G.T.N. ARTS COLLEGE (Autonomous), Dindigul

(Affiliated to Madurai Kamaraj University)

(Accredited with 'B' Grade by NAAC)

DEPARTMENT OF FORENSIC SCIENCE

AUTONOMOUS SYLLABUS

(With effect from the academic year 2019 –2020)

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B. Sc., Forensic Science

B. Sc. Forensic Science
CHOICE BASED CREDIT SYSTEM
(With effect from the academic year 2019-2020 onwards)
REGULATIONS AND SCHEME OF EXAMINATIONS

1. INTRODUCTION OF THE PROGRAMME

Forensic Sciences include 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 skill with fundamental knowledge of various fields of science is necessary.

The field also demands an eye for detail, strong analytical skills, keen observations 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 candidate would be comfortable working both indoors and outdoors, besides processing 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 ones 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.

Anyone 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 in 25 years and for SC/ ST students 3 years of relaxation can be given

2.1. Duration of the program : 3 years

2.2. Medium of instruction : English

3. OBJECTIVES OF THE PROGRAM

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. 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 setup 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 conductive to harmonious development, we must mitigate the crime rate. This can 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 former being referred for Forensic examination .Less than 5% are solved by the application of Forensic Science. The rest are sold by third degree method- a practice which the human rights organization 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 these aims 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 resources, 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 scientist to exchange views, checkouts collaborative programs and work in holistic manner for the advancement of Forensic Science.

4. OUTCOME OF THE PROGRAMME

B. Sc. in Forensic Sciences is 3 year undergraduate 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 evidences 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 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 described by the department of Forensic Science approved by the Board of Studies.

8. UTILISATION

Each subject is segregated into 5 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 (75 marks).

10. SCHEME FOR INTERNAL ASSESSMENT

The Internal assessment will be as follows:

Test	=	15 marks (Average of two tests)
Assignment	=	5 marks
Seminar / Quiz	=	5 marks
Total	=	25 marks

11. EXTERNAL EXAM
External examination will be conducted as semester exams with common question paper.

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 number: 1 to 10 (Multiple Choice Pattern)
1. Two questions from each unit.
2. Four choices in each question.
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)
1. Answer should not exceed four pages.
2. Answer any three out of five.
3.One question from each unit

15. MODEL QUESTIONS

FORENSIC BIOLOGY

Time: Three hours **Maximum Marks: 75**

Section A- (10*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 biological samples b) To perform human specific presumptive tests
c) DNA isolation from biological materials 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 are forward and reverse primers are used.
c) Amplification is done through PCR.
d) ABO blood grouping please 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 phosphates test b) Sodium Alpha c) Naphthyl test d) Nypthanyl diazo test

7. For examination of diatoms sample should be collected from:
a) Bone marrow b) Blood c) Tissue d) Epithelial cell

8. Study of relationship between organisms and their environment:
a) Entomology b) Ecology c) Monospecific d) Monoecious

9. Wildlife forensics, identification of animals done by
a) Grouping b) Feathers c) Wigs d) Pugmarks

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 makers and their used 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 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 mitochondrial DNA?

(OR)

B) Give a detailed account on the experimental method of psychology.

PART C

SECTION-C **(3 * 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, PowerPoint presentation classes, guest lectures, demonstration and internship for One month after each semester and study tour programmes.

17 .TEXT BOOKS

The textbooks 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 retotalling shall be pursued by submission of the 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 sit by University.

20 .TRANSITORY PROVISIONS

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

DEPARTMENT OF FORENSIC SCIENCE

B. Sc. Forensic Science Autonomous Curriculum
REGULATIONS AND SCHEME OF EXAMINATIONS

FIRST SEMESTER

Part	Study Comp.	Code	Course Title	Hours	Credit
I	Tamil	19UTAL11	Ikkaala IIakkiyamum Punaikathaiyum	6	3
II	English	19UENL11	English for Enrichment- I	6	3
III	Core	19UFSC11	Introduction to Forensic Science	5	4
	Core	19UFSC12	Indian Penal Code	5	3
	Allied	19UFSA11	Basic Physics	4	3
IV	Skill Based	19UFSS11	Fundamentals of Computer Science	2	2
IV	NME	19UFSN11	Forensic Science	2	2
V		19UPEV2P	Physical Education	-	-
			TOTAL	30	20

SECOND SEMESTER

Part	Study Comp.	Code	Course Title	Hours	Credit
I	Tamil	19UTAL21	Idaikkaala IIakkiyamum Puthinamum	6	3
II	English	19UENL21	English for Enrichment- II	6	3
III	Core	19UFSC21	Basics of Forensic Science	5	4
	Core	19UFSC22	Forensic Psychology	5	3
	Allied	19UFSA21	Basic Chemistry	4	4
IV	Skill Based	19UFSS21	Police Investigation and Administration	2	2
IV	NME	19UFSN21	Emerging trends in Forensic Science	2	2
V		17UPEV2P	Physical Education	2	1
			TOTAL	30	22

THIRD SEMESTER

Part	Study Comp.	Code	Course Title	Hours	Credit
I	Tamil	19UTAL31	Kaappiya IIakkiyamum Naadahamum	6	3
II	English	19UENL31	English for Enrichment- III	6	3
III	Core	19UFSC31	Forensic Dermatoglyphics	3	3
	Core	19UFSC32	Technological Methods in Forensic Science	3	3
	Core	19UFSC33	Indian Laws	3	3
	Core	19UFSC3P	Practical- I Forensic Dermatoglyphics & Technological Methods in Forensic Science	3	3
	Allied	19UFSA31	Fundamentals of Zoology to Forensic Science.	4	4
IV	Skill Based	19UFSS31	Advanced Forensic Science	2	2
			TOTAL	30	24

FOURTH SEMSETER

Part	Study Comp.	Code	Course Title	Hours	Credit
I	Tamil	19UTAL41	Sanga IIakkiyamum Urainadaiyum	6	3
II	English	19UENL41	English for Enrichment- IV	6	3
III	Core	19UFSC41	Forensic Chemistry	3	3
	Core	19UFSC42	Questioned Documents and Handwriting Examination	3	3
	Core	19UFSC43	Forensic Biology	3	3
	Core	19UFSC4P	Practical- II Forensic Chemistry and Questioned Documents and Handwriting Examination	3	3
	Allied IV	19UFSA41	Introduction to Basic Programming Languages	4	4
IV	Skill Based IV	19UFSS41	Forensic Photography and Accident Investigation	2	2
			TOTAL	30	24

FIFTH SEMESTER

Part	Study Comp.	Code	Course Title	Hours	Credit
III	Core	19UFSC51	Forensic Physics and Ballistics	4	3
	Core	19UFSC52	Forensic Toxicology	4	3
	Core	19UFSC53	Digital and Cyber Forensics	4	3
	Core	19UFSC54	Applied Forensic Science	4	3
	Core	19UFSC5P	Practical – III Forensic Physics and Ballistics & Forensic Toxicology	4	3
	Core	19UFSC5Q	Practical – IV Digital and Cyber Forensics & Applied Forensic Science	4	3
	Core Elective	19UFSE51	Forensic Research Methodology	4	4
		19UFSE52	Economic Offences	4	4
IV		19UESV51	Environmental Studies	2	2
			TOTAL	30	24

SIXTH SEMESTER

Part	Study Comp.	Code	Course Title	Hours	Credit
III	Core	19UFSC61	Forensic Anthropology and Odontology	3	3
	Core	19UFSC62	Forensic Medicine	4	3
	Core	19UFSC63	Forensic DNA Typing and Molecular Techniques	4	3
	Core	19UFSC6P	Forensic Anthropology and Odontology & Forensic Medicine	4	3
	Core	19UFSC6Q	Forensic DNA Typing and Molecular Techniques	4	3
	Core	19UFSA61	Dissertation	5	4
	Core Elective	19UFSE61	Victimology	4	4
		19UFSE62	New Edge Forensics	4	4
IV		19UVEV61	Value Education	2	2
			TOTAL	30	25
TOTAL CREDTS FOR ALL SEMESTER				139 + 1	

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSC11	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	4
Core I			
Course Title	Introduction to Forensic Science		

Objectives

To understand the significance of Forensic Science to human society., the fundamental principles and functions of Forensic Science, the divisions in Forensic Science laboratory, and the forensic establishments in India and abroad.

Unit I

History & Development of Forensic Science - Functions of Forensic Science. Specific contribution of scientists in the field of Forensic Science. Development of Forensic Science in India. Definitions and concepts in Forensic Science. Scope of Forensic Science. Need of Forensic Science. Basic principles of Forensic Science, Ethics in Forensic Science, Frye case and Daubert standard

Unit II

Domains in Forensic Science, Forensic Science international perspectives, including Set up of INTERPOL and FBI. Duties of Forensic Scientist. Code of conduct for Forensic scientists. Qualifications of Forensic Scientist. Data descriptions. Report writing.

Unit III

Organizational setup of Forensic Science laboratory in India & Crime Detection Agencies - Hierarchical Setup Of Central Forensic Science Laboratories, State Forensic Science Laboratories, Government Examiners Of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police And Detective Training Schools, Bureau Of Police Research And Development, Directorate Of Forensic Science And Mobile Crime Laboratories. Police Academies. Police Dogs. Services of Crime Laboratories. Basic Services and Optimal Services.

Unit IV

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 V

1. Identification and morphological examination of Toxic plants
2. To write report on different type of crime cases.
3. To perform the collection, preservation, and packaging of physical evidences found on the given crime scene
4. To perform the comparison of given physical evidences.
5. Examination of Accident Scene.
6. To perform the exhumation of given body/ skeleton/ evidence.

Unit V has to be conducted as practical.

Text Books

1. B S Nabar (2013), Forensic Science in Crime Investigation, Asia Law House, Hyderabad, 3rd edition.
2. B.B. Nanda and R.K. Tiwari (2001). Forensic Science in India: A Vision for the Twenty First century, Select Publishers, New Delhi

Reference Books

1. M.K.Bhasin and S. Nath (2002), Role of Forensic Science in the New Millennium, University of Delhi, Delhi.
2. S.H. James and J.J. Nordby (2005), Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, Boca Raton, 2nd edition.
3. W.G. Eckert and R.K. Wright (1997) Introduction to Forensic Sciences, CRC Press, Boca Raton , 2nd edition.

4. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001),Henry Lee's Crime Scene Handbook, Academic Press,USA, 1st edition.
5. R. Saferstein (2004). Criminalistics, Prentice Hall, New Jersey, 8th edition.
6. W.J. Tilstone, M.L. Hastrup and C. Hald (2013), Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton.

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSC12	Number of Hours/Cycle	5
Semester	I	Max. Marks	100
Part	III	Credit	3
Core II			
Course Title	Indian Penal Code		

Objectives

To understand the elements of Indian Penal Code related to Forensic Science and to know the various types of rimes and Acts governing Offence affecting human body

Unit I

Crime - Basic concepts- Definition of Crime, Nature of Crime, Essentials elements of Crime, effect of crime on the society , crime and its classification , cognizable and non-cognizable offence, bailable and non-bailable offence, compoundable and non-compoundable offences.

Unit II

Different types of Crime - Different types of crime according to Indian Penal Code, Crime against State, Crime against Army, Navy, and Air Force, public servant.Indian Penal Code pertaining to offences against property Sections- 378, 383, 390, 391, 405, 415, 420, 441,463, 489A, 497, 499, 503, 511, Offence relating to Religion, false evidences.

Unit III

Constitution of India - Preamble, Fundamental rights, Directive principles of State Policy- Articles 14, 15, 21, 22, 51A.

Unit IV

Offence affecting human body- Culpable homicide, Murder, Dowry Death, Attempt to Murder, Causing Miscarriage, ,Hurt, Grievous hurt, , Assault, Assault or Criminal force to women with intent to outrage her modesty, Kidnapping , Abduction, Sexual offence, Rape, Unnatural offence.

Unit V

1. To prepare a schedule of five cognizable and five non-cognizable offences
2. To study a crime case in which an accused was punish on charge of murder under Section 302
3. To study a crime case in which accused was punish on charge of rape under Section 375.
4. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
5. To study a crime case in which an accused was punish on charge of Kidnapping.
6. To visit the nearest police station and write a report about the visit

Unit V has to be conducted as practical.

Text Books

1. K.D. Gaur (2016), The Indian Penal Code, Universal Law Publishing, 6th edition.
2. Universals (2019), The Indian Penal Code, Lexis Nexis, New Delhi.

Reference Books

1. J.N. Pandey (2018), The Constitutional Law of India, Central Law Agency.
2. Ratanlal and Dhirajlal (2017), The Indian Penal Code, LexisNexis, 35th edition.
3. Ratanlal and Dhirajlal (2015), The Criminal Procedure Code, LexisNexis, Student Edition.
4. Batuk Lal (2015), The Law of Evidence, Central Law Agency
5. N.V. Paranjape (2017), Criminology & Penology with Victimology, Central Law Publications.

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSA11	Number of Hours/Cycle	4
Semester	I	Max. Marks	100
Part	III	Credit	4
Allied I			
Course Title	Basic Physics		

Objectives

To make the students to have demonstrate skills in scientific inquiry, problem solving and laboratory techniques and to make them to demonstrate understanding of places in the physical universe, to demonstrate a broad base of knowledge in physics and to demonstrate understanding of laws of nature.

Unit I

Properties of matter - Introduction to elasticity – Stress & Strain – Hooke's law – types of moduli – twisting couple of a wire (derivation) – tensile strength – torsional pendulum – rigidity modulus of the material (derivation & experiment) – bending of beams – bending moment (derivation) – uniform and non-uniform bending (experimental procedure only).

Unit II

Thermal Physics - Concept of temperatureConduction, convection & radiation - determination of specific heat capacity of solid (method of mixtures) – Newton's law of cooling - 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 theoremand its application - Ampere's law - Kirchhoff's law and their application - Wheat-stone bridge and its sensitivity - Rectifiers, amplifiers, semi-conductor and its type of junction- Dia, para and ferromagnetic materials and their properties.

Unit IV

Waves and Oscillations - Simple harmonic motion – free oscillations – damped oscillations (Derivation) – force d oscillations (Derivation) - Resonance and its application – interference & beats of waves – transverse & longitudinal oscillations – experimental verification of laws of vibrating strings – Melde's experiment - Doppler effect of sound

Unit V

Atomic Physics - Black body radiation - Planck's theory (Derivation) - De Broglie waves - Heisenberg's uncertainty principle - Rutherford's atomic model - Bohr's atomic model - Bohr's theory for Hydrogen atom - Atomic radii, velocity, frequency and energy of orbital electron – Schrodinger's time independent and time dependant wave equations (Derivation). X-rays: Discovery, Coolidge tube - Properties, Moseley's law & its importance – applications of X-rays.

Text Book

1. R K Gaur and S L Gupta (2018), "Engineering Physics", Dhanpat Rai Publications,

Reference Books

1. Carl F Kauhn (2018), "Basic Physics: A Self Teaching Guide" Noah Books, 2nd Edition
2. R Murugesan and KeerthigaSivaprasath (2019), "Modern Physics", S. Chand Publishing.

Programme	**B. Sc. Forensic Science**	**Programme Code**	**UFS**
Course Code	**19UFSS11**	**Number of Hours/Cycle**	**2**
Semester	**I**	**Max. Marks**	**100**
Part	**IV**	**Credit**	**2**
Skill Based I			
Course Title	**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 and 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 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.

Text Book

1. Alexis Leon and Mathews Leon (1999), Introduction to Computers: Leon Tech World.

Reference Books

1. R.X. Taxali (2012), PC Software for windows made simple, Tata McGraw hill, New Delhi.
2. Stephen L. Nelson. Office 2000 Complete Reference-Bpb.
3. Gini Counter and Annete Marquis. Mastering Office 2000-BPB
4. Joyee Cox and Pully Urban, Quick Course in Microsoft Office: Galgotia Publications.

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSN11	Number of Hours/Cycle	2
Semester	I	Max. Marks	100
Part	IV	Credit	2
Non Major Elective I			
Course Title	Forensic Science		

Objectives

To understand the importance of criminology, the cause of criminal behavior, the significance of criminal profiling to mitigate crime, the consequences of crime in society and the elements of criminal justice system.

Unit I

Basic of Forensic Science - Introduction, Definition, need, scope of Forensic Science. Various Principles of Forensic Science, branches of Forensic Science: Forensic Medicine, Forensic Toxicology, Forensic accounting, Forensic Biology, Forensic Physics, Forensic Photography, Ballistics, Questioned document and Fingerprint, Forensic Psychology, Forensic Anthropology, Wild life Forensic, DNA fingerprinting , Cyber Forensics etc.,

Unit II

Crime: Definition of crime, history and development, victimology, criminological perspective, characteristics of crime, classification of crimes: atrocity, seriousness, motive, statistical, situational & systematic. White collar crime, professional crime, organized crime, present scenario of crime in India.

Unit III

History and development of Forensic Science - Development of Forensic Science in the world and India. National and international scenario in Forensic Science. Various scientists and their contribution in the field Forensic Science,

Unit IV

Physical evidences and their significances in Forensic Science**.** various types of physical evidences found on the crime scene, searching, collection, packaging, and handling of the physical evidences found on the crime scene,

Unit V

Crime scene documentation Crime scene documentation- sketching, note making, photography and videography.

Text Books

1. Nabar. B S (2013), Forensic Science in Crime Investigation, Asia Law House, Hyderabad, 3rd edition.
2. Nanda. B.B. and. Tiwari R.K (2001). Forensic Science in India: A Vision for the Twenty First century, Select Publishers, New Delhi

Reference Books

1. James S.H. and. Nordby J.J (2005), Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, Boca Raton, 2nd edition.
2. Henry C. Lee;Timothy M. Palmbach and Marilyn T. Miller (2001),Henry Lee's Crime Scene Handbook, Academic Press,USA, 1st edition.
3. Saferstein R. (2004), Criminalistics, Prentice Hall, New Jersey, 8th edition.

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSC21	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	4
Core III			
Course Title	Basics of Forensic Science		

Objectives

To make the students to continue to set high professional standards, engage with Forensic Science regulator and other relevant stake holders, maintain appropriate panels of assessors, and to have a long term aim of becoming a royal society

Unit I

Introduction to Crime - Sociological aspect of crime in society, Criminal behaviour, Types of crime, Crime scenario in India. Detection of Crime, Different agencies involved in crime; Police, Medico-legal expert, judicial officers Scope and development of Forensic Science, Forensic Science in India, Growth of Core laboratories, set up in country Facilities provided in Forensic Science Laboratories for chemical, physical, biological, psychological, digital and cyber crime detection and analysis.

Unit II

Crime Scene Investigation - Definition of crime scene, crimes without scene. Classification of crime scene: indoor & outdoor, primary & secondary, macroscopic & microscopic crime scene. Crime scene and its significances, argument and ethics of crime scene. What is physical evidence, classification, types of physical evidences, sources of physical evidence, signification and value of physical evidence, victim and accused, suspect, witness. Special crime scene -mass disaster, terror attack, geological scene and explosive etc.

Unit III

Crime Scene Management -- Introduction to crime scene management, first responding officer and his duties. Crime scene investigator and duties, specialized personnel at the crime scene: biological or chemical terrorist crime scene, processing of scene of crime: plan of action, protection of scene of crime, Crime scene documentation- sketching, note making, photography and videography. Searching, collection, preservation, packing of physical evidence , forwarding or dispatch of exhibit in to the laboratory, chain of custody, collection of standard/reference samples.

Unit IV

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 V

1. To compare and calculate diameter of given bangle piece.
2. To collect and compare physical evidence of Hit and run crime scene Samples.
3. Collection and Handling of arson scene Samples.
4. Packaging and forwarding of physical evidences.
5. Collection of special evidences.

Text Books

1. B. R. Sharma (2014), Forensic Science in Criminal Investigation and Trials, Universal Law Publishing, 5th edition.

2. M. S. Rao and B. P. Maithil(2013), Crime Scene Managemnet: A Forensic Approach, Selective and Scientific Books, New Delhi, 2nd edition.

Reference Books

1. A K Gupta (2014), Essentials of forensic medicine and toxicology, Current Books International, 5th edition.
2. Mark M. Okuda and Frank H. Stephenson (2019), A Hands- On Introduction to Forensic Science: Cracking the Case, CRC Press, 2nd edition.
3. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001),Henry Lee's Crime Scene Handbook, Academic Press, USA, 1st edition.
4. S.H. James and J.J. Nordby (2005), Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, Boca Raton, 2nd edition.

Programme	B.Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSC22	Number of Hours/Cycle	5
Semester	II	Max. Marks	100
Part	III	Credit	3
Core IV			
Course Title	Forensic Psychology		

Objectives

To understand the overview of forensic psychology and its applications, the legal aspects of forensic psychology, the significance of criminal profiling, the importance of psychological assessment in gauging criminal behaviour and the tools and techniques required for detection of deception.

Unit I

The Science of Psychology Concepts of psychology, History of psychology, modern perspectives, types of psychological professional psychology, The science and research methods, professional and ethical issues in psychology.

Biological Perspective : Nerves Neurons: Building the network, central nervous system, peripheral nervous system, Human brain structure and function; sensory systems, endocrine system. Consciousness of Perception: Consciousness, Altered states of consciousness, attention and awareness, sensation and perception, problems in Attention and perception, assessment attention and perception

Unit II

Cognitive Processes Learning process: Types of learning, models of memory, stages of memory, encoding, retention and retrieval, forgetting, brain and memory, problem in learning and memory, intelligence- Concepts and theories.

Cognition, Motivation and Emotion: Thinking, decision making and problem solving, intelligence and language, motivation: Types of approaches Emotion, stress and coping

Unit III

Basics of Forensic Psychology - Definitions and fundamentals 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, psychological autopsy.

Unit IV

Psychology and Criminal Behaviour Psychopathology and personality disorder, Psychological assessment and its importance, Serial Killers, 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.

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 V: Any five

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.

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

Note

Unit V should be handled as practical.

Text Books

1. S. K. & Meyer G. E, (2006) Psychology- Ciccarelli, Pearson Education, New Delhi.
2. Vimla Veeraghawan (2009), Handbook of Forensic Psychology, Selective and Scientific Books.
3. Edward E. Smith and Stephen M. Kosslyn (2015), Cognitive Psychology: Mind and Brain, Pearson Education, New Delhi, 1st edition.

Reference Books

1. Daniel (2011), Thinking, fast and slow, Penguin.
2. Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw (1986), Introduction to Psychology, Hill Book Co.
3. Baran R.A (2001), Psychology, Pearson Education Pvt.Ltd, New Delhi.
4. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau (1995), Scientific Evidence in Civil and Criminal Cases, The Foundation Press, Inc., New York, 4th Edition.
5. R. Saferstein (2004), Criminalistics, Prentice Hall, New Jersey, 8th edition.
6. J.C. DeLadurantey and D.R. Sullivan (1980), Criminal Investigation Standards, Harper & Row, New York.
7. J. Niehaus (1999), Investigative Forensic Hypnosis, CRC Press, Boca Raton.

Programme	B.Sc. Forensic Science	Programme Code	UFS
Course Title	Basic Chemistry		
Course Code	19UFSA21	Number of Hours/Cycle	4
Semester	II	Max. Marks	100
Part	III	Credit	4
Study Component		Allied II	

Objectives

To make the students to demonstrate problem solving and critical thinking skills and also discuss forensic chemical principles, to apply modern methods of forensic analysis in a laboratory setting and 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, Vapour pressure, surface tension surfactants, viscosity, molar refraction, optical activity structure of liquids, Solutions: Method of exploring concentration of solutions, binary liquids, vapour pressure, composite diagram of binary liquids and solutions, distillation, fractional distillations, vacuum distillations, conductance, conductometry, electro motive force, potentiometery

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 phenanthrones, reactive intermediates and related reactions.

Text Books

1. Singh.R.P(2015), Handbook of Chemistry, Arihant Publications
2. Peegassus (2011), Basic concept of chemistry, Pegasus

Reference Books

1. Gupta B.D & Elias.A.J(2013), Organometallic Chemistry, Universities Press.
2. Khopkar, S.M. (2008), Basic concepts of Analytical Chemistry, New Age Science Lt.

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSS21	Number of Hours/Cycle	2
Semester	II	Max. Marks	100
Part	IV	Credit	2
Skill Based II			
Course Title	Police Investigation and Administration		

Objectives

To identify specific periods related to the origins of Indian police and their developments. to examine the historical development and present organization and administration of Police departments, to examine early forms of investigative methods, its evolution and developmental processes, to examine the origins, meaning, development, experiences and the record of community policing, to examine the organizational development issues and future developments in police management and to describe how specific theories of crime control affect the police (i.e., routine activities, Deterrence, environmental criminology)

Unit I

Fundamentals of Policing: History of Indian Police, Police Administration concepts, :Hierarchy, Rank and File Structure, Power & Authority, Span of Control, Unity of Command, Recruitment and Training. Superintendence, control, organization, and management police, . Police Act of 1861 - Police reforms - National Police Commission recommendations (NPC), 1979, Model Police Act of NPC.

Unit II

Organization and structure of Indian Police Structure of State Police District Police – City Police – Special Police battalions; Intelligence Branch, Crime Branch(CID) – Directorate of Vigilance and Anti- Corruption. Central Police Organizations - IB, CBI, CISF, CRPF, RPF, RAW, NIA, NSG etc. Police research and Crime Statistics Organizations – BPR & D, Organizational set up of police stations, working system of Town & City police stations, Village police, Railway and Armed Police. International Criminal Police Organization (INTERPOL).

Unit III

Police Investigation, Procedures and functions:First information Report, Investigation of Scen e of Crimes sketching, Searching, Collection, preservation and transportation of physical clues to the experts. Charge sheet, Investigation of cognizable and non-cognizable offences, Investigation of Robbery, Dacoity, Theft, House breaking

Unit IV

Police Duties and Powers: Arrest, search, locking up and remand of suspected and accused persons. Conducting various types of raids – Prohibition, gambling, Narcotics and PITA – Procedure to be followed and precautions to be taken while suspected hide outs of Criminals/ Terrorists.

Unit V

Investigation of sexual offenses and crime against women: Sexual assault against children (POCSO act), Domestic violence, Dowry death, trafficking. Unnatural death.

Text Books

1. Misra K.K. (1987). Police Administration in Ancient India, K.K. Publications.
2. Guharoy J. T. (1999). Policing in the 21st Century Indian Institute of Public Administration.

Reference Books

1. Srivastava Aparna (1999). Role of Police in Changing Society, APH Publishing House.
2. Gupta, Anandswarup (2007). Crime and Police in India, Agra: Sahitya Bhavan.
3. Banerjee, D (2005). Central Police Organization, Part I & Part II, New Delhi: Allied Publishers, Pvt, Ltd.

Programme	B. Sc. Forensic Science	Programme Code	UFS
Course Code	19UFSN21	Number of Hours/Cycle	2
Semester	II	Max. Marks	100
Part	IV	Credit	2
Non Major Elective II			
Course Title	Emerging Trends in Forensic Science		

Objectives

To understand the Importance of Forensic Engineering, the importance of Forensic Archaeology and the importance of Forensic Intelligence

Unit I

Forensic Engineering - Role of mechanical, electronics and computer engineers in Forensic Science. Accident investigations. Failure of signalling and control systems. Ergonomics. Applications of animations, simulations and digital imaging in solving crime cases. Episodes involving fire engineering.

Unit II

Forensic Archaeology - Role of forensic archaeology. Searching the archaeological site. Methods of digging the burial site. Recovery of remains. Documenting the recovered material. Preservation of remains.

Unit III

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.

Unit IV

Forensic Nursing Forensic nursing development, definition, Role and responsibilities of Forensic Nurses, present and future trends, Forensic case management with the help of Forensic nursing.

Unit V

Forensic Pathology - Definition, Goals and unique aspects in Forensic pathology, objectives, Roles and responsibilities of Forensic pathologists, Significances of Forensic pathology.

Text Books

1. Noon R.K. (1992), Introduction to Forensic Engineering, CRC Press, Boca Raton.
2. Brown J.F. and K.S. Obenski J.F. (1990), Forensic Engineering- Reconstruction of Accidents, C.C. Thomas, Springfield.

Reference Books

1. Killam E.W (1990), The Detection of Human Remains, C.C. Thomas, Springfield.
2. Ribaux O.and Margot P. (2000), Encyclopedia of Forensic Sciences, Volume 1,
3. Siegel J., ASaukko , P.J. and Knupfer G.C. (Ed.), Academic Press, Lon

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC31	Number of Hours/Cycle	3
Semester	III	Max. Marks	100
Part	III	Credit	3
Core V			
Course Title	Forensic Dermatoglyphics		

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 physical and chemical techniques of developing fingerprints on crime scene evidence.
d. The Fingerprint recording, lifting, identification and individualization. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.
e. The significance of foot, palm, ear and lip prints.

Unit I: Basics of fingerprinting

Introduction to Fingerprint: Definition, History and development, Dermatoglyphics, Theory, Fundamental principles of fingerprinting. Significance, Biological basis of fingerprints-embryology (primary and secondary ridge formation) morphology and anatomy of dermal skin, Friction Skin, Theory of pattern formation, Morphology and anatomy of sweat gland: Eccrine gland, Sebaceous gland, Apocrine gland, Chemical constituent of sweat gland (Water, Inorganic, Organic, Metallic and Drugs

Unit II: Development of Fingerprints

Fingerprint Development: Fingerprint at crime scene (Chance, Patent, Plastic and Latent) Formation of latent Fingerprint, Constituents of sweat residue. Development of Fingerprints Physical, Chemical methods & Modern methods, Application of light sources in fingerprint detection. Preservation of developed fingerprints. Collection of Fingerprints at Scene of crime.

Unit III: Fingerprint recording, lifting, identification and individualization

Recording & lifting of Fingerprints Taking of fingerprint: requirements, procedure, precautions, purpose, plain print, rolled print and palm print. Post-mortem fingerprinting: Fresh corpus, Rigor mortis, Mutilated, Decomposed, Drowned, Burn. Photography with various light sources, unknown fingerprint, condition affecting latent print,

Identification and individualization methods for Fingerprints: Osborn Grid, Seymour Trace, Photographic Strip, Polygon, Overlay, Osterburg Grid, Microscopic triangulation and conventional method.

Unit IV: Fingerprint Classification

Basic fingerprint patterns (Arch, loop, whorl and composite), pattern area, delta and core (ridge characters) Ridge counting, Ridge tracing, Various Classification system in fingerprints: Ivan Vucetich, Purkinje, Francis Galton, Henry (10 digit and FBI extension), single digit (battle), damage fingers. AFIS- Automated Fingerprint Identification System, FACTS- Fingerprint Analysis and Criminal Tracing System.

Unit V: Other Impressions

Sole prints, Palm prints and their historical importance. Edgeoscopy & Poroscopy: Significance in personal identification. Lip Prints-Introduction- Nature, collection and examination of lip prints, Application in crime detection. Ear Prints- Introduction- History- Morphology of ear – Ear prints location- Producing standards from suspects- Identification and comparison. Foot prints- Gait pattern analysis, Determination of personality by gait analysis.

Text Books

1. Lee and Gaensleen's and R.S. Ramotowski (2013), "Advances in Fingerprint Technology" (Ed.), CRC Press, Boca Raton, 3rd Edition
2. Surinder Nath (2010), "Fingerprint Identification", Shiv Shakti Book Traders.
3. David R. Ashbaugh (1999), "Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology", CRC Press, Boca Raton, 1st Edition.

Reference Books

1. Christophe Champod, Chris Lennard, Pierre Margot, And Milutin Stoilovic (2004), "Fingerprints and Other Ridge Skin Impressions", CRC Press, Boca Raton London New York Washington, D.C.
2. C. Champod, C. Lennard, P. Margot an M. Stoilovic (2004), "Fingerprints and other Ridge Skin Impressions", CRC Press, Boca Raton
3. William J Bodziak (1999), "Footwear impression evidence, detection, recovery and examination", CRC Press, Boca Raton, 2nd Edition.
4. S.H. James and J.J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
5. W.G. Eckert and R.K. Wright (1997), "Introduction to Forensic Sciences", CRC Press, Boca Raton, 2nd edition.
6. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "Henry Lee's Crime Scene Handbook", Academic Press, USA, 1st edition.
7. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th edition.
8. W.J. Tilstone, M.L. Hastrup and C. Hald (2013), "Fisher's Techniques of Crime Scene Investigation", CRC Press, Boca Raton.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC32	Number of Hours/Cycle	3
Semester	III	Max. Marks	100
Part	III	Credit	3
Core VI			
Course Title	Technological Methods in Forensic Science		

Objectives: After studying this paper the students will know –

a. The significance of microscopy in visualizing trace evidence and comparing it with control samples.
b. The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
c. Advanced Separation and detection techniques in Forensic Science.
d. The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.
e. UV, IR, NMR and AAS importance and utilization in Forensics.

Unit I: Microscopic Techniques

Fundamental principles, Different types of microscopes. Principle, working, mechanism, construction, ray Diagram, application and forensic significance (biological comparison microscope) phase contrast, fluorescent, dark field, polarizing microscope, scanning electron tunneling microscope, atomic force microscope, Forensic applications of microscopy.

Unit II: Basic Separation techniques

Introduction, types of separation, Paper chromatography- introduction, principle, migration parameters, types of paper chromatography, procedure and applications. Column chromatography- Introduction, principle, working, adsorbents, solvents, factors affection column efficiency.

TLC (Thin Layer Chromatography)-Introduction, principle, stationary phase, mobile phase, solvent system, procedure of development, Rf value, Applications of TLC and HPTLC.

Unit III Advanced Separation and detection technique

Gas chromatography: principles, instrumentations and working technique, columns, stationary phases, detectors, Forensic applications and limitations.

HPLC: Introduction, principle, Instrumentation, working, types of column, detectors, Forensic applications and limitations.

Thermal methods- TGA, DTA, DSC- introduction, instrumentation, working, Forensic applications and limitations

Unit IV: UV & IR Spectroscopy

Ultra Violet Spectroscopy- Introduction, working, principle, instrumentation, Lamberts Beer's law, absorption of U.V radiation, Electronic transition. Applications of U.V. Spectroscopy.

Infra-Red Spectroscopy: Introduction, Principle of I.R. Spectroscopy, Fundamental modes of vibrations Types of vibrations, Application of I.R. Spectroscopy.

Unit V: NMR & AAS Spectroscopy

NMR- Spectroscopy: Introduction, Theory of NMR, instrumentation, working, principle, Applications and Numerical problems based on NMR.

Atomic Absorption and Emission Spectroscopy- Introduction, principles, Instrumentation and working, Forensic applications and limitations.

Text Books

1. Willard (1986), "Instrumental Methods of Analysis", CBS Publishers & Distributors, 7th Edition.
2. Douglas A. Skoog /F. James Holler/Stanley R. Crouch (2017), "Principles of Instrumental Analysis", Cengage Learning, USA, 7th Edition

Reference Books

1. D.A. Skoog, D.M. West and F.J. Holler (1992), "Fundamentals of Analytical Chemistry", Saunders College Publishing, Fort Worth, 6th Edition,

2. W. Kemp (1991), “Organic Spectroscopy”, Macmillan, Hampshire, 3rdEdition,
3. J.W. Robinson (1995), “Undergraduate Instrumental Analysis”, Marcel Dekker, Inc., New York, 5th Edition

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC33	Number of Hours/Cycle	3
Semester	III	Max. Marks	100
Part	III	Credit	3
Core VII			
Course Title	Indian Laws		

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

a. The significance of The code of criminal procedure, 1973.
b. The fundamental principles and functions of the code of criminal procedure, 1973.
c. The significance of The Indian Evidence Act, 1872.
d. The fundamental principles and functions of The Indian Evidence Act, 1872.
e. Demonstration activities on Indian Laws.

Unit I The Code of Criminal procedure, 1973

Criminal justice system: The basic principles of criminal justice system; Constitutional perspectives - Articles 14, 20, 21 and 22; The rationale of criminal procedure; Salient features of the Criminal Procedure Code, 1973, Constitution of criminal courts and the significance of the segregation of magistrates into judicial and executive magistrates categories under the code, Important definitions: Investigation, first information, complaint, inquiry, charge, trial, summons and warrant cases, discharge and acquittal, appeal, revision and reference.

Unit II Investigation proceedings

Initiation of investigation proceedings (Secs. 154-157), Interrogation powers of police officer (Secs.160and 161), Evidentiary value of FIR and statements made to police officer (Sec. 162 of cr.p.c) Recording of confessions and statements (Sec. 164), Inquest proceedings (Secs. 174-176).General principle of jurisdiction of criminal courts (Sec. 177), Exceptions to the principle (Secs. 178-188), The Charge, Bail provisions (Secs. 436-450). Trial before a court of session (Secs. 225-237) Provisions as to accused persons of unsound mind (Secs. 328-339).

Unit III The Indian Evidence Act, 1872

The Introduction and The main features of the Indian Evidence Act, 1872.Central conceptions in law of evidence: Facts: Sec. 3, Presumption (Sec. 4),The Doctrine of res gestae (Secs. 6,7,8), Test identification parade(Sec. 9), Evidence of common intention (Sec. 10), The problems of relevancy of "Otherwise" irrelevant facts (Sec. 11), Proof of custom (Sec. 13), confessions caused by , "any inducement, threat or promises" (Sec. 24), Inadmissibility of confession made before a police officer, (Sec. 25),Dying declarations: The justification for reliance on dying declarations (Sec. 32),Expert testimony:45, Oral evidence: general principles concerning Oral evidence (Secs. 59-60)

Unit IV Credibility of Evidence

General principles concerning documentary evidence, primary and secondary evidence, (Secs. 61-66) Public document and private document (Secs. 74-78). Examination of witnesses, Competency to testify (Secs. 118-122), Leading Questions (Secs 141-143), Lawful Questions in Cross-Examination (Sec. 146), Hostile witness (Sec.154), Impeaching of the standing the credit of witnesses (Sec. 155), refreshing the memory (Sec. 164), The general conception of burden of proof (Secs. 101-104).

Unit V Practicals

1. To write report on Current Judicial System
2. To visit the regional forensic laboratories
3. To perform the comparison of given physical evidences.
4. To study the Historical case sessions that change overview of judicial system
5. To Visit District/ Session court

Unit V has to be conducted as practical.

Text Books

1. Ratanlal &Dhirajlal (2019), "The code of criminal procedure", Lexis Nexis publisher, New Delhi, 22nd Edition.
2. The Code of Criminal procedure (1973), "Bare Act", Universal Law Publishing, New Delhi.
3. The Evidence Act (1872), "Bare Act", Universal Law Publishing, New Delhi.

References Books

1. K.D. Gaur (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi, 7th Edition.
2. Ratanlal and Dhirajlal (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi, 36th Edition.
3. R.V.Kelkar's (2016), "The Criminal Procedure Code", Eastern Book Company, Delhi, 6th Edition.
4. M.C.Thakker and C.K.Thakker (2014), "Criminal Procedure", LexisNexis Publisher, New Delhi, 4th Edition.
5. BatukLal (2017), "The Law of Evidence", Thomson Reuters publishers, 7th Edition.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC3P	Number of Hours/Cycle	3
Semester	III	Max. Marks	100
Part	III	Credit	3
Core Practical I			
Course Title	Forensic Dermatoglyphics and Technological Methods in Forensic Science		

Objectives: After studying this paper the students will know –

a. Practical knowledge about Fingerprint examination.
b. Hands-on about Fingerprint Examinations.
c. Physical, Chemical methods of Development of Fingerprints.
d. Fingerprint identification, individualization and classifications.
e. Application of TLC in various Forensic Science related cases.

List of Practicals

1. Recording of plain Fingerprint.
2. Recording of rolled Fingerprint.
3. Identification of various Fingerprint patterns.
4. Analysis of palm prints.
5. Classification of Fingerprint according to Henry's Classification.
6. Ridge counting of Fingerprint.
7. Ridge tracing of Fingerprint.
8. Ridge density of Fingerprint.
9. Development of fingerprint on glass surfaces by using powder method.
10. Development of fingerprint on plastic surfaces by using powder method.
11. Development of fingerprint by using Ninhydrin, Iodine Fuming.
12. Development of fingerprint by using SPR method, Silver Nitrate Solution.
13. Examination and comparison of Fingerprints by using different types of comparison methods.
14. Study of lip prints.
15. Examination of fire arson cases by TLC.
16. Verification of Lamberts Beer's law.
17. Examination of hair, cloth, threads Sample by using Comparison Microscope.
18. Examination of various samples countered in various cases by using TLC. (5 Practicals).

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**19UFSA31**	**Number of Hours/Cycle**	**4**
Semester	**III**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
Allied III			
Course Title	**Fundamentals of Zoology to Forensic Science**		

Objectives: After studying this paper the students will know –

a. The knowledge on taxonomy of animals.
b. Structure and function of prokaryotic cell, morphology of bacteria.
c. Structure and functions of the cell organelles.
d. Immunology, Genetics laws and hereditary disorders.
e. Structure and function of genetic materials and its biotechnological applications.
f. Developmental biology and Biotechnology

Unit I TAXONOMY

Definition, Principles of classification, Grades of Organization, Symmetry and Coelom, Binomial nomenclature - Outline classification of Animal kingdom up to class level with example - Flow chart only. **General characters** of the following phyla: i) Protozoa, ii) Porifera, iii) Coelenterata, iv) Platyhelminthes, v) Nematoda, vi) Annelida, vii) insects viii) Mollusca, ix) Echinodermata, x) Prochordata, xi) Pisces and Amphibia, xii) Reptilia, xiii) Aves, xiv) Mammalia.

Unit II Cell biology and Immunology:

Structure of a prokaryotic cell (*E. coli*) - Structure of T_4 Phage - Structure and functions of the following cell organelles: Cell membrane – Mitochondria – Nucleus – Ribosome. Lymphoid organs Primary (Thymus, Bone marrow) and secondary (Spleen, lymph nodes) - Immunoglobulin: IgG – structure & functions - Antigen – antibody reaction.

Unit III Biochemistry and Physiology

Classification and structure of Carbohydrates.(Mono, Di, Polysaccharides with one example each) - Classification and structure of proteins with examples (primary, secondary, tertiary, and quaternary structure) - Classification and Structure of Lipids with examples; Digestion of Carbohydrates, Protein, and Lipids - Mechanism of respiration and Transport of gases - Structure of Nephron and Formation of urine.

Unit IV Genetics and Molecular biology

Mendel's Laws – Mono and Dihybrid crosses - Multiple Allele (ABO & Rh blood grouping) - Sex linked inheritance in Man. Structure and functions of DNA - Structure and functions of RNAs (t RNA, m RNA, and r RNA) - DNA replication, Protein synthesis.

Unit V Developmental biology and Biotechnology

Structure of sperm and ovum in Human – Fertilization; Assisted Reproductive Technology – IVF, IUF, AI, Sperm Bank, Test tube baby methods. Enzymes and Vectors - Recombinant DNA - Construction and applications - Transgenic animals – Dolly – Methods and Applications DNA finger printing – Methods and Applications – Ethical issues.

Text Books

1. Jason H. Byrd and James L. Castner (2001), "Forensic Entomology", CRC Press, Boca Raton.
2. Benjamin Lewin (2017), "Lewin's XII Genes", Pearsons Prentice hall, Pearson Education, Inc., 12th Edition.
3. Keith Wilson and John Walker (2002), "Principales and Techniques of biochemistry and Molecular biology", Cambridge University press, U.K, 7th Edition.
4. Jenni Punt, Sharon Stranford, Patricia Jones and Judith A Owen (2018), "Kuby Immunology", WH Freeman, 8th Edition.
5. Dr. R C Dubey (2014), "A Textbook of Biotechnology", S. Chand Company & Pvt. Ltd, 5th Edition.

Reference Books

1. L. Stryer (1988), "Biochemistry", W.H. Freeman and Company, New York, 3rd Edition.
2. Richard Li (2015), "Forensic Biology", CRC Press, Boca Raton, 2nd Edition.
3. Avinash Upadhyay, Kakoli Upadhyay (2005), "Basic Molecular Biology", Himalaya Publishing House, 1st Edition.
4. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell (1993), "Harper's Biochemistry", APPLETON & Lange, Norwalk.
5. S. Chowdhuri (1971), "Forensic Biology", BPRD, New Delhi.
6. M.K. Bhasin and S.M.S Chahal (1996), "A Laboratory Manual for Human Blood Analysis", New Delhi house press, Delhi.
7. William Goodwin, Adrian Linacre, Sibte Hadi (2010), "An Introduction to Forensic Genetics", Wiley, 2nd Edition.
8. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th Edition.

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**19UFSS31**	**Number of Hours/Cycle**	**2**
Semester	**III**	**Max. Marks**	**100**
Part	**IV**	**Credit**	**2**
Skill Based III			
Course Title	**Advanced Forensic Science**		

Objectives: After studying this paper the students will know –

a. The fundamental principles on which the science of Crime Scene, Crime Reconstructions is based.
b. Importance of Crime Scene Reconstruction in Forensics.
c. Techniques and methods of Crime Scene Reconstruction.
d. Blood Stain Pattern Analysis.
e. The Forensic Significances of Blood Stain Pattern Analysis.
f. Demonstration of Crime Scene Reconstruction and Blood Stain Pattern Analysis.

Unit I Crime Reconstruction (CR)

A history of crime reconstruction , Ethics in CR, Observer effects and examiner bias, Psychological influence on the forensic examiner, Recommendation to blunt observer effects, Standards for the reconstruction of crime, Science of crime reconstruction, Methods of crime reconstruction, Evidence role in reconstruction, Creation of timelines, Mind mapping, Part charting (flow diagram) the crime scene, The nature of reconstruction, Evidence dynamics, Pre-discovery(offender action, victim actions, witness weather/climate, decomposition, insect activity, animal predation, fire) Post-discovery (failure to search recovery, evidence technicians, medical examiner, premature scene cleanup, packaging, transportation, storage and chain of custody).

Unit II Crime Scene Reconstruction (CSR)

Theoretical and practical concept of crime scene analysis: Fundamental beliefs, theories, principles of CSR, scientific method, facts at scene of crime and relation with evidences. Practical methodology for crime scene reconstruction. Resolving significant investigative questions in CSR. Protocols role in reconstruction.

Unit III Bloodstain Pattern Analysis

Introduction, Terminologies and classification, Biological and physical properties of human Reconstruction using bloodstain blood, Droplet Dynamics in Flight and on Impact, Droplet Directionality from bloodstain patterns, Determination of Point of Convergence and Point of Origin. Impact spatter and mechanisms. Altered bloodstain Documentation and Evaluation of bloodstain evidence. Importance and Legal aspects of BPA. Bloodstain Pattern Analysis to crime scene reconstruction. Manual and Computer-assisted reconstruction of BPA

Unit IV Reconstruction of motor accident, firing, post blast cases, fire

Reconstruction of motor accident, firing, post blast cases, fire. Collection of data (videography photography, measurements, analysis of data) Writing of CSR reports, court room testimony.

Unit V Practicals

1. Reconstruction and evaluation of various scenes of crime.
2. To study crime scene reconstruction methods.
3. To perform rough/ final sketching of crime scene
4. Reconstruction of an old crime scene.
5. Collection and examination blood stain.
6. Analysis of blood stains patterns.

Unit V has to be conducted as practical.

Text Books

1. S.H. James and J. J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.

2. K.S. Narayan Reddy and O. P. Murty (2017), "The Essentials of Forensic Medicine and Toxicology", Jaypee Brothers Medical Publishers, 34th Edition.
3. Ross M. Gadner and tom Bevel (2009), "Practical Crime Scene Analysis and Reconstruction", CRC Press, Boca Raton.

Reference Books

1. W.G. Eckert and R. K. Wright (1997), "Introduction to Forensic Sciences", CRC Press, Boca Raton, 2nd edition.
2. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "Henry Lee's Crime Scene Handbook", Academic Press, USA, 1st edition.
3. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th edition.
4. W.J. Tilstone, M. L. Hastrup and C. Hald (2013), "Fisher's Techniques of Crime Scene Investigation", CRC Press, Boca Raton.
5. Ross M.Gardner & Donna Krouskup (2018), "Practical Crime Scene Processing and Investigation", CRC Press, Boca Raton**,** 3rd Edition.
6. Barry A J Fisher and David R. Fisher (2012), "Technique of crime scene investigation", CRC Press, Boca Raton, 8th Edition.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC41	Number of Hours/Cycle	3
Semester	IV	Max. Marks	100
Part	III	Credit	3
Core VIII			
Course Title	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, Beverages.
c. The method of searching, collecting, preserving and analyzing arson evidence.
d. The techniques of locating hidden explosives.
e. Provisions related to Petroleum Act, Explosive Substances, Food Adulterations, Narcotic Drugs & Psychotropic Substances Act, Drug and Cosmetics Act.

Unit I: Introduction to Forensic Chemistry, Arson and Pesticides

Introduction to Forensic Chemistry – Types of cases – Preliminary Screening – Presumptive Tests (color/spot tests) Examination procedure by Standard methods- Significance of Forensic Chemistry.

Chemistry of fire – Fire triangle- Definition Arson – Nature of Fire – Collection and preservation of fire/ arson Evidences – Evaluation of Evidences – Causes of Fire – Chemical analysis of Arson residues – Analysis of fire debris- Information from smoke staining. Instrumental methods of analysis.

Pesticides: Introduction, Classification, synthesis of DDT, Malathion, BHC, Parathion, applications. Analysis of soil.

Unit II: Examination of Petroleum products & Food adulteration

Examination of Petroleum products – Distillation and fractionation – Standard methods of analysis of petroleum products – Adulteration of petrol – Various fractions and their commercial use.
Food adulteration: Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material cases. Sampling of food, Determination of moisture, ash, pH and Sodium chloride, Butter- water, salt, curd, lactose, fat, ash.

Unit III: Explosives

Introduction to Explosives – Definition of explosives- Classification- Low explosives and high explosives. Military explosives. Blasting agents. Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Blast waves. Bomb scene management. – Composition of explosive components– Explosive Devices – Improvised Explosive devices – Country made explosive and material used - Investigation of explosives - Identification of hidden explosives – Approach to SOC – Post blast Residues Collection – Systematic Analysis of Explosive – Profiling & evaluation of explosives – Disposal of IEDs.

Unit IV: Beverages

Beverages: Composition and analysis of alcoholic and non alcoholic beverages – country made liquor – illicit liquor – classification of alcoholic beverages – Toxic kinetics of alcohol – Effects of alcohol – Collection of samples for identification of alcohols – Chemical & physical tests and evaluation – common adulterants and toxic substances in alcoholic beverages – Breath analysers – Blood alcohol content (BAC).

Unit V: Relevant provision of

Petroleum act – BIS - Central excise act.Explosives act & Explosive substances act.

Prevention of Food Adulteration Act 1954 (Definition, Power of Food Inspector, Offences and Penalties).

Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation, Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties).

Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics, Offenses and Penalties), Arson cases.

Text Books

1. J.D. DeHaan (1991), "Kirk's Fire Investigation", Prentice Hall, New Jersey, 3rd Edition
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau (1995), "Scientific Evidence in Civil and Criminal Cases", The Foundation Press, Inc., New York, 4th Edition.
3. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th Edition
4. Parikh C.K (1999), "Text Book of Medical Jurisprudence Forensic Medicines and Toxicology", CBS Pub. New Delhi.
5. Balraj S. Parmar et.al (2004), "Pesticide Formulation", CBS Publishers, New Delhi .
6. Settle F. A (1997), "Handbook of Instrumental Technique for Analytical Chemistry", Prentice Hall.

Reference Books

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's (2013), "Techniques of Crime Scene Investigation", CRC Press, Boca Raton.
2. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik (2013), "Forensic Science", D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester.
3. Willard (1986), "Instrumental Methods of Analysis", CBS Publishers & Distributors, 7th Edition.
4. K.D. Gaur, (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi, 7th Edition.
5. Ratanlal and Dhirajlal (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi,36th Edition
6. R.V.Kelkar's (2016), "The Criminal Procedure Code", Eastern Book Company, Delhi, 6th Edition.
7. The Code of Criminal procedure (1973), "Bare Act", Universal Law Publishing, New Delhi.
8. The Evidence Act (1872), "Bare Act", Universal Law Publishing, New Delhi.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC42	Number of Hours/Cycle	3
Semester	IV	Max. Marks	100
Part	III	Credit	3
Core IX			
Course Title	Questioned Documents and Handwriting Examination		

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.
e. Important features in handwriting identification, Significance of forensic documentation.

Unit I Nature and Scope of Questioned Documents

Definition of questioned documents, Terminology of documents, History of forensic document examination. Classification of documents-procurement of standard admitted/specimen writings-handling and marking of documents-preliminary examination of documents – Types of crimes related to documents – criminal investigation.

Unit II Handwriting Basics

Handwriting analysis –Definition of Graphology- Basics of Handwriting Identification - Individuality of handwriting - General characteristics of handwriting- Analysis of hand writing- Natural variations and fundamental divergences in handwritings, Tools for Forensic document examination- Basic tools needed for forensic documents' examination: Instrumentation and Principles of Video Spectral Comparator, Stereoscopic microscopes, ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, electrostatic detection apparatus, Simulation and Comparison of Handwriting- Collection of proper standards.

Unit III Disguised writing

Disguised writing and anonymous letters-Identification of writer-Examination of signatures. Characteristics of forged and genuine signatures. Examination of alterations, erasures, over writings, additions and obliterations. Decipherment of secret writings indented and charred documents. Examination of seal impressions and mechanical impressions.

Unit IV Forgeries and their detection

Forgeries and their detection. Definition of Forgery, Types of forgeries. Examination of built up documents. Determination of sequence of strokes, physical matching of documents. Examination of black and white, color Xerox copies, carbon copies and fax messages- Identification of type writer writings-identification of type writer, identification of printed matter, various types of printing of security documents, printing of currency notes. Examination of counterfeit currency notes, passports, visa, stamp papers, postal stamps etc.

Unit V Document Examination

Determining the age and relative age of documents. Determination of age of documents by examination of signatures, paper, ink writing/signatures etc. Examination of computer printouts- dot matrix, ink jet and laser printers, electronic type writers, credit cards, E-documents, digital signatures. Opinion writing, Questioned Document and Handwriting Expert, Reasons for opinion and court testimony.

Text Books

1. Wilson R. Harrison (1981), "Suspect Documents: Their Scientific Examination", Nelson-Hall.
2. Albert S. Osborn (1974), "Questioned document", Nelson-Hall, Inc, 2nd Edition.
3. R.N. Morris (2000), "Forensic Handwriting Identification: Fundamental Concepts and Principles", Academic Press, London.
4. E. David Hants (1997), "The Scientific Examination of Documents – Methods and Techniques", Taylor & Francis, 2nd Edition.
5. B. R. Sharma (2014), "Forensic Science in Criminal Investigation and Trials", Universal Law Publishing, 5th edition.

Reference Books

1. Jan Seaman Kelly and Brian S. Lindblom (2006), "Scientific Examination of Questioned Documents", CRC Press, Boca Raton, 2nd edition.
2. Katherine M. Koppenhaver (2007), "Forensic Document Examination: Principles and Practice", Humana Press, Kindle Edition.
3. Dr. B. R. Sharma (2016), "Handwriting Forensic", Universal Law Publishing - An imprint of Lexis Nexis, 2nd Edition.
4. O. Hilton (1982), "Scientific Examination of Questioned Documents", CRC Press, Boca Raton.
5. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau (1995), "Scientific Evidence in Civil and Criminal Cases", Foundation Press, New York, 4th Edition.
6. Z. Liu, J.H. Cai and R. Buse (2003), "Handwriting Recognition: Soft Computing and Probabilistic Approach (Volume 133)", Springer Science and Business Media.
7. B S Nabar (2013), "Forensic Science in Crime Investigation", Asia Law House, Hyderabad, 3rd edition.
8. S.H. James and J.J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
9. M.K.Bhasin and S. Nath (2002), "Role of Forensic Science in the New Millennium", University of Delhi, Delhi.
10. M. S. Rao and B. P. Maithil (2013), "Crime Scene Managemnet: A Forensic Approach, Selective and Scientific Books", New Delhi, 2nd edition.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSC43	Number of Hours/Cycle	3
Semester	IV	Max. Marks	100
Part	III	Credit	3
Core X			
Course Title	Forensic Biology		

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. How wildlife forensics aid in conserving natural resources.
d. How forensic entomology assists in death investigations.
e. Demonstration on various biological evidences handling and processing.

Unit I Forensic Biology

Introduction to Forensic Biology, Developmental History of Modern Forensic Biology, Importance and significances of Forensic Biology, Blood evidences.

Forensic Botany: (Introduction history and development) botanical evidence encounter in forensic investigation. Identification and examination of plant derivative (leaves, flower, branches, stem, root, wood, grasses, fruits and seeds) classification of plant specimens and examination. Forensic Palynology: Forensic analysis of pollen grains, algae. Investigation of ornamental, imported, stolen, endangered plants. Dendrography (sandal, teak, red sandal wood). Forensic Limnology (collection of diatoms from drowned body, collection of control sample, extraction, digestion, examination, comparison and identification. Dendrochronology, Application of plant ecology, drugs of abuse Opium, Cannabis, from plants, their illegal farming and trading. Practical- To carry out microscopic examination of diatoms.

Unit II Forensic Microbiology

Forensic Microbiology: Concept of forensic microbiology, history, introduction to epidemiology, microbial forensic programs (SWGMGF), CDC, case studies, microbes of forensic significance. Types of media: selective, differential, special. Isolation of bacteria of forensic significance, sample collection, growth conditions, and identification, Preservation methods (serial transfer, liquid nitrogen, lyophilization). Biochemical methods for identification of bacteria. Fungi: isolation and identification. Virology: Classification, Structure and cultivation of Animal, plant and human viruses.

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. Identification of pug marks of various animals. Criminal investigation, identification of animals by teeth, claws, ivory, antlers, furs, skins, bitemarks, pugmarks, Identification of blood, excreta, and other visceral samples. Wildlife protection act, endangered species, CITES, Census of wild life population, Smuggling and poaching, crime scene search. Forensic Ornithology: Introduction and overview, Forensic Significances and cases.

Unit IV Forensic Entomology

Basics of Forensic Entomology, Insects of Forensic importance, Collection of entomological evidence during death investigations. Post Mortem Interval: role of entomology in determination of PMI, Introduction to insects of forensic importance, Determination of PMI, Determining the age of blow fly life cycle stages by ADH/ADD/ isomegalen diagram method. Forensic zoology: (Introduction history and development), Investigation of cases where animals are used in commission of crime. Examine marks on the bodies of victims and identification, examination of animal bite marks.

Unit V Biological Evidences Practicals

1. Study the Nature and importance and Forensic Significances' of various biological evidences.
2. Comparison and examination of human and animal hair
3. Identification of wood, leaves, pollens and juices as botanical evidence.
4. Study the Diatoms and their forensic significance.
5. To carry out microscopic examination of diatoms and Pollen Grains.

Unit V has to be conducted as practical.

Text Books

1. K R Kirtikar B D Basu (2006), "Indian Medicinal Plants - 4 Vols. in 8", M/s Bishen Singh Mahendra Pal Singh.
2. Reba Kanungo (2017), "Ananthanarayan and Paniker's Textbook of Microbiology", Universities Press, 10th Edition.
3. Heather Miller Coyle (2004), "Forensic Botany: Principles and Applications to Criminal Casework", CRC Press, Boca Raton.
4. Jason H. Byrd, James L. Castner (2009), "Forensic Entomology**:** The Utility of Arthropods in Legal Investigations", CRC Press, Boca Raton, 2nd Edition.

Reference Books

1. L. Stryer (1988), "Biochemistry", W.H. Freeman and Company, New York , 3rd Edition.
2. Richard Li (2015), "Forensic Biology", CRC Press, Boca Raton, 2nd Edition.
3. Avinash Upadhyay, Kakoli Upadhyay (2005), "Basic Molecular Biology", Himalaya Publishing House, 1st Edition.
4. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell (1993), "Harper's Biochemistry", APPLETON & Lange, Norwalk.
5. S. Chowdhuri (1971), "Forensic Biology", BPRD, New Delhi.
6. M.K. Bhasin and S.M.S Chahal (1996), "A Laboratory Manual for Human Blood Analysis".
7. William Goodwin, Adrian Linacre, Sibte Hadi (2010), "An Introduction to Forensic Genetics", Wiley, 2nd Edition.
8. M. S. Rao and B. P. Maithil (2013), "Crime Scene Managemnet: A Forensic Approach, Selective and Scientific Books", New Delhi, 2nd edition.
9. B S Nabar (2013), "Forensic Science in Crime Investigation", Asia Law House, Hyderabad, 3rd edition.
10. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th Edition
11. Parikh C.K (1999), "Text Book of Medical Jurisprudence Forensic Medicines and Toxicology" CBS Pub. New Delhi.

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**19UFSC4P**	**Number of Hours/Cycle**	**3**
Semester	**IV**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
Core Practical II			
Course Title	**Forensic Chemistry and Questioned Documents and Handwriting Examination**		

Objectives: After studying this paper the students will know –

a. Practical knowledge about Handwriting examination.
b. Hands-on about Handwriting Examinations.
c. Techniques for forgery detection and identification.
d. Basic tools needed for forensic documents' examination
e. Application of TLC in various Forensic Science related cases.
f. Bribe trap cases detection.
g. Examination of security features of various documents.

List of Practicals

Forensic Chemistry

1. Separation of Components of ink by using TLC.
2. Separation of Components of Yellow Oleander by using TLC.
3. Detection of contamination of petrol with kerosene by using Filter paper Test.
4. Identification of pesticides by TLC.
5. Detection of Methanol.
6. Phenolphthalein test for Bribe Trap cases.
7. Preliminary examination of Explosives (tests for nitrite, nitrate, thiocynate, chlorate, Thiosulphate, Perchlorate, Sulphite and Phosphate etc).

Questioned Document and Handwriting Examination

1. Study of Handwriting characteristics.
2. Examination of Typewritten documents.
3. Detection of Types of Forgery- Simulation forgery.
4. Detection of Types of Forgery- Traced forgery.
5. Detection of Types of Forgery- Blind Forgery.
6. Examination of security features of Currency Notes.
7. Examination of security features of Plastic Money.
8. Examination of security features of Passports.
9. Examination of Rubber stamps.
10. Examination of secret writing.
11. To study alterations, obliterations and erasures in handwriting samples.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSA41	Number of Hours/Cycle	4
Semester	IV	Max. Marks	100
Part	III	Credit	4
Allied IV			
Course Title	Introduction to Basic Programming Languages		

Objectives: After studying this paper the students will know –

a. The concepts of basic Programming Language.
b. Design principles along with understanding of c language.
c. Over view of java Script, HTML, CSS and PHP.
d. Programming language skills in various applications.
e. Demonstration of C, java Script, HTML, CSS and PHP.

Unit I C Overview

History of C Languages , Basics of Programming, Importance of C – Basic structure of C – Programming style – Constants, variables and Data types – Declaration of variables – storage class – defining symbolic constants – declaring a variable as constants – Volatile – overflow and underflow of data. Interpreter and Compiler.

Unit II Overview of Java Script

Introduction, Syntax, statements, comments, variables, Operators, Data types, Control structure, Function, Array, Errors.

Unit III HTML Overview & CSS Overview:

HTML Basics: Understanding HTML – Setting up the Document Structure – Formatting Text by using Tags. -Using Lists and Backgrounds – Creating hyperlinks and Anchors Style Sheets and Graphics: Introduction to Style sheets. Controlling Image Size and Padding. Layouts: Creating Division Based Layouts – Creating User Forms– Using Frames for Layout – Incorporating Audio and Video.

CSS Overview : Introduction, Content and Style, CSS 1 Rules , Length, Percentage, Color and URLs, Font Properties, Color and Background Properties, Text Properties, Box Properties, Classification Properties, Structure and Control, Linking Style Sheets to HTML.

Unit IV PHP Overview

Introduction, Environment, Syntax, Variable Types, Constants, Operator Types, Decision Making, Loop, Arrays, String, Web Concepts, Methods, File System, Functions, Cookies, Sessions, Sending Emails, File Uploading.

Unit V Practicals

1. Write C program to evaluate expressions.
2. Write C program to implement various operators.
3. Write a program in C to Calculate Addition of Three Numbers.
4. Create a Simple web page using HTML basic Tags.
5. Develop an HTML document for a web page of about your Department. Design the page with an attractive background color, text color and background image.
6. Write an example of Style Sheet.
7. Write an HTML document with an example of Ordered List and Unordered List.
8. Write an example of Style Sheet using text, color, and border.
9. Write PHP program to print sum of digits.
10. Write PHP program to print factorial of a number.

Text Books

1. Balagurusamy E. (2019), "Programming in ANSI C", Tata McGraw Hill Publishing Company, New Delhi, 8th Edition.
2. Rob Larsen (2013), "Beginning HTML and CSS", John Wiley & Sons, U.S.
3. Vikram vaswani (2017), "PHP: A Beginners Guide", Tata McGraw Hill Publishing Company, New Delhi.
4. John Pollock (2013), "JAVA Script, A Beginner's Guide", Tata McGraw Hill Publishing Company, New Delhi.4th Edition.

Reference Books

1. Yashvant Kanetkar (2017), "Let Us C", BPB Publications, New Delhi, 17th Edition.
2. Gottfried, (2006), "Programming with C", Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi.
3. Herbert Schildt (2000), "C: The Complete Reference", THM Edition, New Delhi, 4th Edition.
4. Xavier .C (2007), "World Wide Web Design with HTML", Tata McGraw Hill Publishing Company, New Delhi.
5. Jon Duckett (2011), "HTML and CSS: Design and Build Websites", Wileybpublications, 1st Edition.
6. Jon Duckett (2013), "Web Design with HTML, CSS, JavaScript and jQuery set", Wileybpublications, 1st Edition.
7. Marjin Haverbeke (2011), "Eloquent Javascript", No Starch Press, 4th Edition
8. William McCarty (2001), "PHP 4: A Beginers Guide", Tata McGraw Hill Publishing Company, New Delhi.
9. Steven Holzner (2007), "PHP: The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi.

E- Resources

1. www.Youtube.com. Nptelhrd Channel
2. www.tutorialspoint.com
3. www.Javatpoint.com
4. www.ocw.mit.edu.com
5. www.edx.org.com

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	19UFSS41	Number of Hours/Cycle	2
Semester	IV	Max. Marks	100
Part	IV	Credit	2
Skill Based IV			
Course Title	Forensic Photography and Accident Investigation		

Objectives: After studying this paper the students will know –

a. The Basics of Photography and its importance in Forensic Science.
b. Various types of camera, Working of SLR & DSLR Cameras.
c. Scope and significances of photography in various disciplines of forensic science
d. Basics of Automobiles, Road Terminologies,
e. The Theoretical and Practical Knowledge about Investigation of Motor, Railway and Air Accidents.
f. Demonstrations of Forensic Photography and Accident Investigation.

Unit I Photography

history and development of photography, Definition and basic principles, Camera and its Essential parts, Types of camera, Features of camera ,Working of SLR & DSLR Cameras, Optics and Lenses, Zoom and various types of Photography, Effect of aperture, Shutter speed and ISO on photograph, Manual mode & Auto mode.

Unit II Forensic Photography

Introduction, Types of Forensic photography, Scope and significances of photography in various disciplines of forensic science- finger prints, foot prints, physics, chemistry, biology, ballistics, computer forensics etc. Crime scene photography, Bloodstain Photography, Photography of Shooting Incidents, Special Photography Scenes, photogrammetry, Digital Imaging , Legal Issues Related to Photographs and Digital Images.

Unit III Basic of Automobiles

Automobiles- Vehicles manufactured in India, Components of automobile, Chassis, body, chassis frame, general assemblies of chassis and their functions, Various identification numbers, Head lights, Tail lights and Indicators, Types of automobiles, Technical terms- wheel base, thread width, turning radius, ground clearance, variants. Safety standards for cars, Suspension system, Steering system, Brake system and testing of brakes, Tire and rims, two stroke and four stroke engines and their comparison.

Road Terminologies: Cut, Final Grade, Surface, Existing Grade, Fill, Sub grade, Base, Traffic lane, travelled way, Shoulders, Roadbed, ditch, Ditch slope, Back slope, Fill slope, Interceptor ditch, Slope ratio, Central line, Crown, Super elevation, Road dividers. Road signs, symbols and traffic control mechanisms.

Unit IV Motor, Railway and Air Accidents

Vehicular accidents: Primary causes of road accident, Types of road accident, Sources of information, eye witnesses, Tire and other marks, Causes and Injuries, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, types of skid marks, Motor vehicle examination, Hit & Run cases, Motor Vehicles Crimes

Investigation of rail crash:

Introduction, Investigation principles, Best Practices: rail company tests, inspection of driving Cab, examination of electrical/electronic/technological system and their failure, causes of failures, Necessary equipments required for forensic examination.

Air Accidents- Introduction, classifications, sources of information, Types of failure, primary steps to investigation, eye witnesses.

Unit V Practicals

1. To demonstrate Photography with Camera and its Components.
2. To perform Photography using Auto Mode of camera.
3. To perform Photography using Aperture as main component.
4. To perform Photography using Shatter speed as main component.
5. To perform Photography using ISO as main component.
6. To Perform Crime Scene Photography.
7. To examine the road accident cases.
8. Comparative study of technical specifications of various vehicles.
9. To examine skid mark of Vehicles.
10. To perform Physical examination on accidental vehicle.

Text Books

1. Edward M. Robinson (2010), "Crime Scene Photography", Academic Press is an imprint of Elsevier (AP), London, 2nd Edition.
2. C. P. Nakra (2016), "Basic of Automobile Engineering", Dhapat Rai Publishing Company, New Delhi, 20th Edition.
3. Michel P. Burke (2006), "Forensic Medical Investigation of Motor Vehicle Incidence", Taylor & Francis Inc CRC Press Publishers, 1st Edition.

Reference Books

1. Harold Franck and Darren Frank (2015), "Forensic Engineering Fundamentals", Taylor & Francis Inc CRC Press Publishers, 1st Edition.
2. K. M. Gupta (2002), "Automobile Engineering Vol- I and II, Umesh publications", New Delhi.
3. John Freeman (2010), "Photography The New Complete Guide to Taking photographs", Collins and Brown publisher, London.
4. Helmut Gernsheim (1986), "A concise history of photography", Dove publications, New York, 3rd Edition.
5. Michael Langford (2015), "Basic Photography", Focal Press, Routledge publisher, 10th Edition.

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC51	Number of Hours/Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	FORENSIC PHYSICS AND BALLISTICS		

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

a. Various types of Tool Marks and Trace Evidences
b. Footwear Impressions and their Forensic Examinations
c. Fire Arms and Ammunition and their Forensic Examinations.
d. Internal Ballistics, External Ballistics and various factors affecting on the same.
e. The nature, types and formation of wounds/injuries due to projectiles in shooting and bomb blast cases.

Unit I: Tool Marks and Trace Evidences

Tools: Common Hand Tools-Levers, Hand saw, Striking Tools, Grasping Tools, Cutting Tools, Crimping Tools, Knives, Scissors and shears, Chisels and punches, Drill bits.

Tool Marks: tool mark types, compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks, Collection and documentation of tool marks.

Trace Evidences: Soil, Glass, Paint, and Fiber: Introduction, Nature, Composition, types, forensic significance and forensic analysis

Gun Shot Residues (GSR): Mechanism of formation of GSR, modern methods of analysis of GSR from the shooting hand & target with special reference to clothing's.

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

Unit II: Footwear Impressions

Casting 3-D Footwear Impressions: Introduction to casting, Importance of casting, Benefits of casts over photographs, casting materials, Methods of casting with dental stone, plaster of paris, casting footwear impressions in snow.

Treatment of 2-D Footwear Impressions: Lifting 2-D footwear impressions, Lifting impressions electro statically and electrostatic lifting devices, Gelatin and adhesive lifting, other lifting materials and choices, Powdering impressions, Deformable impressions, Impressions on carpets, cushions, grass and skin.

Enhancement of Footwear Impressions: Specialized lighting and photographic methods, Chemical enhancement, other enhancement techniques.

Unit III: Fire Arms and Ammunition

Fire arms - Early hand cannons, The matchlock, The wheel lock, The shaphaunce, The flintlock, The percussion system, The pin fire system, The rim fire system, centre fire system, Needle fire system, Rifling, revolver, Pistols, Bolt action rifle, Shotgun, Sub machine gun, Machine gun, zip guns (Improvised Firearms).

Ammunitions - Rim fire, centre fire, Case less, Blank ammunition, Tear gas, Grenade launcher, Dummy, Primer cap types, Berdan primer, Boxer primer, Cartridge cases - Rimless, semi-rimmed, rimmed, belted. Bullet and its types, Shotgun ammunition- shotgun slugs.

Unit IV: Internal Ballistics & External Ballistics:

Definition, ignition of propellants, shape and size of propellants, manner of burning, various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting. Muzzle velocity; Barrel length and velocity, effect of quantity of gun powder, effect of bullet weight, twist versus muzzle, velocity. Strength of barrel and other parts, Recoil, jump and vibration.

External Ballistics:

Trajectory formation, Vacuum trajectories, Range, Experimental determination and shape of trajectory, Spin, Drift, Angle of fire, Structure of the projectile, Sectional density, Influence of earth and escape Velocity, Air resistance, Retardation, Wind deflection, firing guns in the air, Ricochet.

Unit V: Terminal & Wound Ballistics:

Terminal Ballistics: Effect of projectile on hitting the target, Function of bullet shape, Striking velocity, Striking angle, Tumbling of bullets, Cavitations, Ricochet and its effects.

Wound Ballistics: Understanding the nature, types and formation of wounds/injuries due to projectiles in shooting and bomb blast cases, determination of range of fire- burning, scorching, blackening, tattooing and metal fouling, shots dispersion, Injuries by shotgun, revolver, pistol, rifles, etc., Wounding power of bullets, Interpretation of medico legal report. Ricochet, yawing, cavity formation inside the body (temporary & permanent). Differences in Entry and Exit Wounds, etc. Contact wounds, near contact wound, close range, abrasion collar.

Text Books

1. Houck. Max M.(2003) “Trace Evidence Analysis” ,Academic press,2nd Edition
2. Heard. Brian J. (2008) “Handbook of Fire arm and ballistics- Examining and Interpreting Forensic Evidence”, Wiley-Blackwell, 2nd Edition.
3. “Laboratory Procedural manual,” Physics Section, DFSL, Mumbai

Reference Books

1. Hatcher Jury & Weller (1987) “Firearm Investigation Identification and Evidence”, The University Book Agency, Allahabad.
2. Gunther & Gunther, (1935) “The Identification of Firearms”, Wouldies, New York.
3. Jauhri, M.(1980) “Monograph on Forensic Ballistics”, Govt. of India Publication, New Delhi.
4. Sharma,B.R.(2017) “Firearms in Criminal Investigation and Trails”, Universal law publishing,5th Edition
5. Warlow Tom (2021), “Firearm, the law, and Forensic Ballistics”, CRC Press Routledge, 3rd Edition
6. Laboratory Procedural Manual, Forensic Ballistics, DFS, New Delhi.
7. K. Kumar (2015) “Forensic ballistics in Criminal Justice”, Eastern Book Company
8. S. N. Gaur (2013) “Firearms and Forensic Ballistics”, Delhi Law House, Delhi
9. Footwear Impressions Evidence Detection, Recovery, and Examination Second Edition by William J. Bodziak CRC Press.
10. Criminalistics- An Introduction to Forensic Science By Richard Saferstein.
11. Measurement, Instrumentation and Experiment Design in Physics and Engineering By Michael Sayer and Abhaaiman Singh.
12. Laboratory Procedural Manual, Forensic Ballistics, DFS, New Delhi.
13. Building Materials By P. C. Varghese.
14. Trace Evidence By Max M. Houck.
15. Forensic Engineering Fundamentals By Harold Franck.
16. Fire arms in criminal investigation and trials By B R Sharma
17. Handbook of Fire arm and ballistics By Brian J Heard.
18. Fire Arms, Forensic Ballistics, Forensic Chemistry and Criminal Jurisprudence By S N Gaur et al.

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC52	Number of Hours/Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	FORENSIC TOXICOLOGY		

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

a. The Introduction to Forensic Toxicology, History, Scope and Branches.
b. The Pharmacology: Introduction, Principles, routes of administration.
c. The Analytical Procedures & Extraction of poisons.
d. The General Principles of Management
e. The route of administration of poison & Instrumental Techniques in Toxicology

UNIT I: Toxicology

Toxicology: Introduction to Forensic Toxicology, History, Scope and Branches.
Poisons: Definitions, laws on poisons, Nature, Classification (according to chemistry, action, motive) Common household poisons in India, Types of poisoning.
Toxicological analysis: Diagnosis of poisoning (Living and Dead): Signs and symptoms of poisoning- Acute and Chronic, PM Appearances, stomach contents, Sample collection and preservation of Viscera, blood, urine and other biological samples.

UNIT II: Pharmacology

Pharmacology: Introduction, Principles, routes of administration: Inhalation, Injection, Intramuscular-subcutaneous- intradermal, Dermal and other routes.
Pharmacokinetics: Introduction, Basic principles and Processes- Adsorption, Distribution, Localization, bio-transformation and Excretion.
Pharmacodynamics: Introduction, Basic principles, Types and mechanism of their actions in the body and Factors affecting the mechanism of their actions in the body.

UNIT III: Analytical Procedures & Extraction

Analytical Procedures - Extraction of the drug from the biological tissues, Purification and Qualitative and Quantitative detection of poisons of Metallic Poisons (Anions and Cations), Volatile poisons, Gaseous Poisons, Plant Poisons and Animal Poisons.
Extraction: Introduction, Principles and methods: Liquid-Liquid extraction, Solid Phase Extraction, Direct solvent extraction, Solid phase Micro-extraction, Accelerated Solvent Extraction. Pre-concentration and clean up procedure.

UNIT IV: General Principles of Management

General Principles of Management: Acute and Chronic Poisoning- Introduction, Immediate measures, Elimination of absorbed and unabsorbed poisons, symptomatic treatment and maintenance of vital functions. Antidotes: Introduction, Administration, Types, Mechanism of action.

UNIT V: Identifying route of administration of poison & Instrumental Techniques in Toxicology

Identifying route of administration of poison: Estimation of time and dose administered
Recovery and after care of patients- Poison Information/Control Centre
Instrumental Techniques in Toxicology: Overview of working, instrumentation of Spectroscopic, Chromatographic and Immunoassay methods.
Medico-legal aspect of toxicology: Significance of toxicological findings, Case histories

Text books

1. Curry A.S (1986)Analytical Methods in Human Toxicology, Part II, CRC Press Ohio
2. Krishnamurthy, R. (2011), Introduction to Forensic Science in Crime Investigation, Selective & Scientific Books, New Delhi.
3. Clark, E.G.C. (1986); Isolation and Identification of Drugs, Vol. I and Vol. II, Academic Press

Reference books

1. Working Procedure Manual - Toxicology, BPR&D Publication (2000)
2. Townsend Allen (Ed.)(2005), Encyclopedia of Analytical Science, 2nd Edition, Academic Press
3. Niesink RJM (1996), Toxicology- Principles and Applications, CRC Press
4. Turner Paul (1989)Recent Advances in Pharmacology & Toxicology, Churchill Livingstone, Elenburgh
5. Modi, Jaisingh P (2001); Textbook of Medical jurisprudence & Toxicology, M.M. Tripathi, Pub.
6. Dr. Reddy K.S. and Dr.Murty O.P. (2017) The essentials of Forensic Medicine and Toxicology, Jaypee-The Science Health Publishers

E-sources

1. www.sciencedirect.com
2. www.forensicsciencesimplified.org
3. www.youtube.com
4. www.efjs.springeropen.com
5. www.intechopen.com

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC53	Number of Hours/Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	DIGITAL & CYBER FORENSICS		

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

a. The Cyber Crime & Digital Evidence.
b. The Cyber forensic steps & Incident response process.
c. The Introduction to cryptography & Types of cryptographic algorithms.
d. The Forensic Analysis and Recovery.
e. Information Technology Act (IT Act 2000) & IPR.

Unit I: Cyber Forensics

Cyber Crime & Digital Evidence, cybercrime, conventional crime VS cybercrime, types of cybercrimes, precautions in cyberspace, electronic evidence, Digital Evidence, Digital Vs. Physical Evidence, Nature of digital evidence, Precautions while dealing with digital evidence.

Reasons for commission of cyber crime, Kinds of cyber crimes – cyber stalking; cyber pornography, Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism

Unit II: Incident Response

Introduction to Cyber forensics, Cyber forensic steps (Identification, Seizure, Acquisition, Authentication, and Presentation).

Incident response process, Computer security incident, Goals of incident response, Involvement in incident response process, Incident response methodology, Formulate a response strategy, Investigation of incident, Preparing for incident response, Overview of pre-incident preparation, Identifying risk after detection of an incident.

Unit III: Concealment Techniques

Introduction to cryptography, Types of cryptographic algorithms(Secret key cryptography, Public key cryptography, Hash function),Electronic signature, Steganography, Reversing the steganographic process, Cloaking techniques(Data hide and seek), Renaming files, Manipulating file system, Data hiding on NTFS with alternate data stream.

Unit IV: Forensic Analysis and Recovery

Introduction to open source analysis tools like Slueth kit Autopsy, OS Forensic, SoloImage Master, Disk Locker, FRAT (Forensic Registry Analysis Tool). Working with commercial tools like Encase and Forensic Tool Kit (FTK),

Data Recovery: Disk Geometry, Data Recovery Procedures, Recovery of Swap Files/Temporary Files/Cache Files, Recovery-Formatted Partition Recovery, Data Recovery Tools- open source and Commercial

Unit V: Information Technology Act (IT Act 2000) & IPR

Introduction, definitions of computer, computer network, electronic record, data, secure system, digital signature and certifying authority as per IT Act. Authentication of electronic records (Section-3), legal recognition of electronic records and digital signature (Section-4 and 5), Certifying Authorities and Controller, Offences as per IT Act (Section-65 to Section-78), Special provision in Indian Evidence Act regarding admissibility of electronic records (Section-65B of IEA, 1872).

Intellectual Property Rights: Meaning, Object, and Concept, Copyrights, Patent, Trademark, Domain name Registration.

Text Books

1. "Cybercrime: Investigating High- Technology Computer Crime" -Robert Moore 2nd Edition (25th September 2014), publisher Routledge.
2. "Incident Response and computer forensics", Kevin Mandia, Chris Prosise, Tata McGrawHill, 2006.
3. "Information Technology Act 2000" Bare Act, Law House,new delhi.

Reference books

1. Indian Patents Law and Procedure, D. P. Mittal, 2002, New Delhi, Allied Services (P) Ltd.1999
2. Patent Act, 1970.
3. Copyright Act, 1957.
4. Trade Mark Act, 1999.
5. Information Technology Act, 2000.
6. Computer Forensics: Principles and Practices: Linda Volonino, Reynaldo
7. Digital Evidence and Computer Crime, 2nd ed. **:**Eoghan Casey
8. Cyber Forensic a field manual for collecting, examining and preserving evidence of computer crimes by Albert J. Menendez
9. File System Forensic Analysis by Brian Carrier, Publisher: Addison-Wesley Professional
10. Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis) by Barkha & Ram
11. Cyber Crime – Dr. R C Mishra, Publisher: Authorspress
12. Handbook of Security, Cryptography & Digital Signature

E- Resources

1. www.Youtube.com. Nptelhrd Channel
2. www.tutorialspoint.com
3. www.Javatpoint.com
4. www.ocw.mit.edu.com
5. www.edx.org.com

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC54	Number of Hours/Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	APPLIED FORENSIC SCIENCE		

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

a. The Forensically relevant Databases
b. The historical perspective of secret writings
c. The counterfeiting examinations
d. The Forensic Speaker Identification
e. The Quality management and Expert testimony

Unit I: Forensically relevant Databases

STRBase, NCBI, PubMed, PubChem, ChemFinder™ Ultra academic | Sigma-Aldrich, CODIS, Forensic Information System for Handwriting (FISH), SICAR, AFIS, IBIS, Paint Data Query (PDQ), International Ink Library.

Unit II: Secret Writings

Historical perspective of secret writings: Invisible inks, miniature writings, Hieroglyphics, Ciphers, cryptograms, etc. Terminologies of secret writing and Types of cipher: Autokey, Cipher, Ciphertext, Code, Cryptanalysis, Cryptography, Decrypt, Encrypt, Key, Monoalphabetic substitution, Plaintext, Polyalphabetic substitution, Steganography, Transposition, Alphabetic substitution, Caesar Cipher, Alberti Discus, Trimethius Cipher table, Vignenere Cipher.

Unit III: Counterfeiting

Types: Currency, coins, Government Bonds, Documents, Consumer Goods, certificates, etc. Manufacture & Circulation of Government coins & currency. Minting Process of Genuine coins. Types of counterfeit coin processes and their detection: Cast process and struck process. Characteristics of Genuine currency notes of various countries. Plastic currency: Examination of credit cards and similar material, security features, holographic marks and other characteristics. Methods employed by counterfeiters and methods for detection of counterfeits. Advanced Printing technology: Offset lithography, thermography, Intaglio, Letter press and screen printing. Global scenario on growth of counterfeiting and relevant Provisions of Indian Penal Code, 1860. Numismatic forgery; over view.

Unit IV: Forensic Speaker Identification

Introduction and scope of forensic speaker identification, speaker identification vs. speaker verification. Human vocal tract, production and description of speech sound, acoustic characteristics of speech signal, introduction to phonetics and its importance in forensic speaker identification, International Phonetics Alphabets (IPA) and its symbolic representation.

Methods of speaker identification open and close set, sound spectrograph and its analysis, analysis of vowel and consonant sound. Voice evidence: collection of voice sample, examination and formation of opinion in terms of probability scale, presenting evidence in court of law in view of forensic speaker identification.

Recent advancements-Automated speaker identification: text dependent and text independent approach.

Unit V: Quality management and Expert testimony

Introduction and requirements of quality management systems for forensic science laboratories, Accreditation: introduction and objectives, organizations and certifying bodies (NABL, ILAC,

APLAC), Requirements as per ISO/IEC 17025:2005 or ISO 15189:2007 for accreditation of laboratory. Proficiency testing. Measurement of uncertainty. Internal audit and Laboratory Information Management Systems (LIMS). Expert testimony: definition of expert, writing report and presentation of evidence in court of law, examination-in-chief, cross-examination and re-examination.

Text Books

1. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E).
2. A Course in Phonetics, Sixth Edition, Peter Ladefoged and Keith Johnson, Wardsworth Cengage Learning, Boston, USA, 2011.

References Books

1. Specific Guidelines for Accreditation of Forensic Science Laboratories and Checklist for Assessors, National Accreditation Board for Testing and Calibration Laboratories (NABL 113).
2. Voice Identification: Theory and Legal Applications, Oscar Tosi, University Park Press, Baltimore, USA, 1979.
3. Forensic Speaker Identification, Philip Rose, CRC Press, USA, 2003.
4. Speech Acoustics and Phonetics, Gunar Fant, Springer Publishers, USA, 2004.
5. Speech Science Primer: Physiology, Acoustics, and Perception of Speech, Lawrence J. Raphael, Gloria J. Borden, Katherine S. Harris, Lippincott Williams & Wilkins, 2007.
6. Fundamentals of Speech Science, Donald J. Fucci and Norman J. Lass, Allyn and Bacon, 1997.
7. Mehta, M. K. : The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad. 1970.
8. Sulner, H.F. : Disputed Document, 1966 Oceana Publications Inc., New York.
9. Roy A Huber, A.M. Headrick; Handwriting Identification- Facts and Fundamental, CRC Press (1999)
10. Morris (2000) : Forensic Handwriting Identification (fundamental concepts and Principals)
11. Madinger J. and zalopany, A.R. (1999): Money Laundering CRC Press.
12. Manning, C.A (1999): Financial Investigations and Forensic Accounting CRC Press.
13. Harrison, W.R.: Suspect Documents & their Scientific Examination, 1966, Sweet & Maxwell Ltd., London.
14. Brewster, F, : Contested Documents and Forgeries, The Eastern Law House, Calcutta. 1932.
15. Ordway Hilton; Scientific Examination of Questioned Documents, Rev ED, Elsevier, NY (1982)
16. Mcmenamin, Gerald R; Forensic Linguistics- Advances in Forensic Stylistics, CRC Press, Washington, D.C. (2002)Ellen, D (1997) : The scientific examination of Documents, Methods and techniques. 2nd ed., Taylor & Francis Ltd.
17. Krishnamurthy, R., Introduction to Forensic Science in Crime Investigation, 2011, Selective & Scientific Books, New Delhi.
18. Constitution of India.
19. Indian Evidence Act, 1872.
20. Indian Penal Code, 1860.

E- Resources

1. https://strbase.nist.gov/
2. https://searchsecurity.techtarget.com/definition/Automated-Fingerprint-Identification System#:~:text=The%20Automated%20Fingerprint%20Identification%20System,(FBI)%20in%20criminal%20cases.
3. https://www.ncbi.nlm.nih.gov/
4. https://pubmed.ncbi.nlm.nih.gov/
5. https://pubchem.ncbi.nlm.nih.gov/

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC5P	Number of Hours/Cycle	5
Semester	V	Max. Marks	100
Part	III	Credit	3
CORE PRACTICAL			
Course Title	FORENSIC PHYSICS AND BALLISTICS & FORENSIC TOXICOLOGY		

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

a. The significance of toxicological studies in forensic science.
b. Practical demonstration on toxicological cases.
c. Demonstration activities on Forensic physics and ballistics.
d. The methods of identifying firearms.
e. Demonstration on footprint development & trace evidence analysis.
f. The classification of firearms and their firing mechanisms. b. c. The characteristics of ammunition

List of the Practicals:

FORENSIC PHYSICS AND BALLISTICS

1. Examination of Fire Arm according to Arms Act.
2. Dismantling and assembling of firearms.
3. Examination of fired bullet and identification by comparing with standard data sheet.
4. Examination of firing pin marks on bullet.
5. Examination of cartridge case for chamber, ejector, and extractor marks.
6. Comparison of bullet, cartridge, pallets by ballistic comparison microscope.
7. Barrel wash test.
8. Study of glass fractures due to impacts / heat.
9. Microscopic examination of paint sample.
10. Examination of plastic evidences under comparison microscope.
11. Determination of Trigger pulls of fire arm.
12. Photography of 3-D /2- D shoe/bear foot prints.
13. Casting of 3-D Shoeprint using plaster of Paris/dental stone in mud or clay.
14. Casting of 3-D print in snow using sulphur and other methods.
15. Identification of foot prints by crime lights and lifting by gelatin and adhesive lifting.
16. Enhancement of shoe/bear print by specialized lighting source along with photography.
17. Development of latent shoe /bear foot print using physical developer (powder method
18. Development and lifting of 2-D print by electrostatic methods.

List of the Practicals:

FORENSIC TOXICOLOGY

1. Extraction of substances from viscera by Liquid-Liquid Extraction method
2. Extraction of substances from viscera by solid phase extraction method
3. Identification of drugs (from the extract) by basic colour tests and TLC
4. Determination of a drug in any biological fluid by visible / UV spectrophotometry
5. Determination of a drug / pesticide in toxicological specimen by GC (Only Demonstration)
6. Determination of a drug / pesticide in toxicological specimen by HPLC (Only Demonstration)

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC5Q	Number of Hours/Cycle	5
Semester	V	Max. Marks	100
Part	III	Credit	3
CORE PRACTICAL			
Course Title	DIGITAL & CYBER FORENSICS AND APPLIED FORENSIC SCIENCE		

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

a. The Identification , Seizure ,Search of Digital media
b. Practical demonstration on digital evidences examination.
c. Examination of alteration, erasures, overwriting, additions and obliteration
d. Demonstration on Forensic Speaker Identification and Quality management and Expert testimony.
e. Demonstration activities on Applied Forensic Science.

List of the Practicals:
DIGITAL & CYBER FORENSICS

1. Identification , Seizure ,Search of Digital media
2. To Perform Digital Evidence Collection on crime scene
3. Demonstration of various Forensic tools like Partition magic, Encase FTK etc.
4. Data Recovery, Deleted File Recovery viewing small Disk.
5. Demonstration of Concealment Techniques (Cryptography PGP)
6. Demonstration of Concealment Techniques (Steganography)
7. Demonstration of other Concealment Techniques
8. Conversion of file formats(wave to mp3, avi, wmpetc)

List of the Practicals:
APPLIED FORENSIC SCIENCE

1. Demonstration on various forensically relevant Databases.
2. To study the indented and invisible writings.
3. Examination of Security Documents – Indian Bank Notes.
4. Examination of Travel Documents – Indian Passports and Visas
5. To record speech sample of a subject.
6. To convert analog speech signal into digital one.
7. To segregate voice sample of a particular subject.
8. To form clue words of given speech sample of a subject.
9. To describe speech sample in terms of IPA.
10. To perform auditory analysis on a given set of speakers.
11. Examination of alteration, erasures, overwriting, additions and obliteration
12. Decipherment of secret writings using VSC
13. Decoding cryptogram
14. Examination of rubber stamp and other mechanical impression
15. To calibrate glassware and instruments.
16. To evaluate the quality of given sample in reference to quality assurance.
17. To re-evaluate (proficiency testing) a sample as per NABL guidelines.
18. To estimate uncertainty in measurement.

Programme	**B. Sc Forensic Science**	**Programme Code**	**19UFS**
Course Code	**19UFSE51**	**Number of Hours/Cycle**	**4**
Semester	**V**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
CORE ELECTIVE			
Course Title	**FORENSIC RESEARCH METHODOLOGY**		

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

a. Statistical methods- Basic definitions and applications.
b. Various Measures of central tendency.
c. Tests of significance.
d. Research methodology & Meaning of research in Forensic Science.
e. Writing and presentation of research work.

Unit I: Statistical methods

Statistical methods: Basic definitions and applications. Sampling: Representative sample, sample size, sampling bias and sampling techniques. Data collection and presentation: Types of data, methods of collection of primary and secondary data. Methods of data presentation-graphical representation by histogram, polygon, ogive curves and pie diagram

Unit II: Measures of central tendency

Measures of central tendency: Mean, Median, Mode; Measures of variability: standard deviations, standard error, range, mean deviation and coefficient of variation. ANOVA.

Unit III: Tests of significance

Tests of significance: Small sample test (Chi-square, t test, and F test), large sample test (Z test) and standard error. Introduction to probability theory and distributions, (concept without deviation) binomial, poison and normal (only definitions and problems)

Unit IV: Research methodology

Research methodology: Meaning of research in Forensic Science; Process of research; Identification and criteria of selecting a research problem (Hypothesis); Formulation of objectives; Research plan and its components; Methods of research and difficulties in research; Research proposal and experimental design: Key elements- Objective, Introduction, design or rationale of work, Guidelines for design of experiments, material and methods, designing experiments, compilation and documentation of data; Major organizations and laboratories related to Forensic Science in India. A brief idea about government research agencies such as DBT, DST, ICMR, CSIR, UGC, BPR&D, DRDO etc.

Unit V: Writing and presentation

Writing and presentation: Format of research paper and report writing, Procedure of Reference Citation; Significance of writing research papers and review articles; Major Scientific publishers; Impact factor and citation index; Ethics and scientific conduct, Ethics in human and animal studies; Intellectual Property right and Plagiarism; Effective presentation of research findings.

Text Books

1. Statistics in biology, (1967) Vol. 1: Bliss, C.I.K. McGraw Hill, New York.
2. Practical Statistics for experimental biologist (1985): Ward law, A.C.

Reference Books

1. Statistical Methods in Biology (2000): Bailey, N.T. J. English Univ. Press.
2. Biostatistics - 7th Edition : Daniel
3. Fundamental of Biostatistics : Khan
4. Bio-statistical Methods : Lachin
5. Statistics for Biologist (1974):Campbell R.C. Cambridge
6. Research Methodology Tools And Techniques : H.C Purohit
7. Research Methodology: An Introduction : Wayne Dean Goddard, Stuart Melville
8. Research Methodology in the Medical and Biological Sciences: Petter Laake (Author)
9. Haakon Breien Benestad (Author) Bjorn Reino Olsen (Editor)
10. Research Methodology For Biological Science : Gurumani N Gurumani
11. Research Methodology- G.R. Basotia and K.K. Sharma.
12. Research Methodology- C.H. Chaudhary, RBSA Publication
13. Research Methodology: An Introduction - Wayne Goddard & Stuart Melville
14. Research Methodology - Ranjit Kumar
15. Research Methodology: Methods & Techniques - Kothari, C.R

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSE52	Number of Hours/Cycle	4
Semester	V	Max. Marks	100
Part	III	Credit	4
CORE ELECTIVE			
Course Title	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: ECONOMIC OFFENCES

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

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

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

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

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

Text Books

4. R.V. Clarke, Situational Crime Prevention: Successful Case Studies, 2nd Edition, Criminal Justice Press, New York (1997).
5. S.P. Green, Lying, Cheating and Stealing: A Moral Theory of White Collar Crime, Oxford University Press, Oxford (2006).

Reference Books

1. G. Geis, R. Meier, L. Salinger (Eds.), White-Collar Crime: Classic & Contemporary Views, Free Press, New York (1995).
2. J. Reiman, The Rich get Richer and the Poor get Prison, Allyn & Bacon, Boston (1998).
3. Indian Audit and Accounts department, Audit of Fraud, Fraud Detection and Forensic Audit, 2007.
4. State Crime Branch, Haryana, Investigation of Economic Offences

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSE61	Number of Hours/Cycle	3
Semester	VI	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	FORENSIC ANTHROPOLOGY AND ODONTOLOGY		

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

a. Introduction to Forensic Anthropology:
b. Definition, History, Scope, objectives and development.
c. Determination of race, age, sex, stature
d. Introduction to anthropometric techniques
e. The Forensic Odontology: Introduction Structure and types of teeth.
f. Teeth-marks and bitemarks

Unit I: Introduction to Forensic Anthropology

Introduction to Forensic Anthropology: Definition, History, Scope, objectives and development. Identification- living or dead, absolute identification, partial identification. Corpus Deliciti. Role of forensic anthropologist: Crimes and Mass disasters-natural (Tsunami, landslides, earthquakes, cyclone, typhoon, hurricane, floods) and man-made disasters (terrorist attacks, genocide, fires and explosions, aviation and rail accidents), Scene documentation, Collection of remains, Procurement of Ante Mortem records.

Unit II: Human skeleton

Human skeleton, comparative skeletal anatomy of human and non-human. Determination of race, age, sex, stature- Identification of data by skeleton: skull, sutures, mandible, pelvis, sacrum, long bones and external examination. Identification Indices. Ossification centers and suture enclosures.

Unit III: Introduction to anthropometric techniques

Introduction to anthropometric techniques- Portrait Parle/ Bertillon system. Tools, Instruments and Importance of Somatoscopy, Somatometry, Osteometry and Craniometry in determination of age and sex.

Advanced techniques- Photo fit/ Identi Kit System and tissue depth analysis for reconstruction of various facial features. Cranio- Facial Super Imposition Techniques: Photographic Super Imposition, Video-Superimposition, Roentgenographic Superimposition.

Genetic and Congenital Anomalies: Causes, Types, Identification and their Forensic Significance.

Unit IV: Forensic Odontology

Forensic Odontology: Introduction Structure and types of teeth (Deciduous, permanent, successional, superadded). Dentition and dental formula.

Dental charting (Zsigmondy system, Palmer system, Cunningham's notation, FDI notation). Determination of age, sex and race- identification of data by teeth: Eruption and calcification of deciduous and permanent teeth, appearance and racial differences.

Unit V: Teeth-marks and bite marks

Teeth-marks and bite marks- Appearance of human bite-mark, types of bite-marks, differential diagnosis, collection of bite-mark evidences: non-invasive Forensic dental photography (alternate light imaging, fluorescence imagining technique, UV, IR) & invasive techniques.

Dental diseases.

Text books

1. Beals, R.L. and Hozier, H. (1985), An Introduction to Anthropology, Macmillan, New Delhi
2. Singh, I.P. and Bhasin M. K. (1968), Anthropometery, Kamla-Raj Publications, Delhi.

Reference books

1. David R. Senn and Paul G. Stimson (2nd Edition) (1999), Forensic Dentisty, CRC Press, LLC.
2. John. G Clement and David. L. Ranso (1998), Craniofacial Identification in forensic Medicine, Oxiford University, Press.
3. Hooton, E.A. (1946), Up from the Ape, Macmillan, New York.
4. Steward T.D. (1978), Essentials of Forensic Anthropology, Charles C. Thomas Publisher, Limited, 1979.
5. Mahajan A.& Nath S,Application areas of anthropology,Reliance Publishing
6. Pickering R. & Bachman D, The use of Forensic Anthropology,CRC Press.
7. Shukla B.R.K & Rastogi S.P.P., Physical Anthropology.

E-Resources

1. www.slideshare.net
2. www.youtube.com
3. www.docs.google.com
4. www.link.springer.com

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC62	Number of Hours/Cycle	4
Semester	VI	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	FORENSIC MEDICINE		

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

a. The importance of Forensic Medicine.
b. The Human Anatomy and Physiology: Organizational Levels of human body.
c. The Taphonomy: Introduction-Definition, types, modes and stages of death.
d. The Definition, Nature and extent of wounds, Classification.
e. Thermal Injuries- Hypothermia, Burns, Scalds, Electrical, Lightning

Unit I: Human Anatomy and Physiology

Human Anatomy and Physiology: Organizational Levels of human body.
Cardiovascular system: Structure and Functions of heart, Arterial & Venous system.
Digestive system: Alimentary Canal, Process of Digestion and Absorption of Food.
Respiratory system: Structure, Mechanism and Regulation of Respiration.
Nervous system: Structure and functions of neuron, Transmission of nerve impulse, Central and Peripheral Nervous systems and their functions.
Endocrine System: Characteristics of hormones, Endocrine glands and their Hormones.
Urinogenital system: Structure and Functions of kidneys, Formation and composition of urine, Male and female reproductive systems and their functions.

Unit II: Forensic Medicine

Forensic Medicine: Historical perspectives and Scope, Global and Indian scenario. Legal aspects of Forensic Medicine: Inquest, Exhumation, Dying Declaration, Dying Deposition, Medical Certificates, Medical Report, Summons, oaths, Post Mortem and Ante Mortem records.

Unit III: Taphonomy

Taphonomy: Introduction-Definition, types, modes and stages of death (somatic death and molecular death) Signs and Changes after death: Immediate Changes, Early changes (Algor mortis, Livor Mortis, Rigor Mortis, PM Caloricity) and Late Changes- External and Internal Changes (Putrefaction, Adipocere and Mummification)
Changes in Blood, Cerebrospinal Fluid, Vitreous Humor.
Medico legal aspects of death.

Unit IV: Injuries: Part 1

Injuries: Part 1 Definition, Nature and extent of wounds, Classification, Types- Mechanical (Abrasions, Contusions, Lacerations, Incised, Stabs, Chop, Firearm wounds, Regional wounds- Head Injuries, Skull Fractures, Cerebral Injuries And concerning Medico-legal Aspects.

Unit V: Injuries: Part 2

Thermal Injuries- Hypothermia, Burns, Scalds, Electrical, Lightning. Mechanical Asphyxia: Hanging, Strangulation, Throttling, Suffocation, Smothering, Choking and Concerned Medico-legal Aspects.

Text Books:

1. Modi J. P. (2001) Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Publication.
2. Tortora GJ and Derrickson B (2017) Tortora's Principles of Anatomy and Physiology, Wiley Publications

Reference books

1. Pillay V.V. (2001) Handbook of Forensic Medicine and Toxicology, 12th ed., Paras Publications.
2. JamesP.J. (2005) Encyclopedia of Forensic and Legal Medicine, Elsevier.
3. SmithD.G.V: A Manual of Forensic Entomology and Death: A Procedural Guide, Joyce's Publications (1990)
4. Aggrawal A. Textbook of Forensic Medicine and Toxicology, Avichal Publishing Company.
5. Guharaj P. V., Chandran M. R. (2006)Forensic Medicine: 2nd Edition, Universities Press(India) Pvt. Ltd., Hyderabad
6. Parikh C.K, (1999) Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology, CBS Publishers & Distributors Pvt. Ltd., India.
7. Waugh A. and Grant A. (2018) Ross and Wilson Anatomy and Physiology in Health and Illness, 12th (International) Edition

E-Sources

1. www.slideshare.com
2. www.sciencedirect.com
3. www.youtube.com
4. www.acpjournals.com
5. www.medicalppt.blogspot.com

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC63	Number of Hours/Cycle	4
Semester	VI	Max. Marks	100
Part	III	Credit	3
CORE			
Course Title	FORENSIC DNA TYPING AND MOLECULAR TECHNIQUES		

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

a. Forensic Serology: Introduction, History, Development and Significance.
b. Introduction to human genetics: Overview of Physical basis of hereditary.
c. DNA extraction and Quantification methods.
d. DNA Typing- History, Definition Development and Forensic Significance.
e. Non-human DNA testing & Wildlife Conservation Techniques.

Unit I: Forensic Serology

Forensic Serology: Introduction, History, Development and Significance. Blood: Nature, types of blood encountered on a crime scene, Blood stain pattern interpretation, and age.

Biological Evidences encountered on a crime scene: Collection, Preservation and examination (Presumptive, Confirmatory and Microscopic tests) of blood, semen, saliva, urine, faeces, milk samples.

Human blood group systems: History, Biochemistry and Genetics of ABO, Rh, Mn and other forensically significant blood group systems.

Methods of ABO blood grouping (absorption-inhibition, mixed agglutination and absorption elution) from blood stains and other body fluids/stains. Secretors and non-secretors. Determination of origin of species by immunological methods. Serum Protein polymorphism. Blood-related disorders (Hemophilia, thalessemia, sickle cell anemia) Forensic Importance of Blood Groups. HLA Typing.

Unit II: Introduction to human genetics

Introduction to human genetics: Overview of Physical basis of hereditary, Alleles, Population genetics, human genetic variations, human chromosomes, Normal chromosome set, Chromosomal anomalies, Genetic markers and their Forensic Significance.

Structure of DNA (A, B, Z forms of DNA), Structure of chromatin, centromere, telomere, nucleosome, genome organization.

Mutations: Definitions, Types, and causes and related disorders.

Unit III: DNA extraction and Quantification methods

DNA extraction and Quantification methods: Organic (Phenol-chloroform) extraction, Chelex extraction, FTA paper, Solid phase DNA extraction methods: Qiagen extraction Chemistry and kits, DNA IQ (Identification & quantification), Prep Filer, Differential extraction.

Introduction to electrophoresis techniques.

DNA Amplification: Polymerase Chain Reaction (PCR)-Types, Instrumentation, working. DNA Quantification and DNA Sequencing: Overview.

Unit IV: DNA Typing

DNA Typing- History, Definition Development and Forensic Significance.

STR- Discovery, Structure, Development, STR markers, STR Polymorphisms and related terminologies: Stutter peaks, split peaks, pull up, template DNA, overloaded profiles, low template DNA typing, peak balance, mixtures, degraded DNA, PCR inhibition. RFLP, Blotting techniques.

Unit V: Non-human DNA testing & Wildlife Conservation Techniques

Non-human DNA testing: Sources, domestic animal DNA Testing (cat DNA, dog DNA).

Species identification: Wildlife DNA testing using genetic markers (mtDNA Cytochrome b gene, mtDNA 12S rRNA gene, mtDNA COI gene), geographic origin identification.

Wildlife Conservation Techniques: Biosensors, use of remote sensing techniques for population study of endangered plants and animal species.
DNA banks for endangered animals and DNA database (Types and limitations).

Text books

1. Butler J M, Advanced Topics in Forensic DNA Typing Methodology.
2. Pierce B, Genetics a conceptual approach: Fourth Edition
3. Dr. Krishnamurthy R., Forensic Biology

Reference books

1. Goodwin W, Wiley J & Sons Ltd. (2007), An Introduction to Forensic Genetics
2. Richard Li, Forensic Biology
3. Waldman A.S., Genetic Recombination
4. Gunn A, Essential Forensic Biology
5. Giblett, Eloise R (1969), Genetic Markers in Human Blood, Blackwell Scientific Publications
6. Boorman, DoddB, Lincoln PB, Blood grouping techniques

E-sources

1. www.sciencedirect.com
2. www.youtube.com
3. www.ncbi.nlm.nih.gov
4. www.books.google.co.in
5. www.epgp.inflibnet.ac.in

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code	19UFSC6P	Number of Hours/Cycle	5
Semester	VI	Max. Marks	100
Part	III	Credit	3
CORE PRACTICAL			
Course Title	FORENSIC ANTHROPOLOGY AND ODONTOLOGY & FORENSIC MEDICINE		

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

a. Practical knowledge Forensic Anthropology and Odontology.
b. Hands-on about Forensic Anthropology and Odontology.
c. Bite mark analysis- comparison and examination.
d. Importance of Forensic Medicine.
e. Postmortem findings and their Forensic Significances.
f. Demonstrations on Forensic Medicine.

List of the Practical's:
FORENSIC ANTHROPOLOGY AND ODONTOLOGY

1. Identification of Human Skeleton
2. To perform Exhumation for reinvestigation
3. Age estimation from skull sutures, and sacrum
4. Age estimation from teeth
5. Sex identification from skull
6. Sex identification from pelvis
7. Bite mark analysis- comparison and examination
8. Osteometric measurements on Long bones.
9. Craniometric measurements on skull.
10. To perform Somatometric measurement on living

List of the Practical's:
FORENSIC MEDICINE

1. To perform pre-morgue analysis of a cadaver.
2. To study post-mortem findings of a cadaver.
3. To study modes and stages of death.
4. To study the various types of injuries.
5. Case study Preparation.
6. Post-mortem visit.
7. Mortuary Visit.
8. Demonstration on Medical Report.
9. To study Post Mortem records.
10. To study Ante Mortem records.

Programme	**B. Sc Forensic Science**	**Programme Code**	**19UFS**
Course Code	**19UFSC6Q**	**Number of Hours/Cycle**	**5**
Semester	**VI**	**Max. Marks**	**100**
Part	**III**	**Credit**	**3**
CORE PRACTICAL			
Course Title	**FORENSIC DNA TYPING AND MOLECULAR TECHNIQUES**		

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

a. The importance of Forensic DNA Typing.
b. The importance of Molecular Techniques.
c. DNA Extraction with Organic (Phenol-chloroform) extraction.
d. Demonstration Forensic DNA Typing and Molecular Techniques.
e. Blood stain pattern interpretation
f. Biological Evidences encountered on a crime scene.

List of the Practical's:

FORENSIC DNA TYPING AND MOLECULAR TECHNIQUES

1. To perform chemical tests for different bodily Fluids- Blood, Urine and Saliva
2. To perform microscopic tests for blood
3. To perform chemical tests for bodily fluids- Semen, Vaginal discharge and Milk samples
4. To perform DNA Extraction with Organic (Phenol-chloroform) extraction
5. To perform DNA Extraction with FTA paper
6. To perform Polymerase Chain Reaction of the extracted DNA
7. To study Biological Evidences encountered on a crime scene.
8. Working with vertical and horizontal electrophoretic apparatus
9. Microscopic comparison of Human and animal blood.
10. DNA extraction from bacteria/ yeast/ human origin
11. DNA / RNA quantification by UV-Vis spectrophotometer / DPA / Orcinol

Programme	**B. Sc Forensic Science**	**Programme Code**	**19UFS**
Course Code	**19UFSS41**	**Number of Hours/Cycle**	**5**
Semester	**VI**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
CORE			
Course Title	**DISSERTATION**		

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. Concerned department shall provide all required infrastructure to carry out dissertation work. The format for dissertation report will be similar to the research thesis style; incorporating chapters on: Introduction, Review of Literature, Materials and Methods, Results and Discussion and References / Bibliography.

The dissertation will be submitted in a typewritten and bound form. Copy of each dissertation will be DEPARTMENT OF FORENSIC SCIENCE; G. T. N Arts COLEGE (Autonomous), Dindigul and the centre will store it permanently. Project work on will be based on - Forensically significant and need based problems in the area of Forensic Science.

Programme	**B. Sc Forensic Science**	**Programme Code**	**19UFS**
Course Code	**19UFSE61**	**Number of Hours/Cycle**	**4**
Semester	**VI**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
CORE ELECTIVE			
Course Title	**VICTIMOLOGY**		

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

a. The Meaning and definition of Victimology.
b. Various Patterns of Victimization.
c. National and International Perspectives for Victims of Crime.
d. Victim Compensation.
e. Victim Assistance during Investigation and Trial.

Unit I: Introduction

Meaning and definition of Victimology, Historical Development of Victimology in India, Key Concepts in Victimology, Nature of Victimology, Scope of Victimology in India, Role of Victimologists.

Unit II: Patterns of Victimization

Victims of Crime, Abuse of Power, Victims of Abuse of Power, Types of Victims, Women Victims, Children Victims, and Victims of Group Violence.

Unit III: National and International Perspectives for Victims of Crime

U. N. Declaration on Basic Principles of Justice for Victims of Crime and Abuse of Power (1985), South Asian Society for Criminology and Victimology, World Society of Victimology, Indian Society of Victimology, National Policies for Victims of Crime.

Unit IV: Victim Compensation

Compensation – Meaning and Definition, Key Concepts, Development of Compensation in India, Case Laws relating to compensation, Restitution, Ex- Gratia Compensation, Victim Compensation – Concepts, National and International perspectives.

Unit V: Victim Assistance

Victim Assistance during Investigation and Trial, Legal Aid to Victims of Crime, National Organization for Victim Assistance (NOVA), Victim Witness Assistance (VWA), Sensitization programs.

Text Books

1. Singh Makkar, S.P, 1993, Global perspectives in Victimology, ABC Publications, Jalandar.
2. Rajan, V.N, 1981, Victimology in India: An Introductory Study, Allied Publishers, New Delhi
3. Devasia, V.V., 192, Criminology, Victim logy and Corrections, Ashish Publishing House, New Delhi
4. Schur, Edwin, M, 1965, Crimes without victims, Prentice Hall. Inc.

Reference Books

1. Sparks, Richard F, Genn, Hezel G, Dodd, David. J, 197, Surveying victims, John Wiley and Sons' Ltd.
2. Geiser, Robert. L, 1979, Hidden Victims, Beacon Press, Boston.
3. Parsonage, William H, 1979, Perspectives on Victimology, Sage Publications
4. Shapland, Joanna,Willmore Jon, Duff Peter, 1985, Gower Publishing Company Ltd.

5. Mc Donald, William F, 1976, Criminal Justice and the Victim, Sage Publications, London.
6. Drapkin Israel and Viano, Emilio, 1973, Victimology: A new focus Lexington Books.
7. Walklate, Sandra, 1989, Victim logy: The victim and the criminal justice process, Unwin Hyman Ltd.

Programme	**B. Sc Forensic Science**	**Programme Code**	**19UFS**
Course Code	**19UFSE62**	**Number of Hours/Cycle**	**4**
Semester	**VI**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
CORE ELECTIVE			
Course Title	**NEW EDGE FORENSICS**		

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

a. The Fundamental Aspects of Biometrics.
b. Various Types of Biometrics.
c. Introduction to multimedia, Multimedia components.
d. History, Definition and disciplines of Forensic linguistics.
e. Challenges to digital Forensic evidences.

UNIT I: Fundamental Aspects of Biometrics

Introduction to biometrics, various types of biometric methods, Characteristics of biometrics, Advantages and disadvantages, General biometric system (Identification and Verification), General architecture comparison of different biometric technologies, difficulties in implementation of biometrics, Applications of biometrics.

UNIT II: Types of Biometrics

Physiological Biometrics -Fingerprints, palm prints, iris, retina, geometry of hand and face, Behavioral Biometrics-Handwriting, signatures, keystrokes, gait and voice. Characteristics of biometrics, Advantages and disadvantages, General biometric system (Identification and Verification), General architecture comparison of different biometric technologies, difficulties in implementation of biometrics, Applications of biometrics.

UNIT III: Multimedia Forensics

Introduction to multimedia, Multimedia components (text, graphics, animation, audio, video) Multimedia Applications. Various recording devices and its characteristics, concepts of noise and construction of filter for their removal, nature and types of forgery related to multimedia and it's Authentication. Investigation of crime scene in reference to multimedia evidences.

UNIT IV: Forensic linguistics

History, Definition and disciplines of Forensic linguistics, types of Forensic text, History of Computational Linguistics, Stylistic Profiling, Intuitive and Statistical method, Individual and Language use, language of legal processes, text analysis, phonetics Language acquisition, Universal education and language Homogeneity, Authorship profiling, Veracity of Language, Forensic text type.

UNIT V: Mobile Forensics

Mobile Forensics: The Cell Phone, PDA and GPS Devices, Mobile Edit, CDR (call data Recorder).Challenges to digital forensic evidences-Basics, Identifying evidence, collection of evidence, Seizure error, Transport of evidence- Possession and chain of custody, Searching and seizure of computer related evidences. Storage of evidences, evidence Analysis. Processing of evidences and preparations of report.

Text Books

1. Handbook of Biometrics by A.K. Jain
2. Multimedia Forensics and Security, Chang-Tsun Li, Taylor and Francis, 2013
3. Forensic Speaker Identification, Philip Rose, CRC Press, USA, 2003.

Reference books

1. Voice Identification: Theory and Legal Applications, Oscar Tosi, University Park Press, Baltimore, USA, 1979
2. A Course in Phonetics, Sixth Edition, Peter Ladefoged and Keith Johnson,Wardsworth Cengage Learning, Boston, USA, 2011.
3. Speech Acoustics and Phonetics, Gunar Fant, Springer Publishers, USA, 2004.
4. Handbook of Image and Video Processing, Alan C. Bovik, Elsevier Publishers, 2005.
5. Overview of Audio Forensics, Robert C. Maher, Springer, 2010.
6. Gerald R. McMenamin (2002): Forensic Linguistics: Advances in Forensic Stylistics.
7. John Gibbons, Maria Teresa Turell (2008): Dimensions of forensic linguistics –Gerald R. McMenamin – 1993: Forensic stylistics.
8. John Olsson - 2004 Forensic Linguistics: An Introduction to Language, Crime and the Law.
9. Malcom Coulthard - 2007 An introduction to Forensic linguistics: language in evidence.
10. Alan Davies - 2007 An introduction to applied linguistics: from practice to theory.
11. Henry G. Widdowson, Guy Cook, Barbara Seidlhofer – 1995.
12. Principle and Practice in Applied Linguistics: Studies in Honour Lawrence M. Solan, Peter M. Tiersma - 2010 Speaking of Crime: The Language of Criminal Justice.

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code		Number of Hours/Cycle	2
Semester	V	Max. Marks	100
Part	IV	Credit	2
Value Added Course			
Course Title	FORENSIC PROFESSIONAL ETHICS		

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

a. Fundamental concepts of ethics.
b. Morals, areas of different ethics.
c. Global issues concerning forensic ethics.
d. Other relevant aspects of responsibilities of Forensic Scientists for a crime-free society
e. Global issues.

Unit I: Human Values

Human values, morals and self-discipline for shaping various elements- Integrity, Work ethics, Honesty, Courage, Empathy and Personality.

Unit II: Forensic Ethics

Introduction to Forensic ethics- Meaning, Types, Areas concerning ethics, need and significance.

Unit III: Forensic Science for a crime-free society

Introduction to Forensic Science- Role of Forensic Scientists, Significance of evidences, Crime scene investigation, prevention and solving of crime, forensic awareness.

Unit IV: Safety and Responsibilities

Safety measures to be followed by Forensic Scientists- In lab, on Crime scenes, and courtroom. Responsibilities and risk management for mass disaster scenario.

Unit V: Global issues

Forensic ethics worldwide- Computer ethics in cybercrimes. Identity theft cases.

Text Book

1. Gamble, T.K. & Gamble, M (2002) Communication Works, McGraw Hill, New York

Reference Books

1. Morreale, Spitzberg& Barge (2001) Human Communication: Motivation, Knowledge and Skills, Thomson Learning, Wadsworth.
2. Narula, Uma, (2006) Dynamics of Mass Communication: Models, Perspective, Strategies, Atlantic.
3. Life Skills training Manual, RGNIYD, Govt. of India.

Programme	B. Sc Forensic Science	Programme Code	19UFS
Course Code		Number of Hours/Cycle	2
Semester	VI	Max. Marks	100
Part	IV	Credit	2
Value Added Course			
Course Title	ENTREPRENEURSHIP & INNOVATION		

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

a. Concepts of Entrepreneurship.
b. Information Support System.
c. Business Plan.
d. Innovation & Motivation.
e. Patent, Copy Right & Trade Mark Laws.

Unit I: Introduction to Concepts of Entrepreneurship

Introduction to Concepts of Entrepreneurship: Scope of Entrepreneurship, Definitions of Entrepreneurship and entrepreneur, Characteristics of an Entrepreneur, Entrepreneurial Development models and Theories. Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship.

Unit II: Information Support System

Information Support System: Government schemes, NGO, state/central motivation Policy, CED, IDI, EDI and MSME.

Unit III: Business Plan

Business Plan: Project Report, Information related to product, cost elements, product process, Plant & machinery, Finance sources, secured/unsecured loan, Logistics aspects.

Unit IV: Innovation & Motivation

Innovation & Motivation: Concept of Idea, Motivation Factors, Brain Storming, Incentives, Product innovation, Value potential, R & D importance, customer choice, motivational theory.

Unit V: Patent, Copy Right & Trade Mark Laws

Patent, Copy Right & Trade Mark Laws: Patent Acts for Design, IC circuit layout, Literacy, Art, copy right, Trade mark, PCT, Patent definition, patentable & non-patentable, merits & de-merits, Patent procedure, Monitoring system, Govt. agencies, patent norms.

Text Book

1. Peter F. Drucker (2006), "Innovation and Entrepreneurship", Harper Business; Reprint edition.

Reference Books

1. Eric Ries (2011), "The Lean Startup: How Constant Innovation Creates Radically Successful Businesses", Penguin UK, United Kingdom.
2. Pankaj Goyal (2017), "Before You Start Up: How to Prepare to Make Your Startup Dream a Reality", Fingerprint! Publishing, India.
3. Hayden A. Ellis (2014), "Innovation and Entrepreneurship: Practice and Principles", Createspace Independent Pub.
4. V K Ahuja (2017), "Law Relating to Intellectual Property Rights", Lexis Nexis; Third edition, India.