

**GENERIC ELECTIVES (GE-16): Forensic Biology**  
**Zoo-GE-15**

**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
<b>Forensic Biology Zoo-GE-16</b>	<b>04</b>	<b>02</b>	<b>Nil</b>	<b>02</b>	<b>Passed Class XII with Biology/ Biotechnology</b>	<b>NIL</b>

**Learning Objectives**

The learning objectives of this course are as follows:

- to introduce the concept of forensic biology and DNA analysis.
- to identify and analyse the crime scene for biological evidence.
- to familiarize the students about the scientific methods in forensic biology.
- to emphasis on the practical techniques of biological principles that includessample recovery, sample handling, different analytical techniques and DNA profile comparison.
- to highlight the importance and application of forensic science.

**Learning Outcomes**

By studying this course, students will be able to

- Comprehend the fundamentals of forensic biology and DNA analysis.
- better understand the concepts of proper collection and preservation of biological.
- exhibits and crime scene investigation of biological evidence.
- rationalize the significance of criminal profiling.
- Develop skills based on the practical techniques of biological principles that includes sample recovery, sample handling, different analytical techniques and DNA profile comparison.

**SYLLABUS OF GE-16**

**UNIT- 1: Principles of DNA Forensics and DNA Typing**

**8 hrs**

Definition and fundamental concepts of forensic biology, DNA as biological blueprint of life, Structure of DNA, collection of DNA sample, extraction, profiling, restriction fragment length polymorphism (RFLP), polymerase chain reaction (PCR), short tandem repeat markers, single nucleotide polymorphism markers (SNP), determination of ethnicity, determination of physical appearance, determination of personality traits, mitochondrial DNA, RNA and DNA database. Result interpretation.

**UNIT- 2: Parentage Testing****4 hrs**

Principles of heredity, genetics of paternity, DNA testing in disputed paternity, Mendelian laws of parentage testing.

**UNIT- 3: Biological Evidence****12 hrs**

Nature and importance of study of biological evidences in crime cases:

- a) Forensic examination of hair: Transfer, persistence and recovery of hair evidence, Structure of human hair, Comparison of hair samples, Morphology and biochemistry of human hair.
- b) Comparison of human and animal hair.
- c) Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, plants, plant parts and products by conventional and modern methods, Identification of Pug marks of various animals
- d) Types and identification of microbial organisms of forensic significance
- e) Forensic odontology: structural variation in teeth (human and non-human), types of teeth and their functions, determination of age from teeth: eruption sequence, Gustafson's method, dental anomalies, their significance in personal identification.  
**Bites marks:** Forensic significance, collection and preservation of bite marks, photography and evaluation of bite marks, Lip prints in forensic investigations.

**UNIT- 4: Forensic Importance of Body fluids****6 hrs**

**Blood:** Composition and functions, Collection and preservation of blood evidence, Distinction between human and non-human blood, Determination of blood groups; Forensic characterization of bloodstains, typing of dried stains;

**Semen:** Forensic significance of semen, Composition, functions and morphology of spermatozoa, Collection, evaluation and tests for identification of semen, Individualization on the basis of semen examination.

**Other Fluids:** Composition, functions, identification tests and forensic significance of saliva, sweat, milk and urine.

**Practical****(60 hrs)****(Laboratory periods: 15 classes of 4 hours each)**

1. Prepare slides of scale pattern of human hair and examine morphology of hair to determine the species to which the hair belongs.
2. Chemical identification of human blood.
3. Determination of blood group from fresh and dried blood samples.
4. Crime scene Blood Stain Pattern Analysis, using photographs and videos.
5. Identification of saliva and urine.
6. Separation of amino acids by thin layer chromatography (TLC).
7. Case study of evidences based on: DNA finger printing (disputed paternity)/ Bite marks/ Hair.
8. Visit to any Forensic Lab/Institute.

### **Essential/recommended readings**

1. Tilstone, W.J., Hastrup, M.L. and Hald, C. (2013) Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton.
2. Saferstein, R. (2010) Criminalistics: An Introduction to Forensic Science (10th Edition), Pearson.
3. Butler, J.M. (2005) Forensic DNA Typing, Elsevier.
4. L. Stryer, (1988) Biochemistry, 3rd Edition, W.H. Freeman and Company, New York.
5. Chowdhuri, S. (1971) Forensic Biology, BPRD, New Delhi.

### **Suggestive readings**

1. Duncan, G.T. and Tracey, M.I. (1997) Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton.
2. Inman K. and Rudin, N. (1997) An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton.

**NOTE: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**