Software Piracy, Intellectual Property and Computer Security. Encryption and Decryption Methods. What is Computer Forensic? Basic Introduction to Computers, Hardware and Accessories, Operating Systems and Software. Cyber Crime- Definition, Crimes on Internet, Hacking, Virus, Worms, Cookies, Obscenity and Pornography. Programme, Manipulation. Software Piracy, Intellectual Property and Computer Security. Encryption and Decryption Methods. • **Activity:** Create a poster showing types of cybercrime (e.g., phishing, hacking).	18

	• Prepare a table comparing encryption vs. decryption methods.	

Keywords/Tags: Computer Forensic, Firearms, Ballistics, Bullets

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Bengold&Moryson N. (1999). Speech and Audio Signal Processing. USA, John Wiley & Sons.
2. Caddy B. (2001). Forensic Examination of Glass and Paint Analysis and Interpretation. UK, Taylor and Francis.
3. Hatcher, Jury, & Weller (1977). Firearms Investigation, Identification, and Evidence. Harrisburg, Stackpole Books.
4. Heard B.J. (1997). Handbook of firearms and ballistics. London, John Willey.
5. Hogg. V. (1982). The Cartridges Guide - A Small Arms Ammunition Identification Manual. Harrisburg, The Stackpole Co.
6. Jenkins and White, (2003). Fundamentals of Optics. USA, McGraw Hill.
7. Johari M. (1980). Identification of Firearms, Ammunition and Firearms Injuries. India, BPR&D.
8. Maio V.D. (1999). Gunshot Wounds. US, CRC Press.
9. Mathews, J.H. & Thomas, C.C. (1973). Firearms Identification, Vols. 1, 2, & 3. Illinois, Springfield.
10. Murray, R.C. & Tedrew J.C.F. (1991). Forensic Geology. New Jersey, Prentice hall.
11. Bayuk J. (2010). Cyber Forensics: Understanding Information Security Investigations. NY, Springer.
12. Santanam R., Sethumadhawan M. (2010). Cyber Security, Cyber Crime and Cyber Forensics: Applications and Cyber Forensics: Applications and Perspectives. NY, Information Science Reference
13. Harjit Singh Sagoo. (2017). Shastra Vidya: The Ancient Indian Martial Art of the Hindu Kshatriyas.
14. Forensic Ballistics. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_pg/693
15. Cyber Security. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/277

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 40 **University Exam (UE): 60**

Internal Assessment	Marks	External Assessment	Marks
Mid-Semester Test (MST)	20	Term End Exam	60
Teacher Assessment* (TA) and Class attendance	20		
Total	40		60

Teacher Assessment* Presentation/Assignment/Quiz/Group-Discussion etc.

Practical Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Forensic Science**			
1	Course Code		
3	Course Title	**Forensic Physics, Ballistics & Cyber Practical**	
4	Course Type		
5	Pre-Requisite (if any)		
6	Course Learning Outcome (CLO)	**Understanding of the density gradient method for matching soil, glass, glass fractures and the refractive index of glass. chemical treatment of erased tool marks, lifting and casting of footmarks, tyre marks, handling of a comparison microscope.**	
7	Credit Value	4	
Part B- Content of the Course			
	Total Marks	Max. Marks:100	Minimum Passing Marks:40
Total No. Of Lectures- Tutorial- Practical (in hours per week): L-T-P:			

Topics	**No. Of Lectures**
1. Identification and Matching of Dust/ Soil Sample by Physical Method (Including Density Gradient Method). 2. Physical Matching of Cloth Sample and Identification of Glass Fractures. 3. Calculate the refractive index of glass with Abbe's Refractometer. 4. Restoration of an Erased Punched Mark on a Metal Piece by Chemical Treatment. 5. Comparison of Tool Marks and Fired Cartridge/ Bullet Using Comparison Microscope. 6. Identification of Shots and Pallets. 7.Collection and Handling of Digital Evidence. 8. Detection of Origin of e-Mails (IP Address) etc. 9. Data recovery from various storage devices by using data recovery software. • **Activity:** Hands-on identification and comparison of soil, cloth, glass, and tool mark evidence by students using physical methods and microscopes in a lab simulation. • Practice session on collection and handling of digital evidence, email tracing, and basic data recovery using recovery software by students on simulated digital crime scenarios.	

Keywords/Tags: Computer Forensic, Firearms, Ballistics, Bullets

Part C- Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: 1. Bengold & Moryson N. (1999). Speech and Audio Signal Processing. USA, John Wiley & Sons. 2. Caddy B. (2001). Forensic Examination of Glass and Paint Analysis and Interpretation. UK, Taylor and Francis. 3. Hatcher, Jury, & Weller. (1977). Firearms Investigation, Identification, and Evidence. Harrisburg, Stackpole Books. 4. Heard B.J. (1997). Handbook of Firearms and Ballistics. London, John Willey. 5. Hogg. V. (1982). The Cartridges Guide - A Small Arms Ammunition Identification Manual. Harrisburg, The Stackpole Co. 6. Jenkins and White, (2003). Fundamentals of Optics. USA, McGraw Hill. 7. Johari M. (1980). Identification of Firearms, Ammunition and Firearms Injuries. India, BPR&D. 8. Maio V.D. (1999). Gunshot Wounds. US, CRC Press. 9. Mathews, J.H. & Thomas, C.C. (1973). Firearms Identification, Vols. 1, 2 & 3. Illinois, Springfield. 10. Murray, R.C. &Tedrew J.C.F. (1991). Forensic Geology. New Jersey, Prentic hall. 11. Santanam R., Sethumadhawan M. (2010). Cyber Security, Cyber Crime and Cyber Forensics: Applications and Cyber Forensics: Applications and Perspectives. NY, Information Science Reference. 12. Wiles J., Reyes A. (2007). The Best Damn Cybercrime and Digital Forensics Book Period.US, Elsevier. 13. Nelson B, Philips A., Steuart C. (2014). Guide to Computer Forensics and Investigations. US, Cengage Learning

Part D- Assessment and Evaluation			
Suggested Continuous Evaluation Methods: **Maximum Marks: 100** **Continuous Comprehensive Evaluation (CCE): 40**		**University Exam (UE): 60**	
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Internal Test, Teacher Assessment* (TA) and Class Attendance	40	Term End Exam	60
Total	40		60

Teacher Assessment* Demonstration/Viva-Voce/Lab record etc.

Internship/ Apprenticeship/ Seminar (2 Credits)

Part D- Assessment and Evaluation
Suggested Continuous Evaluation Methods: **Maximum Marks: 100** • **Seminar: Internal Evaluation only** • **Internship/ Apprenticeship: Marks to be allotted by the concerned organization**

Theory Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:	**Class:** M.Sc. II Semester	**Year: 2025**	**Session: 2025-26**
Subject: **Forensic Science**			

1	Course Code		
2	Course Title	**Instrumental Method- Physical, Chemical and Biological: Theory**	
3	Course Type		
4	Pre-Requisite (if any)		
5	Course Learning Outcome (CLO)	Understanding about the sample preparation, handling and extraction techniques the basic principle and working of chromatographic and spectroscopic techniques that could lead to professional job opportunities in testing and pharmaceutical laboratories, the basic principle and working of spectroscopy, microscopy and other analytical instruments	
6	Credit Value	6	
7	Total Marks	Maximum marks:100	Minimum marks: 40

Part B- Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week):
L-T-P:

Unit	Topics	No. Of Lectures
I	Instrumental Approach (Sample, Sampling, Storage of Samples), Simple Sample Separation (Distillation, filtration, evaporation, and crystallization. Solvent Extraction techniques like LLE, SPE, Micro SPE and Distribution Law) and Preparation (Acid Dissolution &; Digestion, Fusions, Dry Ashing and Combustion), Basic Statistics and Data Handling (Significant Figures, Accuracy and Precision, Types of Errors, Quantifying Random Error, Rejection of Results), Performing the Measurement (Signals and Noise, Plotting Calibration Curves), Assessing the Data (Limit of Detection, Limit of Quantification). **IKS: Traditional Indian alchemical and metallurgical practices in Rasashastra and Ayurveda.** • **Activity:** Draw a flowchart showing LLE and SPE steps. • Prepare a poster on types of errors in analytical data (systematic vs. random).	14
II	General Idea on Spectroscopy, Electromagnetic Spectrum, Various Sources of Radiation and their utility and limitations, Interaction of Radiation with Matter, i.e., Reflection, Absorption, Fluorescence, Phosphorescence, Diffraction, Refraction, etc. Detection of Radiation, i.e., Photography, Photoelectric, etc. Introduction to optical systems used in Spectroscopy (Wavelength Selection Devices, Optical Slits, Detectors, Single- Beam and Double- Beam Optics), Dispersive Optical Layouts, and Fourier Transform Spectrometers. Forensic Applications of Spectroscopy.	22

	• **Activity:** Create a table showing radiation types and their forensic use (UV, IR, Visible). • Prepare a labelled sketch of a single-beam spectrophotometer.	
III	Atomic Spectra- Energy Level, Quantum Number and Designation of States, Selection Rule. Molecular Spectra- Quantitative Discussion of Molecular Bindings, Molecular Orbital, Types of Molecular Energies, Discussion of Rotational, Vibrational, and Electronic Spectra. Ultraviolet-Visible and Infrared Spectrophotometry: Basic Principles, Instrumentation, Qualitative and Quantitative Analysis, Interpretation of Spectra, etc. Quantitative Analysis through Ultraviolet-Visible Spectroscopy, Forensic Application of UV-Vis. and IR Spectrophotometry. Mass Spectrometry: Principle and Instrumentation, Correlation of MS with Molecular Structure. A brief idea about the various forms of Mass Spectrometry Coupling with other instruments. Application of MS in Forensic Science. Radiochemical Techniques: Basic Principles and Theory, Introduction about Nuclear Reactions and Radiations, Neutron Activation Analysis (NAA), Nuclear Magnetic Resonance Spectroscopy (NMR) • **Activity:** Prepare a diagram of a mass spectrometer with function of each part. • Make a chart showing UV vs. IR spectra interpretation with sample peaks	18
IV	General Idea of Chromatography; Historical Aspect of Chromatography, Classification of Chromatography (Mobile Phase Mode, Technique, Development Mode, Separation Mechanism &; other Systems of Classification), Theory and Classification of Chromatography (Planar and Column Chromatography, Adsorption and Partition Chromatography, Ion Exchange Chromatography, Exclusion Chromatography, Affinity Chromatography), Principles, Working and Forensic Application of Planar Chromatography; TLC, PC, HPTLC. General Principles, Working and Forensic Application of Column Chromatography General Idea on Working of HPLC and GC. Forensic Application of Chromatography. • **Activity:** Create a comparative chart: TLC vs. HPTLC, HPLC vs. UHPLC. • Draw a labeled diagram of an HPLC setup.	18
V	Gel Electrophoresis, Isoelectric Focusing etc. General Idea and Working of Gel Electrophoresis, PAGE, SDS-PAGE, Capillary Electrophoresis, Forensic Application of Electrophoresis. Production of Antibodies, Precipitation Reaction, Gel Immunodiffusion, Immune-Electrophoresis, Complement Fixation. Molecular Biology Techniques, DNA Profiling and Microfluidics Outline of Genetic Manipulation Enzymes, Enzymes in Genetic Manipulation, Cloning Procedures, Isolation of Specific Nucleic Acid Sequences-Complementary DNA, Gene Libraries, Colony Hybridization, Nick Translation, Oligo-nucleotide Probes, Expression of Genes. DNA Profiling: Structure of DNA and its Polymorphic Marker, Basis of DNA Typing and Techniques: PCR, RFLP, etc. The Introduction of Microfluidics. Theory, Instrumentation, and its applications. **IKS: Ancient Biological Concepts: The knowledge of heredity, immunity (Ojas), and familial traits in the Charaka and Sushruta Samhitas. Early**	18

	understanding of genetic identification, antigen-antibody reactions, and blood-based diagnosis. • **Activity:** Prepare a table showing PCR vs. RFLP with forensic use. • Draw a labelled sketch of gel electrophoresis setup.	

Keywords/Tags: Electrophoresis, Chromatography, Spectroscopy, Separation

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Chatwal and Anand. (2016). Instrumental Methods of Chemical Analysis. India, Himalaya Publishing House Pvt. Ltd.
2. Churáček J. (1993). Advanced Instrumental Methods of Chemical Analysis. Michigan, E. Harwood,
3. Dean J. A. (1995). Analytical Chemistry Handbook. USA, McGraw Hill Inc.
4. Kalri P.S. (2001). Spectroscopy of Organic Compounds. India, New Age International Pub.
5. Khandpur R.S. (2004). Handbook of Analytical Instruments. USA, Tata McGraw Hill Pub. Co.
6. Khanna D.R. &;Gulati H.R. (2002). Fundamentals of Optics Geometrical Physical &; Quantum. India, R. Chand &; Co.
7. Robards K. Jackson P.E. &; Haddad P.A. (2012). Principles and Practice of Modern Chromatographic Methods. Germany, Elsevier pub.
8. Saferstein R. (2001). Forensic Science Handbook Vol. I. London, Prentice Hall.
9. Edwin & Caney, H. M.(1993). Human Genetics: The Molecular Revolution. London, Jones & Bartlett Pub.
10. Epplen J. T., and Lubjumhin, T.(1995). DNA Profiling and DNA Fingerprinting. Basel, Birkhäuser Verlag.
11. Gardner E.J., Simmons M.I. & SnustadD.P.(1991). Principles of Genetics. New York, John Wiley.
12. Glover, D.M., & Hames, B.D.(1995). DNA Cloning, vol. 1 to 4. England, Oxford University Press, Oxford Pub.
13. Joshi A. R. (2002). A Textbook of Practical Biochemistry. India, B. Jain Publishers.
14. Forensic Biology & Serology. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_pg/699
15. Prof. K. R. Srikantha Murthy. (2022). Charaka Samhita-I. Varanasi, India. Chaukhambha Chaukhambha Orientalia.
16. Ambikadatta Sastri (2023). Susruta Samhita-I. Varanasi, India, Chaukhambha Sanskrit Sansthan.

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 40 **University Exam (UE): 60**

Internal Assessment	Marks	External Assessment	Marks
Mid-Semester Test (MST)	20	Term End Exam	60
Teacher Assessment* (TA) and Class attendance	20		
Total	40		60

Teacher Assessment* Presentation/Assignment/Quiz/Group-Discussion etc.

Practical Paper: Scheme A-1 for One Year PG Program			
Part A- Introduction			
Program:			
Program:	**Class:** M.Sc. I Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Forensic Science**			
1	Course Code		
2	Course Title	**Instrumental Method- Physical, Chemical and Biological: Practical**	
3	Course Type		
4	Pre-Requisite (if any)		
5	Course Learning Outcome (CLO)	Understanding about the sample preparation techniques, sample handling and extraction techniques, qualitative and quantitative analysis, the basic principle and working of chromatographic techniques like TLC, HPTLC, HPLC, GC etc. and spectroscopic technique like UV Spectroscopy, FTIR etc.	
6	Credit Value	4	
Part B- Content of the Course			
	Total Marks	Max. Marks:100	Minimum Passing Marks:40
Total No. Of Lectures- Tutorial- Practical (in hours per week): L-T-P:			

Topics	**No. Of Lectures**
1. To measure the pH of Different Substance using pH Meter. 2. To Know the Concentration of Given Liquid by Colorimeter. 3. Sample Preparation and Analysis of Drugs of Abuse by using UV-Visible spectrophotometer. 4. To separate and identify plant pigments by paper chromatography. 5. To know the Practical Working and Handling of High-Performance Thin Layer Chromatography by analyzing the ink sample. 6.To know the Practical Working and Handling of High-Performance Liquid Chromatography by analyzing depressant drugs. 7.To know the Practical Working and Handling of Gas Chromatography by analyzing volatile poisons. 8. Demonstration of Handling and Working of PCR. 9. To perform Protein Estimation of Given Biological Samples. 10. To separate Cell Organelles in Given Tissues using Centrifuge. 11. Demonstration of Working and Handling of Gel Electrophoresis. 12. Demonstration of Working and Handling of Compound, Stereo Microscope, SEM and TEM. 13. Demonstration of Working and Handling of the UV-Spectrophotometer for the Examination of Biological Samples. • **Activity:** Hands-on practice by students to measure pH of various substances and determine concentration of solutions using pH meter and colorimeter, followed by preparation of observation charts.	

• Students will carry out the separation of egg yolk components using a centrifuge, followed by labelling the separated layers and writing the working principle of the technique.	
Keywords/Tags: Electrophoresis, Chromatography, Spectroscopy, Separation	

Part C- Learning Resources

Text Books, Reference Books, Other Resources

Suggested Readings:

1. Chatwal and Anand. (2016). Instrumental Methods of Chemical Analysis. India, Himalaya Publishing House Pvt. Ltd.
2. Churáček J. (1993). Advanced Instrumental Methods of Chemical Analysis. Michigan, E. Harwood,
3. Dean J. A. (1995). Analytical Chemistry Handbook. USA, McGraw Hill Inc.
4. Kalri P.S. (2001). Spectroscopy of Organic Compounds. India, New Age International Pub.
5. Khandpur R.S. (2004). Handbook of Analytical Instruments. USA, Tata McGraw Hill Pub. Co.
6. Khanna D.R. &;Gulati H.R. (2002). Fundamentals of Optics Geometrical Physical &; Quantum. India, R. Chand &; Co.
7. Robards K. Jackson P.E. &; Haddad P.A. (2012). Principles and Practice of Modern Chromatographic Methods. Germany, Elsevier pub.
8. Saferstein R. (2001). Forensic Science Handbook Vol. I. London, Prentice Hall
9.(1978). Biology Methods Manual. London: Metropolitan Police Forensic Science Laboratory.
10. Albert S., Bray B., Lewis D., Roberts K., and Watson J.D. (1989). Molecular Biology of the Cell. New York, Garland Pub.
11. Clifford B.J.(1971). The examination and typing of bloodstains in the Crime Laboratory. USA, US Court Printing Press.
12. Edwin & Caney, H. M.(1993). Human Genetics: The Molecular Revolution. London, Jones & Bartlett Pub.
13. Epplen J. T., and Lubjumhin, T.(1995). DNA Profiling and DNA Fingerprinting. Basel, Birkhäuser Verlag.

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 40 **University Exam (UE): 60**

Internal Assessment	Marks	External Assessment	Marks
Internal Test, Teacher Assessment* (TA) and Class Attendance	40	Term End Exam	60
Total	40		60

Teacher Assessment* Demonstration/Viva-Voce/Lab record etc.

Theory Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:	**Class:** M.Sc. II Semester	**Year: 2025**	**Session: 2025-26**
Subject: **Forensic Science**			
1	Course Code		
2	Course Title	**Dactylography, Biometrics and Questioned Documents: Theory**	
3	Course Type		
4	Pre-Requisite (if any)		
5	Course Learning Outcome (CLO)	Understanding about the basics of fingerprint, history, patterns & classification, types of fingerprints, location, development, photography & comparison, ear biometrics and iris recognition, retina biometrics and face recognition.	
6	Credit Value	6	
7	Total Marks	Max. Marks:	Minimum Passing Marks:

Part B- Content of the Course

Total No. Of Lectures- Tutorial- Practical (in hours per week):
L-T-P:

Unit	Topics	No. Of Lectures
I	**History of Fingerprints**, Formation of Ridges, Different Fingerprint Patterns and Areas, Ridge Characteristics, Ridge Count, Ridge Tracing, Levels of Fingerprint Identification, Classification of Fingerprint- Henry system of classification, single digit classification, extension of the Henry system. Types of Fingerprint; Latent, Visible, and Plastic Prints, Location of Fingerprints; Development of Latent Prints by Physical and Chemical Methods. Photography and Comparison of Fingerprints, 3-D Development of Fingerprints **IKS: Ancient Indian palmistry (*Hasta Samudrika Shastra*): Individual fingerprint patterns for personality and destiny.** • **Activity:** Create a chart showing fingerprint patterns: loop, whorl, arch. • Draw an enlarged sample ridge with bifurcation and core marked.	14
II	**Fingerprint Biometrics**: Introduction to AFIS, Working of AFIS System, AFIS Components, Digitization & Processing of Fingerprints: Acquisition, Normalization & Segmentation, Enhancement, Binarization, Thinning & Post-processing, Minutiae Extraction, Fingerprint Matching in AFIS, Indexing & Retrieval. AMBIS- Integrated Biometric Identification System, CCTNS. Iris Recognition: Introduction, Anatomical and Physiological Underpinnings; Iris Signature Representation and Matching; Localization, Representation; Matching. Retina Biometrics: Structure of Eye; Human Retina and Structure; Unique Pattern of Blood Vessels; Retina Pattern and Identification. • **Activity:** Prepare a table showing AFIS steps from acquisition to matching. • Draw a labelled eye showing iris structure for recognition.	22

III	**Voice Production**, Theory-Vocal Anatomy, Speech Signal Processing & Pattern Recognition- Basic Factors of Sound in Speech, Acoustic Characteristics of Speech Signal. An Introduction to the Techniques of Pattern Recognition and Comparison. **Face Recognition and Facial Reconstruction** Face Recognition: Introduction, Detection, Representation, and Classification, Techniques and their Applications. Facial reconstruction: 2D & 3D Facial reconstruction. **IKS: Face reading and body proportion analysis to determine personality and identity (*Samudrika Shastra* and *Ayurveda)*** • **Activity:** Make a side-by-side table of 2D vs. 3D facial reconstruction techniques. • Create a diagram showing facial biometric mapping points.	18
IV	Definition of Questioned Document, Types of Questioned Document, Collection, Preservation & Handling of Questioned Document, Photography of Questioned Document, Preliminary Examination of Questioned Document. Basic Tools Needed for Forensic Document Examination- Ultraviolet, Visible, Infrared, and Fluorescence Spectroscopy, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus, Determining the Age and Relative Age of Documents. • **Activity:** Make a list of tools used in questioned document analysis. • Draw a sketch showing how UV/IR is used on ink.	18
V	Comparison of Handwriting, Development of Individuality in Handwriting, Natural Variations and Fundamental Divergences in Handwriting, Class & Individual Characteristics. Standards for Comparison of Handwriting. Comparison of Paper, Ink, Printed Documents, Typed Documents, Xeroxed Documents. Alterations in Documents, Including Erasures, Additions, Over-Writing, and Obliterations. Indented and Invisible Writings. Charred Documents. Examination of Counterfeit Indian Currency Notes, Passports, Visas, and Stamp Pads. **IKS: Role of handwriting in resolving disputes in ancient India (Document examination in Dharamasastra)** • **Activity:** Prepare a chart showing class vs. individual characteristics in handwriting. • Make a checklist for detecting counterfeit currency (5 key features).	18
Keywords/Tags: Comparison, Document, Voice, Biometrics		

Part C- Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: 1. James S. H. (2014). Forensic Science: An Introduction to Scientific and Investigative Techniques. USA, Taylor & Francis Group. 2. Ashbaugh D. R., (1999). Quantitative and Qualitative Friction ridge analysis. NY, CRS Press. 3. Daluz H. M., (2014). Fundamentals of Fingerprint Analysis. NY, CRC Press.

4. Das R. (2014). Biometric Technology: Authentication, Bio Cryptography, and Cloud-Based.

5. Nickolls, L.C. (1956). Scientific Investigation of Crime. London, Bulterwest.

6. Kelly J. S. & Lindblom B. S. (2006). Scientific Examination of Questioned Documents.

NY, CRC Press.

7. Fingerprints and Other Impressions. https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_pg/690

8. K. C. Sen. (1982). Hast Samudrika Shastra: The Indian Science of Hand Reading. D. B. Taraporevala Sons & Co. (Bombay/Mumbai)

Part D- Assessment and Evaluation

Suggested Continuous Evaluation Methods:
Maximum Marks: 100
Continuous Comprehensive Evaluation (CCE): 40 **University Exam (UE): 60**

Internal Assessment	**Marks**	**External Assessment**	**Marks**
Mid-Semester Test (MST)	20	Term End Exam	60
Teacher Assessment* (TA) and Class attendance	20		
Total	40		60

Teacher Assessment* Presentation/Assignment/Quiz/Group-Discussion etc.

Practical Paper: Scheme A-1 for One Year PG Diploma			
Part A- Introduction			
Program:	**Class:** M.Sc. II Semester	**Year: 2025**	**Session:** 2025-26
Subject: **Forensic Science**			
1.	Course Code		
2.	Course Title	**Dactylography, Biometrics and Questioned Documents: Practical**	
3.	Course Type		
4.	Pre-Requisite (if any)		
5.	Course Learning Outcome (CLO)	Understanding about Collection, Preservation, Handling & Forwarding of Charred Document, Comparison of Forged and Genuine Document, Examination of ink by TLC, and Collection and Handling of Digital Evidence.	
6.	Credit Value	4	
Part B- Content of the Course			
	Total Marks	Max. Marks: 100	Minimum Passing Marks: 40
Total No. Of Lectures- Tutorial- Practical (in hours per week): L-T-P:			

Topics	**No. Of Lectures**
1. To Record a Fingerprint Chart by Direct Print Method and Rolling Method. 2. To Identify the Fingerprint Patterns along with Core and Delta. 3. To Perform Ridge Tracing and Ridge Counting of the Fingerprints. 4. Development of Latent Prints by Powder Method and Chemical Methods on Porous and Non-Porous Surfaces. 5. Lifting of Fingerprints by Different Methods. 6. Identification of Chance Prints Found on Different Surfaces. 7. Collection, Preservation, Handling & Forwarding of Charred Document. 8. Photographic Comparison of Handwriting & Signature. 9. Comparison of Forged and Genuine Document by VSC & Other Methods. 10. Decipher of Secret Writing by Physical and Chemical Methods. 11. Examination of Questioned Document & Currency by VSC. 12. Examination of ink by TLC • **Activity:** Practice recording fingerprints using both direct and rolling methods, followed by identification of fingerprint patterns, cores, and deltas through group discussion. • Hands-on development and lifting of latent prints on various surfaces using powder and chemical methods, combined with a demonstration on basic document examination techniques.	

Part C- Learning Resources
Text Books, Reference Books, Other Resources
Suggested Readings: 1. James S. H. (2014). Forensic Science: An Introduction to Scientific and Investigative Techniques. USA, Taylor & Francis Group. 2. Ashbaugh D. R., (1999). Quantitative and Qualitative Friction ridge analysis. NY, CRS Press. 3. Daluz H. M., (2014). Fundamentals of Fingerprint Analysis. NY, CRC Press. 4. Das R. (2014). Biometric Technology: Authentication, Bio Cryptography, and Cloud-Based. 5. Nickolls, L.C. (1956). Scientific Investigation of Crime. London, Bulterwest. 6. Kelly J. S. & Lindblom B. S. (2006). Scientific Examination of Questioned Documents. NY, CRC Press.

Part D- Assessment and Evaluation			
Suggested Continuous Evaluation Methods: **Maximum Marks: 100** **Continuous Comprehensive Evaluation (CCE): 40**			**University Exam (UE): 60**
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Internal Test, Teacher Assessment* (TA) and Class Attendance	40	Term End Exam	60
Total	40		60

Teacher Assessment* Demonstration/Viva-Voce/Lab record etc.

Value Added Course [Constitutional Human and Moral Values (CHM)/Employability and Entrepreneurship Skill Course (EESC)] (2 Credits)

Part D- Assessment and Evaluation
Suggested Continuous Evaluation Methods: **Maximum Marks: 100** • **CHM: Only Term End Exam (Theory)** • **EESC: Only Term End Exam (Theory)**