

*Placed at the meeting of
Academic Council
held on 26.03.2018*

**APPENDIX - CR
MADURAI KAMARAJ UNIVERISTY
(University with Potential for Excellence)**

New Course

B.Sc. Forensic Science (Semester)

CHOICE BASED CREDIT SYSTEM

(With effect from the academic year 2018-2019 onwards)
REGULATIONS AND SCHEME OF EXAMINATIONS

1. INTRODUCTION OF THE PROGRAMME

Forensic Sciences includes essential components such as Forensic Pathology, Psychiatry, Psychology, Forensic Medicine and Odontology (Dentistry). It is chiefly laboratory-based science consisting of related elements of Chemistry, Biology, Toxicology, Ballistics, the Science of Fingerprinting, Questioned Documents and Impressions.

The discipline involves **crime- scene investigation** including fire and explosion scenes and drug laboratories. The subject applies scientific knowledge to aid in the administration of justice, and has no boundaries as far as subjects are concerned; it makes use of all faculties of science, such as Physics, Chemistry, Biology and Medicine, among others.

Technical skill can be developed through the curriculum. However, intelligence and aptitude required in solving a crime by viewing it from various angles needs to be developed by the student through practical exposure. Good academic skills with fundamental knowledge of various fields of science is necessary.

The field also demands an eye for detail, strong analytical skills, keen observation and scientific investigations. The ability to work with experts from other fields such as Psychology, Social Science, Non Clinical experts and Statistics is a must. Ideal candidates would be comfortable working both indoors and outdoors, besides possessing the following skill sets:

- Good hold on science subjects (especially Biology and Chemistry)
- An enquiring mind
- High degree of accuracy and attention to detail in one's nature of work
- Observation skills
- Patience
- Ability to work under pressure for long hours
- Team spirit

2. Eligibility

Passed Class XII from a recognized Board in science stream.

The admission will be done on merit basis taking into consideration the aggregate marks obtained in the following three subjects:

- (i) Physics
- (ii) Chemistry

Any one out of Mathematics or Biology in whichever subject the candidate has scored higher marks.

Age

The Maximum limit to admit a candidate in B.Sc Forensic Science is 25 Years and for SC/ST Students 3 Years of relaxation can be given

- 2.1. Duration of the Programme : 3 years
- 2.2. Medium of Instructions : English

3. OBJECTIVES OF THE PROGRAMME

The Universal Declaration of Human Rights directs the member nations to create such conditions under which the ideals of free human beings, enjoying civil and political freedom from fear and want, can be achieved. The Constitution of India, through its various articles, strives to ensure security and safety of citizens in accordance with the principles of Universal Declaration of Human Rights. However, crime is a violation of these principles. In a country like India, where majority of population is uneducated, social set up is heterogeneous, public- police relations are not very cordial, poverty is rampant and unemployment widespread, it is not surprising that crime rate is increasing exponentially.

If we have to create conditions conducive to harmonious development, we must mitigate the crime rate. This can best be achieved by relying on the support of forensic science system. Unfortunately, in our country, forensic science is not viewed as a core investigative skill in crime detection. In fact, there is a lack of understanding of the forensic process itself. It is for this reason that less than 10% of the police cases are, at present, being referred for forensic examination. Less than 5% are solved by the application of forensic science. The rest are solved by third degree method – a practice which the human rights organizations will not allow in days to come.

In majority of serious crime cases, hi-tech measures are being adopted by perpetrators of crime. The counter measures have to be more sophisticated to surpass them. This calls for strengthening the foundations of forensic science at national level. It is with this aim that we wish to initiate a B.Sc. Course in Forensic Science.

The following are the objectives of this course:

1. To emphasize the importance of scientific methods in crime identification and detection.
2. To disseminate information on the advancements in the field of forensic science.
3. To highlight the importance of forensic science for perseverance of the society.
4. To review the steps necessary for achieving highest excellence in forensic science.
5. To generate talented human resource, commiserating with latest requirements of forensic science.
6. To use technological advancements in the investigation of crimes and its occurrences.
7. To provide a platform for students and forensic scientists to exchange views, chalk- out collaborative programs and work in a holistic manner for the advancement of forensic science.

4. OUTCOME OF THE PROGRAMME

B.Sc. in Forensic Sciences is a 3- year under graduate course which involves the application of scientific knowledge to the investigation of crimes. Professionals in this discipline apply their knowledge of science to analyze the evidence found at a crime scene. An analysis could involve anything from an object at the crime scene, to soil, blood stains, saliva, body fluids, bones, fingerprints, DNA profiling, recovering data from computers, researching new techniques/ technology etc. **B.Sc. Forensic Sciences Syllabus** includes essential components such as Forensic Pathology, Psychiatry, Psychology, Forensic Medicine and Odontology (Dentistry).

5. CORE SUBJECT PAPER

All the core papers are mentioned inside the course structure.

6. SUBJECT ELECTIVE PAPER

The subject elective papers are mentioned inside the course structure.

7. NON – MAJOR ELECTIVE PAPER

Non Major Elective paper as prescribed by the Department of Forensic Science approved by the University.

8. UNITIZATION

Each Subject is segregated into five units with each unit consisting of equal distribution of major concepts.

9. PATTERN OF SEMESTER EXAM

Examination will be conducted at the end of each semester. Each Semester has two patterns of examination namely Internal (25 marks) and external (75marks).

10. SCHEME FOR INTERNAL ASSESSMENT

The Internal assessment will be as follows:

Test	=	10Marks (Average of the best two tests)
Assignment	=	5 marks
Seminar / Group Discussion	=	5 marks
Peer- team – teaching	=	5 marks
Total	=	25 marks

11. EXTERNAL EXAM

External Examination will be conducted as semester exams as per University norms with common question paper for all affiliated colleges.

12. QUESTION PAPER PATTERN

The exciting Pattern of Question Paper will be as follows.

Time: 3 Hours

Maximum Marks: 75

Section A: (10*1=10 Marks) Question No: 1 to 10 (Multiple Choice Pattern)

1. Two questions from each Unit.
2. Four Choices in each questions
3. No "None of these: choice.

Section B: (5*7=35 Marks)

1. Answer all Questions either (a) or (b)
2. Answer not exceeding two pages
3. One Question from each unit.

Section C: (3*10=30 Marks)

Answer should not exceed Four Pages. Answer any Three out of Five (One Question from each Unit).

13. SCHEME FOR EVALUATION

External Evaluation is done at the University level by Central Evaluation Procedure.

14. PASSING MINIMUM

Passing Minimum for the UG Course is 40% marks in Internal and External Separately.

Sl. No	Range of CCPA	Class
1	40 & above but below 50	III
2	50 & above but below 60	II
3	60 & Above	I

15. MODEL QUESTIONS

FORENSIC BIOLOGY

Time: Three hours

Maximum: 75 marks

SECTION A- (10 x 1=10)

Answer ALL questions.

1. While conducting Luminol test, luminol reacts with hydrogen salt and forms:

- (a) Di-anion (b) Cation (c) Anion (d) All of the above

2. Electrophoresis is mainly used for:

- (a) Differentiate the biological sample
(b) To perform the human specific presumptive tests
(c) DNA isolation from biological material
(d) Separates the molecules

3. Restriction enzymes are used in one of these techniques:

- (a). Sequencing (b). Genotyping (c). RFLP (d). Polymerization

4. Which of the following statement is false ?

- (a). Enzymes are differentiated by electrophoresis method
(b). While DNA sequencing both forward and reverse primers are used
(c). Amplification is done through PCR
(d). ABO blood grouping is mainly used for differentiating individuals

5. The fluorescence examination of the seminal stains indicates

- (a). Pink color (b). White color (c). Blue color (d). Red color

6. The presumptive test for semen is

- (a) Acid phosphatase test (b). Sodium alpha naphthyl test (c). Napthanal diazo test
(d). Barbiturate test

7. For examination of diatoms sample should collect from

- (a). Bone marrow (b). Blood (c). Tissue (d). Epithelial cells

8. A study of relationships between organisms and their environment

- (a). Ethnology (b). Ecology (c). Monospecific (d). Monoecious

9. In wild life Forensics, identification of animals done by

- (a). Grouping (b). Feathers (c). Twigs (d). Pug marks

10. Illegal way of trafficking animals

- A. Kidnapping B. Poaching C. Harboring D. Smuggling

PART B

SECTION-B

(5 x 7=35)

Answer all Questions by choosing either (a) or (b)

11. A) Describe the identification methods of blood? Forensic significance of biological materials.
(OR)

b) Describe about the DNA markers and their uses in Forensic cases

12. A) Describe the identification method of Urine and its Forensic significance.

(OR)

b) Explain about the Acid Phosphate Test.

13. A) What are Diatoms. Explain the identification methods of Diatoms and its specificity.
(OR)
b) What are the different types of timber varieties encountered in forensic cases
14. A) Explain about the Forensic significance of Fiber evidence.
(OR)
b) Define culpable homicide. When does it amount to murder?
15. A) Define about mitochondrial DNA. What is the forensic significance of mtDNA?
(OR)
B) Give a detailed account on the experimental method of psychology.

PART C

SECTION-C (3 x 10=30)

Answer Any Three Questions

16. Explain the process of protection of biological evidence.
17. Write down the process of identification of blood.
18. Discuss the basic principles of DNA Extraction.
19. What are the characteristics of finger prints?
20. Write a note on crime scene reconstruction

16. TEACHING METHODOLOGY

To enhance the quality of students through creative and effective teaching the following teaching methodologies by classroom teaching methods, Practical training, Power Point Presentation classes, Guest lectures, Demonstrations and Internship for one month after each semester and study tour programmes.

17. TEXT BOOKS

The text books are mentioned below each individual paper.

18. REFERENCE BOOKS

The reference books are mentioned below each individual paper.

19. RETOTALLING AND REVALUATION PROVISION

Revaluation and re totaling shall be pursued by submission of respective application forms duly filled and authorized by the head of the Institution as per University norms. The applications must reach the University within the stipulated time frame as set by University.

20. TRANSITORY PROVISION

The revision of syllabus shall be done once in three years for better enhancement and updations.

21. SUBJECT AND PAPER RELATED WEBSITE

The websites are mentioned below the reference books column for every subject.

FIRST YEAR SEMESTER- 1

SCHEME OF EXAMINATIONS

Subjects	Exam Duration	No. of Hours	No. of Credits	Internal	External	Total
Part I						
Tamil - I	3	6	4	25	75	100
Part-II						
English – I	3	6	4	25	75	100
Part-III Core Subjects						
Introduction to Forensic Science	3	4	3	25	75	100
Crime and Society	3	6	4	25	75	100
Part – III Subject Elective						
Physics	3	3	3	25	75	100
Part – IV Skill Based Subject						
Economics	3	3	3	25	75	100
Part – IV Non Major Elective						
Anthropology	3	2	2	25	75	100
TOTAL		30	23			

SEMESTER- II

Subjects	Exam Duration	No. of Hours	No. of Credit	Internal	External	Total
Part I						
Tamil - II	3	6	4	25	75	100
Part-II						
English – II	3	6	4	25	75	100
Part-III Core Subjects						
Criminal Law	3	4	3	25	75	100
Forensic Psychology	3	5	4	25	75	100
Part III – Subject Elective						
Chemistry	3	3	2	25	75	100
Part – IV Skill Based Subjects						
Psychology	3	4	3	25	75	100
Part – IV Non Major Elective						
Forensic Science and Society	3	2	2	25	75	100
Total		30	22			

SECOND YEAR - SEMESTER-III

<i>Subjects</i>	<i>Exam Duration</i>	<i>No. of Hours</i>	<i>No. of Credits</i>	<i>Internal</i>	<i>External</i>	<i>Total</i>
Part – I						
Tamil – III	3	6	4	25	75	100
Part – II						
English – III	3	6	4	25	75	100
Part-III Core Subjects						
Forensic Dermatoglyphics	3	4	2	25	75	100
Technological Methods in Forensic Science	3	6	4	25	75	100
Criminalistics	3	4	3	25	75	100
Part III – Subject Elective						
Zoology	3	2	2	25	75	100
Part IV- Skill Based Subject						
Introduction to Biometry	3	2	2	25	75	100
Total		30	25			

SEMESTER-IV

Subjects	Exam Duration	No. of Hours	No. of Credits	Internal	External	Total
Part – I						
Tamil – IV	3	6	4	25	75	100
Part – II						
English – IV	3	6	4	25	75	100
Part-III Core Subjects						
Forensic Chemistry	3	4	3	25	75	100
Questioned Documents	3	3	2	25	75	100
Forensic Biology	3	4	3	25	75	100
Part III Subject Elective						
Computer Science	3	3	2	25	75	100
Part – IV Skill Based Subject						
Handwriting Identification and Recognition	3	4	3	25	75	100
Part – IV						
Extension Activities	-	-	1	-	-	-
Total		30	24			

THIRD YEAR
SEMESTER-V

<i>Subjects</i>	<i>Exam Duration</i>	<i>No. of Hours</i>	<i>No. of Credits</i>	<i>Internal</i>	<i>External</i>	<i>Total</i>
Part-III Core Subjects						
Forensic Ballistics	3	6	5	25	75	100
Forensic Toxicology	3	6	5	25	75	100
Part III Subject Elective						
Digital Forensics	3	6	4	25	75	100
Economic Offenses	3	6	4	25	75	100
Part IV Skill Based Subject						
Botany	3	4	3	25	75	100
Part IV Mandatory Subject						
Environmental Studies	3	2	2	25	75	100
Total		30	23			

SEMESTER- VI

<i>Subjects</i>	<i>Exam Hrs</i>	<i>No. of Hours</i>	<i>No. of Credits</i>	<i>Internal</i>	<i>External</i>	<i>Total</i>
Part-III Core Subjects						
Forensic Anthropology	3	6	5	25	75	100
Forensic Medicine	3	6	5	25	75	100
Part III Subject Elective						
Accident Investigation	3	4	3	25	75	100
Dissertation	3	5	4	25	75	100
Part IV Skill Based Subject						
DNA Typing	3	5	4	25	75	100
Part IV Mandatory Subject						
Value Education	3	2	2	25	75	100
Total		30	23			

Total Credits - 140

CORE: INTRODUCTION TO FORENSIC SCIENCE

Learning Objectives: After studying this paper the students will know –

- a. The significance of forensic science to human society.
- b. The fundamental principles and functions of forensic science.
- c. The divisions in a forensic science laboratory.
- d. The working of the forensic establishments in India and abroad.

Unit 1: History of Development of Forensic Science in India

Functions of forensic science. Historical aspects of forensic science - Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science - Frye case and Daubert standard.

Unit 2: Tools and Techniques in Forensic Science

Branches of forensic science. Forensic science in international perspectives, including set up of INTERPOL and FBI. Duties of forensic scientists. Code of conduct for forensic scientists. Qualifications of forensic scientists. Data depiction. Report writing.

Unit 3: Organizational set up of Forensic Science Laboratories in India

Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories. Police Academies. Police dogs. Services of crime laboratories. Basic services and optional services.

Unit 4

1. To study the history of crime cases from forensic science perspective.
2. To cite examples of crime cases in which apprehensions arose because of Daubert standards.
3. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.
4. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.
5. To write report on different type of crime cases.

Unit 5

1. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.

2. To examine the hierarchical set up of different forensic science establishments and suggest improvements.
3. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
4. To compare and contrast the role of a Police Academy and a Police Training School.
5. To compare the code of conduct prescribed by different establishments for forensic scientists.

Note: Unit 4 and 5 has to be conducted as practicals.

Reference Books:

1. B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).
2. M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).
3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.G. Eckert and R.K. Wright in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
5. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

CORE: Crime and Society

Learning Objectives: After studying this paper the students will know –

- a. The importance of criminology.
- b. The causes of criminal behavior.
- c. The significance of criminal profiling to mitigate crime.
- d. The consequences of crime in society.
- e. The elements of criminal justice system.

Unit 1: Basics of Criminology

Definition, aims and scope. Theories of criminal behavior – classical, positivist, sociological. Criminal anthropology. Criminal profiling. Understanding modus operandi. Investigative strategy. Role of media.

Unit 2: Crime

Elements, nature, causes and consequences of crime. Deviant behavior. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence. White collar crimes Victimology. Juvenile delinquency. Social change and crime. Psychological Disorders and Criminality. Situational crime prevention.

Unit 3: Criminal Justice System

Broad components of criminal justice system. Policing styles and principles. Police's power of investigation. Filing of criminal charges. Community policing. Policing a heterogeneous society. Correctional measures and rehabilitation of offenders. Human rights and criminal justice system in India.

Unit 4

1. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressure group.
4. To evaluate the post-trauma stress amongst victims of racial discrimination.
5. To correlate deviant behavior of the accused with criminality (take a specific example).
6. To evaluate victimology in a heinous crime.

Unit 5

1. To examine a case of juvenile delinquency and suggest remedial measures.
2. To evaluate how rising standards of living affect crime rate.
3. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.
4. To visit a 'Model Police Station' and examine the amenities vis-à-vis conventional police stations.
5. To examine steps being taken for rehabilitation of former convicts and suggest improvements.
6. To prepare a report on interrogation cells and suggest improvements.

Note: Unit 4 and 5 has to be conducted as practicals.

Reference Books:

1. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
2. D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton (2002).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester (1997).
5. R. Gupta, *Sexual Harassment at Workplace*, LexisNexis, Gurgaon (2014).

SUBJECT ELECTIVE: BASIC PHYSICS

Objectives:

1. Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques
2. Students will demonstrate understanding of places in the physical universe

3. Students demonstrate a broad base of knowledge in physics.
4. Students will demonstrate understanding of laws of nature.

UNIT I

Mechanics: Force, conservative and non conservative force, rotational motion of inertia, expression of M.I. of regular shaped bodies. Kepler's law. Acceleration due to gravity. Simple Harmonic motion and compound pendulum. Newton's law of motion.

UNIT II

Thermal Physics: concept of temperature, ideal gas equation and its law. Vander Waal's equation, reversible and irreversible process, Zeroth law, first, second and third law of thermodynamics. Carnot's cycle.

UNIT III

Electromagnetism: Coulomb's law. Electric field, Magnetic field due to current, Gauss's theorem and its application, Ampere's law, Kirchhoff's law and their applications. Wheat-stone bridge and its sensitivity. Rectifiers, Amplifiers, semiconductor and its type of junction. Paramagnetic, diamagnetic, ferromagnetic materials and properties.

UNIT IV

Waves and Oscillations: Resonance and its application, Doppler Effect, Photo electric effect, Electron microscope. Optics: Combination of lens and prism, direct vision spectroscope. Diffraction –the phenomenon, diffraction at a straight edge, slit and wire, Resolving power of a telescope an eye, wave front, polarization of light and Polarimetry, Optical instrument (eg. Eye, Camera, Microscope, Telescope).

UNIT V

Atomic Physics: Black body radiation, Planck's theory, De Broglie waves. Heisenberg's Uncertainty principle, Rutherford's atomic model. Bohr's atomic model of Hydrogen atom and atomic spectra, Schrodinger wave equation. Moseley's experiment on X-rays, diffraction of Xrays and its application, Radioactivity.

Reference Books:

1. Basic physics: a self teaching guide – II edition – Carl F Kauh
2. Handbook of Physics –
3. New simplified physics – S L Arora
4. A Master Resource book in Physics – D B Singh

SKILL BASED SUBJECT: FUNDAMENTALS OF COMPUTER SCIENCE

Objectives:

- To learn the basics of computer and information technology
- To understand the function of the operating system and DOS commands
- To Learn about usage of Internet, E-mail and World Wide Web

UNIT I

History and development of computers-mini, personal and super computers.

UNIT II

General awareness of computer hardware, CPU and other peripheral device (input output and auxiliary storage device).

UNIT III

Basic operating system concept-MS Dos and Windows.

UNIT IV

Knowledge of computer system, software and programming language, machine language, assembly language, and higher level language. Awareness of software packages like lotus and other scientific application packages.

UNIT V:

Cyber Crimes: Introduction, stand alone computer crimes- Printing of Counterfeit Currency and other documents. Computer Scanners, Imaging Software (Photoshop, Photo paint etc.), Software Piracy, Data Recovery.

REFERENCE BOOKS:

1. Alexis Leon and Mathews Leon. Introduction to Computers: . Leon Tech World, 199
2. R.X.Taxali. PC Software for windows Made simple: Tata Mcgraw hill.
3. Stephen L.Nelson. Office 2000 Complete Reference – Bpb.
4. Gini Counter and Annete Marquis. Mastering Office 2000-BPB.
5. Joyce Cox and Pully Urban, Quick Course in Microsoft Office: Galgotia Publications

NON MAJOR ELECTIVE: BASICS OF FORENSIC SCIENCE**Objectives:**

- Continue to set high professional standards.
- Engage with forensic science regulator and other relevant stake holders
- Maintain appropriate panels of assessors.
- Have a long term aim of becoming a royal society

UNIT I:

Introduction to crime, Sociological aspect in society, Criminal behavior, Types of crime, Monitoring system in society, Crime scenario in India.

UNIT II:

Detection of Crime, Different agencies involved in crime: Police, Medico-legal expert, Judicial officers

UNIT III

Scope and development of forensic science, Forensic science in India, Growth of Core laboratories, set up in country.

UNIT IV:

Facilities provided in forensic Science laboratories for chemical, physical, biological psychological, digital and cyber crime detection and analysis

UNIT V:

Detection of crime scene, Crime scene management, Role of forensic scientists, investigative officers, forensic doctors, fire brigade, judiciary - Importance of physical evidence, collection of physical evidence in crimes like murder theft, extortion, explosion etc.

Reference Books:

1. Essentials of forensic medicine and toxicology – A K Gupta
2. A hands – on introduction to forensic science – Mark Okuda
3. A learning network forensics – Samir Dutt
4. Forensic psychology for dummies – David V Canter

PART – III CORE: CRIMINAL LAW

Learning Objectives: After studying this paper the students will know –

- a. *Elements of Criminal Procedure Code related to forensic science.*
- b. *Acts and provisions of the Constitution of India related to forensic science.*
- c. *Acts governing socio-economic crimes.*
- d. *Acts governing environmental crimes.*

Unit 1: Law to Combat Crime

Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts. Criminal Procedure Code. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass. Summary trials – Section 260(2). Judgements in abridged forms – Section 355. Indian Penal Code pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362. Sections 375 & 377 and their amendments. Indian Penal Code pertaining to offences against property Sections – 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497, 499, 503, 511.

Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses.

Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. Section 293 in the code of criminal procedure.

Unit 2: Constitution of India

Preamble, Fundamental Rights, Directive Principles of State Policy. – Articles 14, 15, 20, 21, 22, 51A.

Unit 3: Acts Pertaining to Socio-economic and Environmental Crimes Narcotic, Drugs and Psychotropic Substances Act. Essential Commodity Act. Drugs and Cosmetics Act. Explosive Substances Act. Arms Act. Dowry Prohibition Act. Prevention of Food Adulteration Act. Prevention of Corruption Act. Wildlife Protection Act. I.T. Act. Environment Protection Act. Untouchability Offences Act

Unit 4

1. To prepare a schedule of five cognizable and five non-cognizable offences.
2. To study the powers and limitations of the Court of Judicial Magistrate of First Class.
3. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal Procedure Code.
4. To study a crime case in which an accused was punished on charge of murder under Section 302.
5. To study a crime case in which an accused was punished on charge of rape under Section 375.
6. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.
7. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in this Article were taken care of.

Unit 5

1. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.
2. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
3. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which they belonged.
4. To study a case in which Drugs and Cosmetic Act was invoked.
5. To study a case in which Explosive Substances Act was invoked.
6. To study a case in which Arms Act was invoked.
7. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
8. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution of India.

Note: Unit 4 and 5 should be handles as practicals

Suggested Readings

1. D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton (1999).
2. Vipa P. Sarthi, *Law of Evidence*, 6th Edition, Eastern Book Co., Lucknow (2006).
3. A.S. Pillia, *Criminal Law*, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).
4. R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi (1965).
5. (Chief Justice) M. Monir, *Law of Evidence*, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).

CORE: FORENSIC PSYCHOLOGY

Learning Objectives: After studying this paper the students will know –

- a. *The overview of forensic psychology and its applications.*
- b. *The legal aspects of forensic psychology.*
- c. *The significance of criminal profiling.*
- d. *The importance of psychological assessment in gauging criminal behavior.*
- e. *The tools and techniques required for detection of deception.*
- f. *The critical assessment of advanced forensic techniques like polygraphy, narco analysis and brain electrical oscillation signatures.*

Unit 1: Basics of Forensic Psychology

Definition and fundamental concepts of forensic psychology and forensic psychiatry. Psychology and law. Ethical issues in forensic psychology. Assessment of mental competency. Mental disorders and forensic psychology. Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling. Psychology in the courtroom, with special reference to Section 84 IPC.

Unit 2: Psychology and Criminal Behavior

Psychopathology and personality disorder. Psychological assessment and its importance. Serial murderers. Psychology of terrorism. Biological factors and crime – social learning theories, psycho-social factors, abuse. Juvenile delinquency – theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Unit 3: Detection of Deception

Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis. Polygraphy – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test. Narco analysis and brain electrical oscillation signatures – principle and theory, ethical and legal issues.

Unit 4

1. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.
2. To prepare a report on relationship between mental disorders and forensic psychology.
 1. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
 2. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.
 3. To study a criminal case in which hypnosis was used as a means to detect deception.

Unit 5

1. To prepare a case report on thematic appreciation test.
2. To prepare a case report on Minnesota multiphasic personality inventory test.
3. To prepare a case report on thematic appreciation test.
4. To prepare a case report on word association test.
5. To prepare a case report on Bhatia's battery of performance test of intelligence.
6. To cite a criminal case in which narco analysis was used as a means to detect deception.

Note: Unit 4 and 5 should be handled as practicals

Suggested Readings

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
3. J.C. DeLadurantey and D.R. Sullivan, *Criminal Investigation Standards*, Harper & Row, New York (1980).
4. J. Niehaus, *Investigative Forensic Hypnosis*, CRC Press, Boca Raton (1999).
5. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

PART – III SUBJECT ELECTIVE **CHEMISTRY**

Objective:

Objectives:

- Be able to demonstrate problem solving and critical thinking skills and also discuss forensic chemical principles
- Be able to apply modern methods of forensic analysis in a laboratory setting
- Be able to design appropriate experiments to achieve results in a safe and environmentally sensitive manner

UNIT I

Liquid state: free volume of liquid and density measurement, physical properties of liquid, Vapor pressure, surface tension surfactants, viscosity, molar refraction, optical activity structure of liquid. Solutions: Method of exploring concentration of solutions, binary liquids, vapor pressure, composite diagram of binary liquids and solutions, distillation, fractional distillations, vacuum distillations. Conductance, conductometry, electro motive force, potentiometry

UNIT II

Chemical thermodynamics and kinetics, first law of thermodynamics, Internal energy, enthalpy second law of thermodynamics, entropy and its significance, free energy and work function , Rate of reaction, order of molecularity reaction, slow reaction and fast reaction, first order reaction, half life period of first order reaction, Activation energy, temperature dependence of activation energy, explosive reactions, Oscillatory reactions.

UNIT III

Study of modern periodic table, long form of periodic table, periodic properties, atomic radii, ionization potential, electron affinity electro negativity, metallic characters, non metallic characters and magnetic properties, comparative study of S and P block elements.

UNIT IV

Gravimetric analysis, volumetric analysis, chromatographic separation, the liquid chromatography, Electrophoresis, Thermal methods

UNIT V

Empirical and molecular formulae, hybridization, nature of chemical bonding, polarization, hydrogen bonding, Vander walls forces, IUPAC nomenclature of alkanes, alkenes, haloalkanes, alcohol ether aldehydes, ketones, carboxylic acids, nitro compounds, nitrites including cyclic analogues and also aromatic compounds, naphthalene, anthrones and phenantrones, reactive intermediates and related reactions.

Reference Books:

1. Handbook of Chemistry – R P Singh
2. Basic concept of Chemistry – Peegassus
3. Basic organo metallic Chemistry – Anil elais
4. Basics concepts of Analytical Chemistry – S M Khopkar

PART – IV SKILL BASED SUBJECTS

PSYCHOLOGY

Objectives:

- Develop knowledge and skills of a professional research psychologist
- Develop knowledge and skills for teaching

UNIT I:

THE SCIENCE OF PSYCHOLOGY Concepts of psychology, History of psychology, modern perspectives, types of psychological professionals psychology, The science and research methods, professional and ethical issues in psychology

UNIT II

BIOLOGICAL PRESPECTIVE Nerves Neuros: Building the network , central nervous system, peripheral nervous system, Human brain structure and function; sensory systems endocrine system.

UNIT III

CONSCIOUSNESS OF PERCEPTION Consciousness, Altered states of consciousness, attention and awareness, sensation and perception, problems in Attention and perception, assessment attention and perception.

UNIT IV

LEARNING AND MEMORY Learning process, Types of learning, models of memory, stages of memory, encoding, retention and retrieval, forgetting, brain and memory, problem in learning and memory.

UNIT V

COGNITION, MOTIVATION AND EMOTION Thinking, decision making and problem solving intelligence and language, motivation: Types of approaches Emotion, stress and coping.

Reference Books:

1. Thinking fast and slow – Daniel
2. The psychology influence – Robert R Ciaibini

PART – IV

NON MAJOR ELECTIVE: FORENSIC SCIENCE AND SOCIETY

Learning Objectives: After studying this paper the students will know –

- a. *Importance of forensic engineering.*
- b. *Importance of forensic archeology.*
- c. *Importance of forensic intelligence.*

Unit 1: Forensic Engineering

Role of mechanical, electronics and computer engineers in forensic science. Accident investigations. Failure of signaling and control systems. Ergonomics. Applications of animations, simulations and digital imaging in solving crime cases. Episodes involving fire engineering.

Unit 2: Forensic Archeology

Role of forensic archeology. Searching the archeological site. Methods of digging the burial site. Recovery of remains. Documenting the recovered material. Preservation of remains.

Unit 3: Forensic Intelligence

Role of forensic intelligence in crime analysis. Methods of crime analysis. Databases in forensic intelligence. Management of serial crimes by application of forensic intelligence.

Suggested Readings

1. J.F. Brown and K.S. Obenski, *Forensic Engineering – Reconstruction of Accidents*, C.C. Thomas, Springfield (1990).
2. E.W. Killam, *The Detection of Human Remains*, C.C. Thomas, Springfield (1990).
3. R.K. Noon, *Introduction to Forensic Engineering*, CRC Press, Boca Raton (1992).
4. O. Ribaux and P. Margot in *Encyclopedia of Forensic Sciences*, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Ed.), Academic Press, London (2000).

PART – IV NON MAJOR ELECTIVE FORENSIC SCIENCE AND CRIMINAL JUSTICE SYSTEM

Objectives:

To provide students with competency in the following areas:

- Administration of justice
- Criminological theory
- Research and analytical methods
- To teach students to critically think and to be able to communicate well in written and oral forms.

Unit – I

Forensic Science: Basic principles and its significance. History & development of forensic science. Nature and scope of forensic science. Organizational structure of Forensic Science Laboratories at central & State level. Ethics in Forensic science.

Unit – II

Scene of crime: Types, protection of scene of crime, preservation (recording) of scene of crime-photography and sketching methods. Physical evidence: Meaning, Types, search 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.

Unit – III

Crime: Definition, theories of causation of crime: Pre-classical and Neo-classical, constitutional, geographical, economic, psychological, sociological, Multiplecausation approach. General factors of crime, forms of punishment in brief.

Unit – IV

Indian Penal Code: Introduction, General exceptions, Offences against person, Offences against property, Attempt to suicide, Sexual offences. Criminal Procedure Code: Introduction and general idea of sections: 291-93, 154, 155, 156, 157, 158, 159, 160, 161, 162, 172, 173, 174, 175, And 176. Indian Evidence Act: Introduction and general idea of sections: 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, And 159.

Unit – V

Criminal Justice System: Police organization at district, state & central level. Organization of courts in India, jurisdiction of courts in criminal cases, prosecution, F.I.R., case diary, roznamacha. Report Writing and Evidence Evaluation: Report formats of crime scene and laboratory findings. Court Testimony: Admissibility of expert testimony, pro court preparation & court appearance, examination in chief & re-examination, cross examination.

Reference Books:

1. Forensic Science in crime Investigation – B S Nabar
2. Criminology and criminal Justice – Griffith University

PART - III CORE

FORENSIC DERMATOGLYPHICS

Learning Objectives: After studying this paper the students will know –

- a. *The fundamental principles on which the science of fingerprinting is based.*
- b. *Fingerprints are the most infallible means of identification.*
- c. *The world's first fingerprint bureau was established in India.*
- d. *The method of classifying criminal record by fingerprints was worked out in India, and by Indians.*
- e. *The physical and chemical techniques of developing fingerprints on crime scene evidence.*
- f. *The significance of foot, palm, ear and lip prints.*

Unit 1: Basics of Fingerprinting

Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints. Classification and cataloguing of fingerprint record. Automated Fingerprint Identification System. Significance of poroscopy and edgeoscopy.

Unit 2: Development of Fingerprints

Latent prints. Constituents of sweat residue. Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents. Application of light sources in fingerprint detection. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Fingerprinting the deceased. Developing fingerprints on gloves.

Unit 3: Other Impressions

Importance of footprints. Casting of foot prints, Electrostatic lifting of latent foot prints. Palm prints. Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance. Palm prints and their historical importance.

Unit 4

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.

Unit 5:

6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of foot prints.

Note: Unit 4 and 5 should be handled as practicals

Suggested Readings

1. J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot and M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton (2004).
4. Lee and Gaenslen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

TECHNOLOGICAL METHODS IN FORENSIC SCIENCE

Learning Objectives: After studying this paper the students will know –

- a. *The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.*
- b. *The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.*
- c. *The significance of microscopy in visualizing trace evidence and comparing it with control samples.*
- d. *The usefulness of photography and videography for recording the crime scenes.*

Unit I: Instrumentation

Sample preparation for chromatographic and spectroscopic evidence. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography.

UNIT II

Spectroscopic methods. Fundamental principles and forensic applications of Ultraviolet- visible spectroscopy, infrared spectroscopy, atomic absorption

spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law.

UNIT III

Electrophoresis – fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

Unit IV: Microscopy

Fundamental principles. Different types of microscopes. Electron microscope. Comparison Microscope. Forensic applications of microscopy.

Unit V: Forensic photography

Basic principles and applications of photography in forensic science. 3D photography. Photographic evidence. Infrared and ultraviolet photography. Digital photography. Videography. Crime scene and laboratory photography.

Suggested Readings

1. D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry*, 6th Edition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).
3. J.W. Robinson, *Undergraduate Instrumental Analysis*, 5th Edition, Marcel Dekker, Inc., New York (1995).
4. D.R. Redsicker, *The Practical Methodology of Forensic Photography*, 2nd Edition, CRC Press, Boca Raton (2000).

CORE: CRIMINALISTICS

Learning Objectives: After studying this paper the students will know –

- a. *The methods of securing, searching and documenting crime scenes.*
- b. *The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.*
- c. *The legal importance of chain of custody.*
- d. *The tools and techniques for analysis of different types of crime scene evidence.*

Unit 1:

Crime Scene Management - Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes. Documentation of crime scenes – photography, videography, sketching and recording notes. Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at crime scenes. The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how?). Crime scene logs.

Unit 2:**Crime Scene Evidence**

Classification of crime scene evidence – physical and trace evidence. Locard principle. Collection, labeling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Reconstruction of crime scene.

Unit 3: Forensic Physics

Glass evidence – collection, packaging, analysis. Matching of glass samples by mechanical fit and refractive index measurements. Analysis by spectroscopic methods. Fracture analysis and direction of impact.

UNIT IV

Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases.

Fibre evidence – artificial and man-made fibres. Collection of fibre evidence. Identification and comparison of fibres.

UNIT V

Soil evidence – importance, location, collection and comparison of soil samples.

Cloth evidence – importance, collection, analysis of adhering material. Matching of pieces.

Toolmark evidence. Classification of toolmarks. Forensic importance of toolmarks.

Collection, preservation and matching of toolmarks. Restoration of erased serial numbers and engraved marks. Forensic gemmology.

Reference Books:

1. Introduction to Forensic science and Crimminalistics – Robert E Gaensslen
2. Introduction to criminal Justice – Robert M Bohm
3. Criminalistics – an introduction to forensic science – Professor Catherine Housecroft

PART – III SUBJECT ELECTIVE**FUNDAMENTALS OF BIOLOGY****Objective:**

The students will be able to:

1. Read, understand and critically interpret the primary biological literature
2. Design, conduct analyse and communicate biological research
3. Will be able to explain the organic evolution and its principles and mechanism

UNIT I

General Characteristics, classification and economic importance of Algae, Fungi, Lichens, Bryophytes, Pteridophytes & Gymnosperms.

UNIT II

Angiosperms: Principle of classification and nomenclature of angiosperms, Anatomy of angiosperms, Structure and development of anthers and ovules, fertilization, seed development, seed dormancy and germination.

UNIT III

Non-Chordates: General characteristics, classification and economic importance of Protozoa, Porifera, Coelenterate, Helminthes, Annelida, Arthropoda, Mollusca and Echinodermata. 4.
Chordates: General characteristics, Classification and importance of Protochordata, Hemichordate, Urochordata, Cephalochordata and Cyclostomata, Amphibia, Reptilia, Aves and Mammalia.

UNIT IV

Genetics: A brief history, introduction, Mendel's laws, Linkage and crossing over, Sex linked inheritance, Structural and numerical changes in chromosomes, Mutation, Multiple alleles and Gene concept. Evolution: Introduction, different concepts of Origin of life, Theories of organic evolution, Theory of inheritance of acquired characters (Lamarckism). Theory of natural selection, Mutation theory and synthetic theory, Speciation and isolating mechanism, Morphological criteria for species and races. Allopathic and sympatric population. Isolating mechanism.

UNIT V

Human Physiology: Introduction of different types of physiological systems: Cardiovascular and Lymphatic system, Respiratory System, Excretory System, Digestive System, Endocrine System, Nervous System and Skeletal System

Reference Books:

1. A Dictionary of ecology – Michael Alleby
2. Encyclopedia of evolution – Stanley rice
3. Desk encyclopedia of microbiology - Moselio

PART – IV **SKILL BASED SUBJECT**

INTRODUCTION TO BIOMETRY

Learning Objectives: After studying this paper the students will know –

- b. The basis of biometry.*
- c. The classification of biometric processes.*
- d. The importance of behavioral biometry.*

Unit 1: Fundamental Aspects

Definition, characteristics and operation of biometric system. Classification of biometric systems – physiological and behavioral. Strength and weakness of physiological and behavioral biometrics.

UNIT II

Multimodal biometrics. Key biometric processes – enrollment, identification and verification. Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV.

UNIT III

Biometric versus traditional technologies.

Unit IV

Physiological Biometrics

Fingerprints, palm prints, iris, retina, geometry of hand and face.

Unit V

Behavioral Biometrics

Handwriting, signatures, keystrokes, gait and voice.

Suggested Readings

1. S. Nanavati, M. Thieme and R. Nanavati, *Biometrics*, Wiley India Pvt. Ltd. (2002).
2. P. Reid, *Biometrics for Network Security*, New Delhi (2004).
3. J.R. Vacca, *Biometric Technologies and Verification Systems*, Butterworth-Heinemann, Oxford (2007).

SEMESTER – IV

PART - I

TAMIL – IV

PART - II

ENGLISH – IV

PART – III

CORE: FORENSIC CHEMISTRY

Learning Objectives: After studying this paper the students will know –

- a. *The methods of analyzing trace amounts of petroleum products in crime scene evidence.*
- b. *The methods of analyzing contaminants in petroleum products.*
- c. *The classification and characteristics of the narcotics, drugs and psychotropic substances.*
- d. *The methods of identifying narcotics, drugs and psychotropic substances.*
- e. *The forensic identification of illicit liquors.*
- f. *The classification of explosives, including the synthesis and characterization of representative analogs.*
- g. *The significance of bomb scene management.*

UNIT I

Petroleum and Petroleum Products - Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.

UNIT II

Narcotics, Drugs, Psychotropic Substances and Alcoholic Beverages - Natural and synthetic. Drug dependence. Classification of drugs of abuse – narcotics, hallucinogens, depressants, stimulants and anabolic steroids. Withdrawal symptoms.

UNIT III

Tests of narcotics, drugs and psychotropic substances of Alcoholic and non-alcoholic beverages. Analysis of alcoholic beverages. Detection and determination of ethanol and methanol. Licit and illicit liquors.

UNIT IV

Explosives - Classification of explosives – low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents.

UNIT V

Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Blast waves. Bomb scene management. Searching the scene of explosion.

Reference:

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
4. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition, Oxford University Press, New York (1983).

CORE: QUESTIONED DOCUMENTS

Learning Objectives: After studying this paper the students will know –

- a. *The importance of examining questioned documents in crime cases.*
- b. *The tools required for examination of questioned documents.*
- c. *The significance of comparing hand writing samples.*
- d. *The importance of detecting frauds and forgeries by analyzing questioned documents.*

Unit 1:

Nature and Scope of Questioned Documents - Definition of questioned documents - Types of questioned documents. Preliminary examination of documents.

UNIT II

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 III

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

Forgeries - Alterations in documents, including erasures, additions, over-writings and obliterations. Indented and invisible writings. Charred documents.

UNIT V

Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Disguised writing and anonymous letters.

Reference:

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*, 4th 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).

CORE: FORENSIC BIOLOGY

Learning Objectives: After studying this paper the students will know –

- a. *The significance of biological and serological evidence.*
- b. *The forensic importance of hair evidence.*
- c. *The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.*
- d. *How wildlife forensics aid in conserving natural resources.*
- e. *How forensic entomology assists in death investigations.*

UNIT I

Biological Evidence - 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.

UNIT II

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 III

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.

UNIT IV

Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.

UNIT V

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

Reference:

1. L. Stryer, *Biochemistry*, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, *Harper's Biochemistry*, APPLETON & Lange, Norwalk (1993).
3. S. Chowdhuri, *Forensic Biology*, BPRD, New Delhi (1971).
4. R. Saferstein, *Forensic Science Handbook*, Vol. III, Prentice Hall, New Jersey (1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

PART - III SUBJECT ELECTIVE: BIOLOGY

UNIT I

Cell structure and function in prokaryotes and eukaryotes Properties, classification and function of carbohydrates, proteins, nucleic acids and lipids, Study of blood components and body fluids

UNIT II

Principles of taxonomy and system of classification of angio sperms (Bentham and Hooker) and Gymnosperms (chamberlain) Origin of life and Geological time scale. Mechanical and conducting tissue systems in plants

UNIT III

Acid, base, and buffers, Beer and Lambert's law, colorimetry and spectrophotometry, principles methods and application of chromatography and electrophoresis

UNIT IV

Basics of microbiology and concept of pure culture technique microscopy principle and types of microscopy Broad classification of microorganisms - Immunity and immune system, Structure and Interaction of antigens and antibody, ELISA, western blot, and southern blot techniques.

UNIT V

Genetic materials – structural organization and function. Mendelian principles, sex linkage and sex determination Recombinant DNA technology and its applications in health, and diseases.

PART – IV SKILL BASED SUBJECT

HANDWRITING IDENTIFICATION AND RECOGNITION

Learning Objectives: After studying this paper the students will know –

- a. *Important features in handwriting identification.*
- b. *Basis of handwriting characteristics.*
- c. *Significance of forensic documentation.*

UNIT I

Handwriting Identification - Basis of handwriting identification. Characteristics of handwriting – scope and application. Class and individual characteristics.

UNIT II

Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting – physical, mechanical, genetic and physiological.

UNIT III

Handwriting Examination - Basis of handwriting comparison. Collection of handwriting samples. Forgery detection. Counterfeiting. Examination of altered and erased documents. Tools used in handwriting examination.

UNIT IV

Handwriting Recognition - Basis of handwriting recognition. Off-line and on-line handwriting recognition. Steps involved in handwriting recognition – pre-processing, feature extraction and classification.

UNIT V

Handwriting – Methods - Applications of handwriting recognition

Reference:

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*, 4th 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).

5. Z. Liu, J.H. Cai and R. Buse, Handwriting Recognition: *Soft Computing and Probabilistic Approach* (Volume 133), Springer Science and Business Media (2003).

PART – IV: EXTENSION ACTIVITIES
AS PER UNIVERSITY SYLLABUS

SEMESTER - 5

PART - III

CORE: FORENSIC BALLISTICS

Learning Objectives: After studying this paper the students will know –

- a. *The classification of firearms and their firing mechanisms.*
- b. *The methods of identifying firearms.*
- c. *The characteristics of ammunition.*
- d. *The importance of firearm evidence.*
- e. *The nature of firearm injuries.*
- f. *The methods for characterization of gunshot residue.*

UNIT I: Firearms

History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms. Internal ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting.

UNIT II

External Ballistics – Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballistic data.

Terminal Ballistics – Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, influence of range. Ricochet and its effects, stopping power.

UNIT III

Ammunition

Types of ammunition. Constructional features 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 IV

Firearm Evidence

Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire.

UNIT V

Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothings - Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self defence.

Reference:

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. Schwoeble and D.L. Exline, *Current Methods in Forensic Gunshot Residue Analysis*, CRC Press, Boca Raton (2000).
4. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

CORE: FORENSIC TOXICOLOGY

Learning Objectives: After studying this paper the students will know –

- a. *The significance of toxicological studies in forensic science.*
- b. *The classification of poisons and their modes of actions.*
- c. *The absorption of poisons in body fluids.*
- d. *The forensic identification of illicit liquors.*
- e. *The classification and characteristics of the narcotics, drugs and psychotropic substances.*
- f. *The menace of designer drugs.*
- g. *The methods of identifying and purifying narcotics, drugs and psychotropic substances.*

UNIT I

Basics of Toxicology - Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests - Postmortem Toxicology. Human performance toxicology - Dose-response relationship. Lethal dose 50 and effective dose 50.

UNIT II

Poisons - Classification of poisons. Physico-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings - Signs and symptoms of common poisoning and their antidotes. Collection and preservation of viscera, blood and urine for various poison cases - Identification of biocides and metal salts in body fluids. Metabolism and excretion of poisons. Application of immunoassays in forensic work. Animal poisons. Snake venom. Mode of action. Carbon monoxide - poisoning. Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms. Beverages. Alcoholic and non-alcoholic illicit liquors. Analysis and identification of ethyl alcohol. Estimation of ethyl alcohol in blood and urine. Proof spirit. Crime scene management in illicit liquor cases.

UNIT III

Narcotics, Drugs and Psychotropic Substances - Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances - Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substances

UNIT IV

Crime scene search for narcotics, drugs and psychotropic substances – searching a suspect, searching a dwelling, searching a vehicle - Clandestine drug laboratories. Collection and preservation of drug evidence. Testing of narcotics, drugs and psychotropic substances - Isolation techniques for purifying narcotics, drugs and psychotropic substances – thin layer chromatography, gas-liquid chromatography and high performance liquid chromatography. Presumptive and screening tests for narcotics, drugs and psychotropic substances. Microcrystalline testing of drugs of abuse.

UNIT V

Analysis of narcotics, drugs and psychotropic substances in breast milk, saliva, urine, hair and antemortem blood - Drugs and driving. Dope tests - Analysis of narcotics, drugs and psychotropic substances in postmortem blood. Postmortem changes affecting the analysis of narcotics, drugs and psychotropic substances.

Reference:

1. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
2. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition, Oxford University Press, New York (1983).
3. S.B. Karch, *The Pathology of Drug Abuse*, CRC Press, Boca Raton (1996).
4. A. Poklis, Forensic toxicology in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
5. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, *Alcohol, Drug and Driving*, **4**, 99 (1988).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

PART – III

SUBJECT ELECTIVE: DIGITAL FORENSICS

Learning Objectives: After studying this paper the students will know –

- a. *The basics of digital forensics.*
- b. *The cases which fall under the purview of digital crimes.*
- c. *The types of digital crimes.*
- d. *The elements involved in investigation of digital crimes.*

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 II

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 III

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 IV

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 - Treatment of exhibits. Creating bitstream of the original media. Collection and seizure of magnetic media.

UNIT V

Legal and privacy issues. Examining forensically sterile media. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Tracking users.

Reference:

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*, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).

SUBJECT ELECTIVE: ECONOMIC OFFENCES

Learning Objectives: After studying this paper the students will know –

- a. Basic economic and financial terminology.*
- b. Economic crimes in India are linked to several other crimes.*
- c. Economic crimes often have a bearing on national security.*
- d. Types of common economic offences and their consequences.*
- e. Steps involved in mitigating economic crimes.*

UNIT I

Taxonomy of Economic Offences / Criminogenic Factors - Fundamentals of economics in economic offences - Tax evasion. Excise duty evasion. Fraudulent bankruptcy. White collar crime. Economic exclusion. Black money.

UNIT II

Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme. Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in human organs. Cultural objects trafficking. Racketeering in employment. Racketeering in false travel documents.

UNIT III

Applied Economics in Processing Evidence - Forensic accountancy and forensic auditing. Valuation of economic losses. Violation of Intellectual Property Rights.

UNIT IV

Prevention of Economic Offences - Legislations to deal with different forms of economic offences. RBI Act. SEBI Act. Competition Commission of India Act - Credit card frauds.

UNIT V

Enforcement agencies to deal with different forms of economic offences. International perspectives – measures adopted by FBI and INTERPOL. Case histories of economic offences.

Reference:

1. R.V. Clarke, *Situational Crime Prevention: Successful Case Studies*, 2nd Edition, Criminal Justice Press, New York (1997).
2. S.P. Green, *Lying, Cheating and Stealing: A Moral Theory of White Collar Crime*, Oxford University Press, Oxford (2006).
3. G. Geis, R. Meier, L. Salinger (Eds.), *White-Collar Crime: Classic & Contemporary Views*, Free Press, New York (1995).
4. J. Reiman, *The Rich get Richer and the Poor get Prison*, Allyn & Bacon, Boston (1998).
5. Indian Audit and Accounts department, *Audit of Fraud, Fraud Detection and Forensic Audit*, 2007.
6. State Crime Branch, Haryana, *Investigation of Economic Offences*.

SKILL BASED SUBJECT: MEDICAL JURISPRUDENCE

Unit – I

Concept of Medical Jurisprudence: Brief knowledge about legal procedures in Courts, inquest, Criminal courts and their powers, Subpoena & oath of medical expert. Recording of Medical experts evidence in courts. Types of Medical evidence. Kinds of witness and rules for giving evidence.

Unit – II

Personal Identity: Definition and importance. Parameters contributing to personal identity- Race, Sex, Age, Complexion, features & Photographs, Anthropometry, Fingerprints, Footprints, Tattoo marks, Occupational marks, Handwriting, Clothes & Ornaments, Voice & Speech, DNA, Superimposition techniques for skull. Disputed paternity.

Unit – III

Post-Mortem Examination: Importance, post-mortem report format, external & internal examination in brief. Viscera & its preservation. Examination of decomposed and mutilated bodies. Precaution to be taken during post mortem examination. Exhumation. Cause of death.

Unit – IV

Wounds: Wounds & its types, Medico-legal aspects, post mortem & ante mortem wounds, General characteristics of injuries from burns, scalds, lightning, electricity and radiation. Forensic importance of wounds.

Unit – V

Deaths in its Medico-legal aspects: Modes of Death (Coma, Syncope, Asphyxia), Sudden death. Sign of Death, cessation of vital functions, changes in the Eye & Skin, cooling of body, post-mortem lividity, cadaveric changes in the muscles, putrefaction, adipocere & mummification. Estimation of time since Death.

Reference:

1. Modi JS: medical jurisprudence and Toxicology.
2. Taylor : Medical jurisprudence
3. Parikh CK: Chikitsa Nyaya Shastra Aur Vish Vigyan.
4. Keith Simpsen & Bernard Knight : Forensic Medicine
5. Poison, CJ, DJ Gee, B. Knight : Forensic Medicine
6. Reddy : Forensic Medicine

PART – IV MANDATORY SUBJECT

ENVIRONMENTAL STUDIES

SYLLABUS AS PER UNIVERSITY

SEMESTER – 6

PART – III CORE: FORENSIC ANTHROPOLOGY

Learning Objectives: After studying this paper the students will know –

- a. *Importance of forensic anthropology in identification of persons.*
- b. *Different techniques of facial reconstruction and their forensic importance.*
- c. *Significance of somatoscopy and somatometry.*

UNIT I

Significance of Forensic Anthropology - Scope of forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, sex, stature from skeletal material.

UNIT II

Personal Identification – Somatoscopy and Somatometry - Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin’s tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.

UNIT III

Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height - Indices - cephalic index, nasal index, cranial index, upper facial index.

UNIT IV

Facial Reconstruction - Portrait Parle/ Bertillon system. Photofit / identi kit. Facial superimposition techniques - Cranio facial super imposition techniques photographic super imposition, video super imposition,

UNIT V

Roentgenographic superimposition. Use of somatoscopic and craniometric methods in reconstruction - Importance of tissue depth in facial reconstruction - Genetic and congenital anomalies – causes, types, identification and their forensic significance.

Reference:

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, *Bones*, M. Evans & Co., New York (2000).
3. S. Rhine, *Bone Voyage: A Journey in Forensic Anthropology*, University of Mexico Press, Mexico (1998).

CORE: FORENSIC MEDICINE

Learning Objectives: After studying this paper the students will know –

- a. The duties of the first responding officer who receives a call on homicide or suicide case.*
- b. The steps involved in processing the death scene.*
- c. The importance of ascertaining whether the crime was staged to appear as suicide or accident.*
- d. The importance of bloodstain patterns in reconstructing the crime scene.*
- e. The importance of autopsy.*
- f. The importance of forensic odontology*

UNIT I

Death Investigations - Fundamental aspects and scope of forensic medicine - Approaching the crime scene of death. Obtaining first hand information from the caller. Rendering medical assistance to the victim, if alive. Protecting life. Recording dying declaration - Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses.

UNIT II

Suspect in custody – initial interrogation and searching for evidence. Miranda warning card. Assessing the crime scene. Request for forensic team. Importance of command post and log book. Management of crowd and media - Importance of taking notes. Items to be a part of noting.

UNIT III

Documenting the death scene. Processing evidence. Evaluation of injuries. Importance of canvass form. Indexing the death investigation - Handling buried body cases – search for buried bodies, methods of exhumation - Suicide cases – evaluating the type of injuries, gauging the psychological state of victim, suicide notes.

UNIT IV

Autopsy - Forensic pathology. Medico-legal aspects of death. Causes of death - Determination of time since death - Investigation of sexual offences. Death by drowning – Injuries -Types and classification of injuries - Antemortem and post mortem injuries - Aging of injuries. Artificial injuries.

UNIT V

Forensic Odontology - Development, scope and role of forensic odontology in mass disaster and anthropology. Types of teeth and their comparative anatomy - Bite marks. Forensic significance of bite marks. Collection, preservation and photography of bite marks evidence. Legal aspects of bite marks. Estimation of age from teeth.

Reference:

1. K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York (1982).
2. M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
4. H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science, Volume 1*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).
6. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

SUBJECT ELECTIVE: ACCIDENT INVESTIGATIONS**UNIT I**

Motor Vehicle Accidents - Accident scene. Sources of forensic information. Eyewitness accounts. Extent of vehicle damage. Visibility conditions. Photographs of accident site. Estimation of speed. Tire marks, skid marks, scuff marks.

UNIT II

Maintenance of vehicles - Abandoned vehicles - Importance of air bags - Railway accidents.

UNIT III

Accident Analysis - Pre-crash movement - Post-crash movement - Collision model - Gauging driver's reaction - Occupants's kinematics - Types of injuries resulting from accident - Biomechanics of injuries - Hit and run investigations - Trace evidence at accident sites.

UNIT IV

Tachographs - Forensic significance of tachograph data - Tachograph charts- Principles of chart analysis -Accuracy of speed record - Tire slip effects.

UNIT V

Falsification and diagnostic signals. Route tracing.

Reference:

1. T.S. Ferry, *Modern Accident Investigation and Analysis*, Wiley, New York (1988).
2. D. Lowe, *The Tachograph*, 2nd Edition, Kogan Page, London (1989).
3. T.L. Bohan and A.C. Damask, *Forensic Accident Investigation: Motor Vehicles*, Michie Butterworth, Charlottesville (1995).
4. S.C. Batterman and S.D. Batterman in *Encyclopedia of Forensic Sciences*, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

SUBJECT ELECTIVE: DISSERTATION

The dissertation will be based on a research topic in Forensic Science/Criminology. The topic will be assigned in consultation with police and forensic science establishments, giving due consideration to the problem areas faced by these institutions. The students will be expected to undertake extensive field work, in collaboration with mobile police laboratories.

SKILL BASED SUBJECT: DNA FORENSICS

Learning Objectives: After studying this paper the students will know –

- a. *The basic principle of DNA analysis.*
- b. *The forensic significance of DNA typing.*
- c. *The importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.*
- d. *Role of DNA typing in parentage testing.*

UNIT I

Basic Principles - DNA as biological blueprint of life - Extraction of DNA for analysis. Quantitation of DNA – yield gel quantitation and slot blot quantitation. Mitochondrial DNA – sequence analysis.

UNIT II

Forensic DNA Typing - Collection of specimens. Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence.

UNIT III

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 - Touch DNA.

UNIT IV

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. Reference populations and databases.

UNIT V

Report Writing: Role of DNA typing in identifying unrecognizable bodies - Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

Reference:

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).

PART – IV

MANDATORY SUBJECT : VALUE EDUCATION