



**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Forensic Science**

**B.Sc. with Major Forensic Science – Batch (2024-2028)**  
**SEMESTER - IV**

**BFS401 FORENSIC BALLISTICS**

Course Code	Category	Course Name	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL			L	T	P
			End Sem University Exam	Two Term Exam	Teachers Assessment*	End-Sem University Exam	Teachers Assessment*				
BFS401	Major	Forensic Ballistics	60	20	20	60	40	4	0	4	6

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

**\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participationin Class, given that no component shall exceed more than 10 marks.**

**Course Objectives:** After studying this paper the students will know –

1. The classification of firearms and their firing mechanisms.
2. The characteristics of ammunition.
3. The importance of firearm evidence.
4. The methods for characterization of gunshot residue.
5. The nature of firearm injuries.

**Course Outcomes:**

1. Student will be able to understand the historical development and basic concepts of Firearms and Ammunition.
2. Student will be able to know the classification of firearms.
3. Students will be familiar with the various aspects of internal ballistics and external ballistics.
4. Student will be able to evaluate and interpret crucial information from firearm injuries and
5. Understand the concepts behind linkage of firearm and ammunition.

**Unit 1: Firearms**

Definition of Firearms, History and development of firearms- Early history of firearms, the earliest firearms, the fifteenth century Match lock, sixteenth & seventeenth century small arms, The age of the Flint lock, the percussion lock firearms.

**Classification of firearms:** Characteristics and firing mechanism of smooth bored firearms (M.L., B.L.) Rifled firearms (Pistol, Revolver, Rifles, and Machine Guns), Classification, nomenclature and construction of country made firearms.

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#### **Unit 2: Ammunition**

Types of ammunition. Constructional features (Cartridge case primer propellant, Bullets, Pellets and wads). and characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles. Headstamp markings on ammunitions. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.

#### **Unit 3 Types of Ballistics**

**Internal Ballistics:** Definition, Ignition of the propellant, manner of burning, Piobett's law, Shape and Size of the propellant, pressure space curve, shot start pressure. All burnt point, Velocity, Space curve, Le Due's formula, muzzle velocity, Factors affecting muzzle velocity, theory of recoil.

**External Ballistics:** Definition-trajectory drop in the flight of the projectiles force of gravity, air resistance-base drag, Yaw, Shape of bullet (Spherical ball, Cylinder- conical, flat nose, round nose etc.) effective range, extreme range.

**Terminal Ballistics:** Definition, behavior of various types of bullets on hitting the target, remaining velocity, stopping power, Ricochet.

#### **Unit 4: Firearm Evidence**

**Range of Firing determination:** Visual and Chemical, instrumental methods with special reference to the applications of Neutron activation, Atomic absorptions, Scanning Electronmicroscopy and other miscellaneous methods.

**Gunshot Residue:** Mechanism of formation of GSR, modern methods of analysis of GSR from the shooting hand & target with special reference to clothings.

**Bullet and Cartridges matching:** Class and individual characteristics on bullet and cartridge case for comparing and matching with suspected firearm. Briefs of NIBIN and IBIS.

#### **Unit 5: Firearm injuries:**

Ballistic aspect of firearm injuries, nature, Effect of target, Velocity, constructional features and range on the wounding, significance of studying cavitations in body, Bullet Entry/Exit Hole Identification Evaluation of Firearm injuries.

**Reconstruction:** Accident, Suicide, murder and self-defense.

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##### **Practicals:**

1. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
2. To correlate the velocity of bullet with the impact it produces on the target.
3. To correlate the striking angle of the bullet with the impact on the target.
4. To estimate the range of fired bullets.
5. To carry out the comparison of fired bullets.
6. To carry out the comparison of fired cartridge cases.
7. Determination of Shot number from size and weight of shots
8. To identify gunshot residue.
9. To correlate the nature of injuries with distance from which the bullet was fired.
10. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

##### **Suggested Readings:**

1. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein(Ed.), Prentice Hall, New Jersey (1988).
3. A.J. Schwoebel and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
4. J.A. Siegel, P.J. Saukko and G.C. Knupfer Elaad in Encyclopedia of Forensic Science, Volume 2, (Eds.), Academic Press, London (2000).
5. Kumar, Forensic Ballistics in Criminal Justice (1987)
6. Burrard, The Identification of Firearms and Forensic Ballistics (1951)
7. B.R. Sharma, Firearms in Criminal Investigation and Trails (1990).

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**SEMESTER - IV**

**VOFS102 QUESTIONED DOCUMENT**

Course Code	CATEGORY	Course Name	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
Course Code	Category	Course Name	End Sem University Exam	Two Term Exam	Teachers Assessment*	End-Sem University Exam	Teachers Assessment*				
VOFS102	VC	Questioned Document	0	0	0	60	40	0	2	4	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Objectives:** After studying this Paper the Students will Know-

1. The fundamentals of questioned document.
2. Examination, identification and comparison of questioned document.
3. The basic principles and characteristics of handwriting.

**Course Outcomes:**

1. Student will be able to understand the basic tool for Forensic Documents examination .
2. Student will be able to know Comparison of documents
3. Students will be able to know Comparison of Handwriting

**Unit 1:Nature and Scope of Questioned Documents:**

Definition of questioned documents. Types of questioned documents. Preliminary examination of documents.

**Unit 2:Basic tools needed for forensic documents' examination:**

Ultraviolet, Visible, Infrared and Fluorescence Spectroscopy, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus. Determining the age and relative age of documents.

**Unit 3: Comparison of Documents**

Comparison of handwriting. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and individual characteristics.



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### **B.Sc. with Major Forensic Science – Batch (2024-2028) SEMESTER - IV**

#### **Unit 4: Comparison of Handwriting**

Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting. Standards for comparison of handwriting. Comparison of paper, ink, printed documents, typed documents, Xeroxed documents.

#### **Unit 5: Forgeries**

Alterations in documents, including erasures, additions, over-writings and obliterations.Indented and invisible writings. Charred Documents. Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Disguised writing and anonymous letters.

#### **Practicals:**

1. To identify handwriting characters.
2. To study natural variations in handwriting.
3. To compare handwriting samples.
4. To detect simulated forgery.
5. To detect traced forgery.
6. To study the line quality defects in handwriting samples.
7. To examine the security features of currency notes, passports and plastic money.
8. To study alterations, obliterations and erasures in handwriting samples.
9. To cite a case wherein Section 45 of Indian Evidence Act was invoked, seeking expert opinion for authentication of handwriting and/or signatures.
10. To cite a case wherein Section 489A of the Indian Penal Code was invoked in context of fake currency.

#### **Suggested Readings:**

1. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4<sup>th</sup> Edition, Foundation Press, New York (1995).
3. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).
4. E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).

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