



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

**Choice Based Credit System (CBCS)**  
**B. Sc. with Major Forensic Science - Batch (2022-25)**  
**SEMESTER- V**

**BFS501 FORENSIC BIOLOGY**

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
<b>BFS501</b>	<b>Major Core 1</b>	<b>Forensic Biology</b>	<b>60</b>	<b>20</b>	<b>20</b>	<b>60</b>	<b>40</b>	<b>4</b>	<b>0</b>	<b>4</b>	<b>6</b>

**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 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. How forensic entomology assists in death investigations.

**Course Outcomes:** After studying this paper-

1. The students will have the understanding of various forms of biological evidence.
2. They will be able to determine the importance of biological evidence such as blood Semen saliva etc in crime investigation.
3. Student will be able to know about wildlife Forensics.
4. They will be able to evaluate the significance of Microbes, insects and diatoms Criminal Investigations.

**Unit 1:Biological Evidence: I** Composition, Histology, Examination of blood and blood stains, Identification of lochial and menstrual stains by various methods.

**Semen:** Composition, St. of spermatozoa, Forensic methods of detection and identification of semen and seminal stain examination. Identification and examination of other body fluids/stains- vaginal, saliva, urine, pus, faces, vomit, milk, sweat &tears.

**Unit 2:**

**Biological Evidence: II** 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.

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#### Unit 3: Biological Evidence :III

Types and identification of microbial organisms of forensic significance. Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance.

#### Unit 4: 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. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.

#### Unit 5: Forensic Entomology:

Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations.

#### Practicals

1. To examine hair morphology and determine the species to which the hair belongs.
2. To prepare slides of scale pattern of human hair.
3. To examine human hair for cortex and medulla.
4. To carry out microscopic examination of pollen grains.
5. To carry out microscopic examination of diatoms.
6. To cite a crime case in which diatoms have served as forensic evidence.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics

#### Suggested Readings:

1. E.J. Gardner, M. I. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York; (1991)
2. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London; (1904)
3. Richard Saferstein; Forensic Science Hand Book; Ed.; Prentice Hall, Englewood Cliff, New Jersey; (1982)
4. P. L. Williams and R. Warwick; Gray's anatomy; Churchill Livingstone, London; (1980)
5. Biology Methods manual; Metropolitan Police Forensic Science Laboratory, London; (1978)
6. Herbert R. Mauersberger; Mathews Textile Fibres – their physical, Microscopic and chemical properties; John Wiley, New York; (1954)
7. R.P. Pandey, Plant Anatomy; S. Chand, new Delhi; (1998)
8. Kimball, John W; Biology; Arvind Publishing Co. New Delhi (1974)
9. Edwin, H. Mc Caney – Human Genetics, The Molecular Revolution, Jones & Bartlett Pub. London, (1993)
10. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of Cell,

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#### SEMESTER- V

#### BFS502 DNA Typing

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BFS502	DSE 1	DNA Typing	60	20	20	60	40	3	0	2	4

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

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

1. The basic principle of DNA analysis.
2. The importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.
3. The forensic significance of DNA typing, i.e parentage testing etc.
4. The report writing procedure
5. The legal perspective of DNA typing.

**Course Outcomes:**

1. Students will able to understand the basic structure of human genome and DNA molecules.
2. To understand various DNA typing methods such as RFLP, STR and SNPs with their Limitations and advantages.
3. To understand different methods of extraction of DNA by conventional and recent methods.
4. Students will be capable of performing DNA profiling of any biological samples aiming Investigation.

#### **Unit 1: Basics of DNA Typing**

History of DNA fingerprinting. Basic Principles, DNA as biological blueprint of life. Extraction of DNA for analysis. Quantization of DNA – yield gel quantitation and slot blot quantitation.

#### **Unit 2: Forensic DNA Typing Collection of specimens:**

Polymerase chain reaction: Historical perspective, sequence polymorphisms, individualization of evidence. Short tandem repeats (STR): Role of fluorescent dyes, nature of STR loci. Restriction fragment length polymorphism (RFLP): Genetic markers used in RFLP, typing procedure and interpretation of results. Mitochondrial DNA – Sequence analysis. Touch DNA

#### **Unit 3: Forensic Significance of DNA Profiling**

Parentage Testing Principles of heredity. Genetics of paternity. DNA testing in disputed paternity. Mendelian laws of parentage testing. Mathematical basis of parentage identification. Missing body cases. Veterinary & wild life and Agriculture cases

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### SEMESTER- V

#### Unit 4: Report Writing

Role of DNA typing in identifying unrecognizable bodies. Evaluation of result. Frequency calculations, Interpretation, Allele frequency determination, Hardy-Weinberg law. Match probability: Reference populations and databases, Quality control, Certification and Accreditation.

#### Unit 5: Legal perspective

Legal standard for admissibility of DNA profiling – procedural & ethical concerns, status of development of DNA profiling in India & abroad.

**Recent technologies:** DNA chips, SNPS, DNA cloning, Limitations of DNA profiling.

#### List of Practicals:

1. To carry out the separation of amino acids by thin layer chromatography.
2. To carry out extraction of DNA from body fluids.
3. To preparation of gel plates for electrophoresis.
4. To carry out electrophoresis for separation of enzymes.
5. To prepare a report on the role of DNA typing in solving paternity disputes.

#### Suggested Readings :

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).
3. H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
5. Daniel L. Hartl & Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones & Bartlet Pub. 1998.
6. Jaiprakash G. Shewale, Ray H. Liu Forensic DNA Analysis: Current Practices and Emerging Technologies, CRC Press, 2013
7. John M Butler: Forensic DNA Typing. Elsevier Academic Press.
8. Lee M.C. and Gaenesten, R.E: DNA and other Polymorphism in Forensic Science. Year book Medical Published.

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#### SEMESTER- V

#### VOFS103 DIGITAL FORENSIC

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			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
VOFS103	VC	Digital Forensics	0	0	0	60	40	0	2	4	4

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

1. The basics of Digital Forensics.
2. Computer Crimes and their types
3. The cases which fall under the purview of Digital Crimes.
4. The types of Digital Crimes.
5. Elements involved in investigation of Digital Crimes.

**Course Outcomes:**

1. Types of Computer-crimes
2. Fundamentals of Computer components and Networking & Security.
3. Applications of Computer Forensic tools in Investigation.

#### **Unit 1: Fundamentals and Concepts**

Fundamentals of computers Hardware and accessories – development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats, Memory and processor, methods of storing data operating system, software, introduction to network, LAN, WAN and MAN.

#### **Unit 2: Computer Crimes**

Definition and types of computer crimes, Distinction between computer crimes and conventional crimes Reasons for commission of computer crimes, Breaching security and operation of digital systems.

#### **Unit 3: Types of Computer Crimes**

Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security in cyber space, An overview of hacking, spamming, phishing and stalking.

#### **Unit 4: Computer Forensics Investigations**

Seizure of suspected computer, Preparation required prior to seizure, Protocol to be taken at the scene, Extraction of information from the hard disk.

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#### Unit 5: Examination of Exhibits

Treatment of exhibits, Creating bit stream of the original media, Collection and seizure of magnetic media, Legal and privacy issues, Examining forensically sterile media, Restoration of deleted files, Password cracking and E-mail tracking, Encryption and decryption methods, Tracking users.

#### Practicals:

1. Examination of cases related with e-mail bombing.
2. To examine different types of Malwares in System.
3. To recover data from any hard disk
4. Collection and seizure of magnetic media.
5. To study different methods of Encryption and decryption
6. To trace any e-mail and further examination
7. To crack a password of any system

#### Suggested Readings:

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, Computer Crimes and Computer Forensics, Select Publishers, New Delhi (2003).
2. C.B. Leshin, Internet Investigations in Criminal Justice, Prentice Hall, New Jersey (1997).
3. R. Saferstein, Criminalistics, 8<sup>th</sup> Edition, Prentice Hall, New Jersey (2004).

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#### Practical

1. To determine relative viscosity of given organic liquids by viscometer (Four liquids)
2. To determine the molecular weight of a high polymer by using solutions of different concentrations
3. To determine Pk value of given weak acid by pH-metric titration with strong base  
Analysis of acid and basic radicals
4. pH metric measurement
  - (a) To prepare buffers and standardization of pH meter
  - (b) Determine the molarity of HCl pH-metrically provided M/10 NaOH
5. Determination of functional groups
6. Analysis of acid and basic radicals
7. Detection of elements

#### Suggested Readings

1. Advanced Inorganic Chemistry, Volume-I, Nineteenth Edition, Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan, S. Chand Publication, ISBN- 81-219-0263-0.
2. Concept and model
3. Concise Inorganic Chemistry, Fifth Edition, of Inorganic Chemistry, Third Edition, Douglas Mc. Doniels, Wiley India. J. D. Lee, Wiley India
4. General Chemistry, Sixth Edition, Raymond Chang, McGraw Hill
5. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

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