SKILL ENHANCEMENT ELECTIVE (SEC) COURSES

Forensic Science Series

Already Existing and Approved Courses

1. Basic Forensic Science

2. Forensic Chemistry

Proposed Courses

1. Forensic Analysis of Biological Evidence (**Proposed by Dept of Biochemistry and Acharya Narendra Dev College**)
2. Forensic Toxicology (**Proposed by Acharya Narendra Dev College**)
3. Injury and Death (**Proposed by Acharya Narendra Dev College**)
4. Questioned Document Examination (**Proposed by Acharya Narendra Dev College**)

Skill development and job opportunities

- After completion of this course students would obtain the training in collection, documentation, and analysis of physical evidences. They will be encouraged to do short internships in police station, forensic laboratories and research institutes.
- The students will also able to take a job in a forensic laboratories or police station even after completing a one-year course as they are able to collection, preservation and documentation of evidence, drawing acrime scene and doing preliminary analysis at crime scene.
- They will also be eligible for jobs in Government or non-Government agencies that are involved in legal and criminal investigations.

FORENSIC ANALYSIS OF BIOLOGICAL EVIDENCES

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Forensic Analysis of Biological Evidences	2	0	-	2	XII Passed with Science	Nil

Course Objectives

The course aims to provide an understanding of the applications of biochemistry in forensic sciences through analysis of evidences, which will help students develop analytical and problem-solving skills for real life situation. The course will keep abreast with all recent developments and emerging trends in forensic science thus helping interested students take up forensic science as future course of study.

Learning outcomes

After completing the course students will be able to

1. Explain how a forensic investigation is initiated through preservation of evidences, as well as chemical, physical and biological methods of their analysis
2. Establish identity of an individual by serological evaluation, and DNA analysis.
3. Comprehend the importance of precision, reproducibility and accuracy in identification of a biological sample.
4. Evaluate and t identify the accurate age, sex and identity of an individual in skeletal remains in a forensic investigation.
5. Obtain hands-on-experience in some of the basic biochemical processes involved in forensic investigation.

Skill development and job opportunities

After completion of this course students would obtain the training in analysis of biological evidences. They will be encouraged to do short internships in forensic laboratories and research institutes. The students will also be able to take a job in forensic laboratories as they will know how to handle a forensic sample and do basic biochemical analysis

Unit I: Biochemical analysis of trace evidences (3 Weeks/ 12 Hours)

- Examination of Fiber and Soil
- Examination of Hair and Pollen

Unit II: Biochemical analysis of biological fluids as forensic evidence (3 Weeks/ 12 Hours)

- Preliminary and Confirmatory test for blood, semen and saliva and other biological fluids
- Blood group and blood protein analysis for identification of an individual
- Blood splatter analysis

Unit III: DNA Fingerprinting (4 Weeks/ 16 Hour)

- Extraction of DNA from biological samples (Blood/Semen/Saliva/Hair)
- DNA fingerprinting based on micro/mini satellite markers (PCR and Agarose gel electrophoresis)

Unit IV: Forensic Anthropology (2 Weeks/ 8 Hours)

- Determination of sex, age and ethnicity through skeletal remains
- Forensic odontology to determine age and identity of remains

Unit V: Field trip to a forensic laboratory and case study presentation (3 Weeks/ 12 Hours)

Teaching Methodology/Activities in the Classroom

Content presentations, virtual labs/videos, hands-on sessions and case study discussions

Assessment Patterns for Each Unit/Practical

Unit I: Assessment based on the results reported for the practical conducted (20 marks)

Unit II: Test on the topics covered (10 marks)

Unit III: Assignment for interpreting DNA fingerprinting results (15 marks)

Unit IV: Assessment based on the results reported for the practical conducted (10 marks)

Unit V: Case Study Presentation (10 marks)

Viva (5 marks)

Practical Record/File (10 marks)

ESSENTIAL READINGS

- James, S. H., Nordby, J. J. & Bell, S. (2014). *Forensic Science: An Introduction to Scientific and Investigative Techniques, Fourth Edition*: Taylor & Francis. ISBN 9781439853832
- Saferstein, R. (2018). *Criminalistics: An Introduction to Forensic Science, Twelfth edition*: Pearson Education. ISBN 10:0134477596, ISBN 13: 9780134477596
- Tewari, R. K., Sastry P. K., Ravikumar, K. V. (2002). *Computer Crime and Computer Forensic*, *First Edition*: Selective & Scientific Books
- Veeraraghavan, V. (2009). *Handbook of Forensic Psychology, First Edition*: Selective & Scientific Books

SUGGESTED READINGS

- Lee, H., Palmbach, T. & Miller, M. (2001). *Henry Lee's crime scene handbook, First Edition*: Academic Press ISBN 9780080507989
- Parikh, C. K. (2016). *Parikh's textbook of medical jurisprudence, forensic medicine and toxicology : for classrooms and courtrooms*, *Seventh Edition*: CBS Publishers and Distributors. ISBN 9788123926469

FORENSIC TOXICOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Forensic Toxicology	2	0	-	2	XII Passed with Science	Nil

1. Learning Objectives

The Learning Objectives of this course are as follows:

- Acquire a thorough understanding of the fundamental principles of toxicology, including how toxic substances impact the human body
- Explore the role of forensic toxicology in legal cases, such as post-mortem investigations, drug-facilitated crimes, and toxin detection in criminal cases
- Develop hands-on skills in analyzing biological samples using laboratory techniques like chromatography, spectroscopy and immunoassays
- Study the ethical and legal responsibilities of forensic toxicologists, with a focus on proper evidence handling, accurate reporting, and providing testimony in court

2. Learning Outcomes

The Learning Outcomes of this course are as follows:

- Students will be able to identify various drugs, poisons, and toxins, including narcotics, hallucinogens, alcohol, and environmental toxins, and understand their effects on human health.
- Students will gain practical experience in laboratory techniques such as spectrophotometry, chromatography (TLC) and immunoassays for analyzing toxic substances in biological samples.
- Students will learn how to analyze toxicological results from biological samples and interpret their significance in forensic investigations, with an emphasis on their impact on criminal cases and legal outcomes.

3. Main Course Structure

Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.

Unit I: Fundamental principles of forensic toxicology and its significance in criminal investigations. (6 Weeks/24 Hours)

- **Laboratory 1**: Discuss and prepare a report on the basic principles of toxicology, including ADME, DRC, toxicokinetics, and toxicodynamics
- **Laboratory 2**: Discuss the classification of drugs and controlled substances, along with testing and screening methods
- **Laboratory 3**: Learn proper techniques for collecting, storing, and preserving biological samples for toxicological analysis
- **Laboratory 4**: Participate in a virtual demonstration of post-mortem analysis related to poisoning or drug overdose cases
- **Laboratory 5**: Discuss the effects of drug poisoning on various human body systems through case studies

Unit II: Toxicological analysis of substances using common laboratory tools and techniques. (9 Weeks/36 Hours)

- **Laboratory 6**: Conduct a crime scene investigation focused on searching for toxic substances, drugs, narcotics, and psychotropic substances
- **Laboratory7:** Perform toxicological analysis of biological samples using thin-layer chromatography, including the comparison and extraction of target molecules
- **Laboratory 8**: Perform spectrophotometric analysis of biological samples and compare them with known toxic substances for quantification
- **Laboratory 9**: Explore various methods for detecting alcohol and drugs in biological fluids using colorimeter
- **Laboratory 10-11**: Analyze case studies of famous poisoning incidents, such as notable historical poisonings and criminal cases
- **Laboratory 12**: Write and present a comprehensive toxicology report based on a real or hypothetical case investigation

4. **Teaching Methodology/Activities in the Classroom**

Content presentations, virtual labs/videos, hands-on sessions and case study discussions

5. Assessment Patterns for Each Unit/Practical

Unit I:

- Written report on the principles of toxicology and the topics discussed in class (ADME, DRC, toxicokinetics, toxicodynamics). (15 marks)
- Presentation and discussion on the classification of drugs and controlled substances, testing, and screening methods. (10 marks)

Unit II:

- Case Study Analysis and Report on the effects of drug poisoning on human systems. Class discussion and active participation in the analysis (10 marks).
- Practical evaluation of search and identification techniques used during crime scene investigations. Written report on findings from the simulated investigation (15 marks).
- Practical assessment on the use of thin-layer chromatography (TLC) for analyzing biological samples. Practical test on performing spectrophotometric analysis and comparing results with known toxic substances. (15 marks)

Viva (5 marks)

Practical Record/File (10 marks)

6. Mapping with the Next Suggestive Course

Forensic Chemistry

7. Prospective Job Roles after a Particular Course

Skill enhancement increases employability and credibility, providing an edge in both private and governmental sectors. Students can enter fields like crime scene investigation, forensic chemistry and toxicology.

8. Essential Reading

- Forensic Toxicology: Medicolegal Case Studies" by D. R. (Ruth) Gurdjian (2020) CRC Press, ISBN: 978-0367330155
- Forensic Science: From the Crime Scene to the Crime Lab" by Richard Saferstein (2017) Publisher: Pearson, ISBN-13**:** 978-013429229
- Forensic Science: An Introduction to Scientific and Investigative Techniques" by Norman J. Nordby (2013) by CRC Press, ISBN-13: 978-1466515570

9. Suggestive Reading

- Forensic Toxicology: Principles and Applications" by David J. M. H. and William G. McKinney (2007) Latest Elsevier, ISBN: 978-0128103937

10. Examination scheme and mode

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi from time to time.

INJURY AND DEATH

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Injury and Death	2	0	-	2	XII Pass with Science	Nil

1. Learning Objectives

The Learning Objectives of this course are as follows:

- To explain how a medical examiner can determine the different modes of causing injury to the victim
- To make the students learn how the time of death of a cadaver can be deciphered
- To highlight the types of deaths that a person can encounter.

2. Learning Outcomes

The Learning Outcomes of this course are as follows:

- Students will be able to recognize the mode of injury by examining the pattern of wound on the victim.
- Students will be able to correlate how the type of injuries can give an idea that what type of death and what could have been the murder weapon.
- Students will be able to explain the purpose and relevance of autopsy.
- They will be able to understand how through autopsy the medical examiner can make out if death might have occurred due to drowning, electrical shock, or substance abuse.
- Students will be able to analyze and explain the causes for changes after death and the investigative issues to be addressed.
- Students will be able to understand the different types of death based on natural and unnatural causes.

3. Main Course Structure

Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.

Unit I: Types of Injury **(7Weeks/28 Hours)**

- **Laboratory 1**: Classification of abrasions, contusions and lacerations as types of blunt end injuries
- **Laboratory 2**: Classification of incision, stab, fracture as types of sharp end injuries
- **Laboratory 3:** Discussion of medico legal aspects of injury
- **Laboratory 4-5**: Case study presentations on the basis of different types of injuries

Unit II: Types of Death (8Weeks/32 Hours)

- **Laboratory 6**: Understanding the classification of deaths as natural, accidental, suicidal and homicidal.
- **Laboratory 7**: Discuss features that can aid in determining the manner of death by strangulation, drowning or drug overdose.
- **Laboratory 8:** Discuss diagnostic features that help in determining the different modes of death (coma, syncope and asphyxiation).
- **Laboratory 9:** Determining time of death through algor mortis, livor mortis and rigor mortis
- **Laboratory 10:** Use of Forensic Entomology to determine time of death
- **Laboratory 11:** Discussion of medico legal aspects of death
- **Laboratory 12-13:** Case study presentations on the basis of different types, manner and mode of deaths

4. Teaching Methodology/Activities in the Classroom

Content presentations, virtual labs/videos, field visits and case study discussion

5. Assessment Pattern for each Unit/Practical.

Unit I:

- Assignment to determine types of injuries (10 marks)
- Case Study Presentations (20 marks)
- Test (10 marks)

Unit II:

- Assignment to determine types of deaths marks (10 marks)

- Assessment based on presentation of a crime through play marks (10 marks)

Viva marks (10 marks)

Practical Record/ File (10 marks)

6. Mapping with the Next Suggestive Course

None

7. Prospective Job Roles after a Particular Course

Skill enhancement increases employability and credibility, providing an edge in both private and governmental sectors. Students can be associated with any forensic laboratory for assistanceship with a medical examiner.

8. Essential Reading

- Wagner, Scott A (2009). *Death Scene Investigation: A Field Guide*. New York: CRC Press. ISBN# 978-1-4200-8676-8
- James, S.H. Nordby, J.J. and Bell, S. (2014). 4th Edition. *Forensic science: An introduction to scientific and investigative techniques*. Florida, USA: CRC Press. ISBN-13: 978-1439853832

9. Suggestive Reading

- Bardale, R. (2011). 1st Edition. *Principles of forensic medicine and toxicology*. New Delhi: Jaypee Brothers Medical Publishers. ISBN-13**:** 978-9350254936.

10. Examination Scheme and Mode

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi from time to time.

QUESTIONED DOCUMENT EXAMINATION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Questioned Document Examination	2	0	-	2	XII Passed with Science	Nil

1. Learning Objectives

The Learning Objectives of this course are as follows:

- Introduce students to the importance of questioned documents and their significance in forensic science, highlighting the various types of documents that can be contested, such as signatures on crucial documents, handwriting alterations, and forgeries in written materials
- To familiarize students with the different techniques and methods used in document examination, including handwriting analysis, ink analysis, and paper analysis, while also exploring the role of instrumental tools (e.g., UV light, infrared spectroscopy) in the investigation of questioned documents

2. Learning Outcomes

The Learning Outcomes of this course are as follows:

- Students will become familiar with forged documents and understand the different types of documents and materials that can be classified as such.
- Students will learn to identify and explain the various techniques used in questioned document examination, including both traditional methods and advanced technological tools.
- Students will critically assess the role of forensic document examiners in the legal context and gain an understanding of how their findings can impact judicial decisions.

3. Main Course Structure

Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.

Unit I: Fundamental characteristics of handwriting and their role in individualization

(6 Weeks/ 24 Hours)

- **Laboratory 1**: To analyze and compare the characteristic features of handwriting
- **Laboratory 2**: To examine natural variations in handwriting
- **Laboratory 3-4**: Comparison of known handwriting samples with questioned documents, focusing on consistency in formation, pressure, speed, and slant using specialized scanners
- **Laboratory 5**: To detect intentional corrections, modifications, alterations, or changes in forged documents
- **Laboratory 6**: To review and discuss the case studies related to forged handwritten document

Unit II: Forgeries in special documents **(3 Weeks/ 12 Hours)**

- **Laboratory 7**: To identify security features in currency notes, mark sheets, passports, and degree certificates
- **Laboratory 8**: To review and discuss case studies related to document forgeries, including fake currency, passports and educational documents

Unit III: Analysis of documents using both destructive and non-destructive methods through various tools and techniques. **(6 Weeks/24 Hours)**

- **Laboratory 9**: Analysis of various types of paper and ink using thin layer chromatography and spectrophotometry
- **Laboratory 10**: Microscopic and digital examination of unique paper features, such as thickness, fiber structure, and composition
- **Laboratory 11**: Comparative analysis of forged and known paper samples using the aforementioned paper characteristics

- **Laboratory 12**: Review and discussion of case studies that utilize the techniques covered in the previous labs

4. Teaching Methodology/Activities in the Classroom

Content presentations, virtual labs/videos, hands-on sessions and case study discussions

5. Assessment Patterns for each Unit/practical.

Unit 1:

- Assessment will focus on the various methods and techniques discussed for detecting document forgeries. Students will be evaluated on their understanding and ability to write about the different identification methods effectively (15 marks).
- Assessment will be based on the student's hands-on performance during the practical session, including the experiment execution and the outcomes observed. A viva/test will also be conducted to evaluate the student's understanding of the practical concepts (10 marks).
- Assessment will focus on the properties of various types of documents and paper covered in the unit. Students will be evaluated on their understanding of these properties and their application in document analysis (10 marks).

Unit II:

- Students will present case studies relating to different types of currency notes, identity documents, or other forms of evidence. The assessment will be based on the selection of cases, the depth and relevance of content, and the clarity of the presentation style (20 marks).

Unit III:

- Students will be assessed on their understanding and application of procedures used to identify ink samples on questioned documents. The assessment will focus on the detailed steps involved in the identification process and the accuracy of the student's explanation of the method (10 marks)

Viva (5 marks)

Practical Record/File (10 marks)

6. Mapping with the next suggestive course

Death and Injury

7. Prospective Job Roles after a particular course

Skill enhancement increases employability and credibility, providing an edge in both private and governmental sectors. Students can enter fields like crime scene investigation, forensic graphology and document analysis.

8. Essential Reading

- Forensic Science: From the Crime Scene to the Crime Lab" by Richard Saferstein (2017) Publisher: Pearson, ISBN-13: 978-013429229.
- Forensic Science: An Introduction to Scientific and Investigative Techniques" by Norman J. Nordby (2013) by CRC Press, ISBN-13: 978-1466515570
- Forensic Document Examination: A Desk Reference" by Max M. Willis (2004) CRC Press, ISBN-13: 978-0849307244

9. Suggestive Reading

- Scientific Examination of Questioned Documents" by James E. Starrs and R. D. MacDonald (2001), CRC Press, ISBN-13**:** 978-0849301457
- Forensic Handwriting Examination: A Definitive Guide" by Peter M. De Forest (2002) CRC Press, ISBN-13**:** 978-0849308432

10. Examination scheme and mode

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi from time to time.