DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS & SCIENCE FOR WOMEN (A), PERAMBALUR

Affiliated to Bharathidasan University, Tiruchirappalli (Nationally Re-accredited with 'A' grade by NAAC & an ISO 9001:2008 Certified Institution)

B.Sc. Forensic Science Program – COURSE STRUCTURE UNDER CBCS

(For candidates admitted from the academic year 2021 – 22 onwards)

Eligibility: Pass in 10+2 (With Biology)

Year & sem	Part	Course	Course code	Title of the Paper	Periods /week	Credits	Marks			Exam Hours
							IA	CE	Total	
I year & I semester	I	Language Course I	21U1LT1/ 21U1LH1/ 21U1LF1/ 21U1LS1/ 21U1LA1	Cheyyul (Ikkalaillakkiyam), Sirukadhai, Illakiyavaralaru/ Hindi/ French/ Sanskrit/ Arabic	6	3	25	75	100	3
	II	English Language Course I	21U1EL1	English for Communication –I	6	3	25	75	100	3
	III	Core Course I	21UFS1C1	General Forensic Science & Crime Scene Management	6	6	25	75	100	3
		Core Course II	21UFS1C2P	Crime Scene ManagementLab	4	3	40	60	100	3
		Allied Course I	21UFS1A1	Physics	3	3	25	75	100	3
		Allied Course II	21UFS1A2P	Physics and Biology Lab	3	-	-	-	-	-
	IV	EVS	21U1EVS	Environmental studies	2	2	25	75	100	3
Total					**30**	**20**	**165**	**435**	**600**	
I year & II semester	I	Language Course II	21U2LT2/ 21U2LH2/ 21U2LF2/ 21U2LS2/ 21U2LA2	Cheyyul (Idaikalaillakkiyam), Pudhinam/ Hindi/ French/Sanskrit/ Arabic	6	3	25	75	100	3
	II	English Language Course II	21U2EL2	English for Communication –II	6	3	25	75	100	3
	III	Core Course III	21UFS2C3	Crime and Criminal JusticeSystem	5	4	25	75	100	3
		Core Course IV	21UFS2C4	Introduction to Psychology	5	5	25	75	100	3

		Allied Course II	21UFS1A2P	Physics and Biology Lab	3	3	40	60	100	3
		Allied Course III	21UFS2A3	Biology	3	3	25	75	100	3
	IV	Value Education	21U2VED	Value Education	2	2	25	75	100	3
Total					**30**	**23**	**190**	**510**	**700**	

II year & III semester	I	Language Course III	21U3LT3/ 21U3LH3/ 21U3LF3/ 21U3LS3/ 21U3LA3	Cheyyuil (Kappiyangal, Urainadai, Aluval Murai, Madagal, Ilakiya Varalaru)/ Hindi/ French/ Sanskrit/ Arabic	6	3	25	75	100	3
	II	English Language Course III	21U3EL3	English through literature	6	3	25	75	100	3
	III	Core Course V	21UFS3C5	Fingerprints and Questioned Documents	6	6	25	75	100	3
		Core Course VI	21UFS3C6P	Fingerprints and Questioned Documents Lab	4	3	40	60	100	3
		Allied Course IV	21UFS3A4	Chemistry	3	3	25	75	100	3
		Allied Course V	21UFS3A5P	Basic Chemistry Lab	3	-	-	-	-	-
	IV	NonMajor Elective I	21UFS3N1A	Criminalistics	2	2	25	75	100	3
			21UFS3N1B	Questioned Document Analysis						
			21UFS3N1C	Fingerprint Science						
Total					**30**	**20**	**165**	**435**	**600**	
II year & IV semester	I	Language	21U4LT4/ 21U4LH4/ 21U4LF4/ 21U4LS4/ 21U4LA4	Cheyyuil (Sanga Ilakiyam Neethi Ilakiyam, Nadagam, Ilakiya Varalaru, Pothu Katurai)/ Hindi/ French/ Sanskrit/ Arabic	6	3	25	75	100	3
	II	English	21U4EL4	English for Competitive Examination	6	3	25	75	100	3
	III	Core Course VII	21UFS4C7	Forensic Physics and Ballistics	5	5	25	75	100	3
		Core Course VIII	21UFS4C8	Instrumentation	5	5	25	75	100	3
		Allied Course V	21UFS3A5P	Basic Chemistry Lab	2	3	40	60	100	3
		Allied Course VI	21UFS4A6	Basics of Computer	4	3	25	75	100	3

	IV	NonMajor Elective II	21UFS3N2A	Handwriting Analysis	2	2	25	75	100	3
			21UFS3N2B	Investigation of Scene of Occurrence						
			21UFS3N2C	Digital Forensics						
Total					**30**	**24**	**190**	**510**	**700**	

III year & V semester	III	Core Course IX	21UFS5C9	Forensic Biology and Serology	6	6	25	75	100	3
		Core Course X	21UFS5C10	Forensic Biology and Serology Lab	4	3	40	60	100	3
		Core Course XI	21UFS5C11	Cyber Crime and Cyber Law	6	5	25	75	100	3
		Core Course XII	21UFS5C12	Cyber Forensics Lab	4	4	40	60	100	3
		Major Based Elective I	21UFS5M1A	Forensic Anthropology	4	4	25	75	100	3
			21UFS5M1B	DNA Forensics						
			21UFS5M1C	Accident Investigation						
	IV	Skill Based Elective I	21UFS5S1A	Forensic Photography	2	2	25	75	100	3
			21UFS5S1B	Biometry						
			21UFS5S1C	Speaker Recognition & Audio and Video Analysis						
		Skill Based Elective II	21UFS5S2A	Tools and Impression analysis	2	2	25	75	100	3
			21UFS5S2B	Research Methodology and Statistics						
			21UFS5S2C	Handwriting Identification						
		Soft Skill Development	21U5SS	Soft Skill Development	2	2	25	75	100	3
Total					**30**	**28**	**230**	**570**	**800**	
III year & VI semester	III	Core Course XIII	21UFS6C13	Forensic Medicine and Toxicology	6	6	25	75	100	3
		Core Course XIV	21UFS6C14	Forensic Medicine and Toxicology Lab	6	4	40	60	100	3
		Core Course XV	21UFS6C15	Advanced Forensic Psychology	6	5	25	75	100	3
		Major Based Elective II	21UFS6M2A	Economic Offences	5	4	25	75	100	3
			21UFS6M2B	Fire and Explosives Investigation						
			21UFS6M2C	Wildlife Forensics						
			21UFS6M3A	Mini Project	6	4	25	75	100	3
		Major Based Elective III	21UFS6M3B	Digital and Cyber Forensics Lab						
			21UFS6M3C	DNA Analysis Lab						
	IV	Gender studies	216GS	Gender Studies	1	1	25	75	100	3
	V	Extension Activities	-	Extension Activities	-	1	-	-	-	-
Total					**30**	**25**	**165**	**435**	**600**	

Grand total (Entire course)	**180**	**140**	**1105**	**2895**	**4000**	

Marks

Maximum - 100 marks (passing minimum 50 marks)

External - 75 marks (Passing minimum 30 marks)

Internal - 25 marks (Internal Assessment as per UG Rules and Regulation)

Question Paper Pattern for UG Program

- Part A shall contain Ten questions carrying 1 mark each (10*1=10)
- Part B shall contain Five questions carrying 7 marks each, Each Question contain eitheror choice pattern (5*7=35)
- Part C shall contain Five questions carrying 10 marks each, out of which the studentshave to answer for any Three questions (3*10=30)

Program Objective:

1. To provide the basic knowledge and principles of Forensic Science.
2. To develop problem-solving skills in a stepwise fashion.
3. To inculcate diverse skills and abilities involved in various fields of Forensic Science.
4. To develop laboratory skills.
5. To develop conceptual understanding of Criminal Justice System and Legal System.
6. To produce ethical and skillful graduates who can articulate the professional standards.

Program Outcome:

1. Demonstrate knowledge and understanding of some basic principles and concepts of Forensic Science and ability to apply knowledge and understanding of various scientificprinciples to solve crime cases.
2. Possess high awareness of major issues and development of research areas in ForensicScience.
3. Understand various aspects of Indian Law and related sections.
4. Acquire professional ethics and act in a non-biased manner.

FIRST YEAR SEMESTER I

CORE COURSE I

Course Title: General Forensic Science & Crime Scene Management

Course code : 21UFS1C1 **Maximum marks : 75Exam hours : 3**

Learning Objectives:

a. The significance of Forensic science to human society.

b. The fundamental principles and functions of Forensic science.

c. The divisions in a Forensic science laboratory.

d. The methods of securing, searching and documenting crime scenes.

e. The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes. f. The legal importance of chain of custody.

UNIT 1:

Introduction to Forensic Science. Need and functions of Forensic science.Historical aspects of Forensic science. Development of Forensic ScienceLaboratories. Definitions and concepts in Forensic science. Basic principles of Forensic science. Scope of Forensic science. Forensic Science in Indian scenario. Admissibility in Indian Courts. Frye standard and Daubert standard. Legal and Scientific problems.

UNIT 2:

Branches of Forensic science and their importance. Hierarchical set up of various Government Forensic Science Laboratories. Basic services of crime laboratories. Qualifications of Forensic scientists. Duties of

Forensic scientists. Code of conduct for Forensic scientists. Data depiction.

UNIT 3:

Crime Scene. Types of crime scenes. Safety measures at crime scenes. Role of First Responding Officer. Coordination between police personneland Forensic scientists at crime scenes. The evaluation of 5Ws (who? what? when? where? why?) and 1H (how?).

UNIT 4:

Documentation of crime scenes – photography, videography, sketchingBaseline method, Triangulation method, coordinate method, extended coordinate method. Crime scene notes. Search – Definition, Objectives, Patterns- Strip/Lane method, Grid method, Zone method, Spiral method, Wheel method. Classification of crime scene evidence – physical and trace evidence. General collection, labelling, sealing and transportation of evidence. Hazardous evidence. Preservation of evidence. Chain of custody- objectives and importance.

UNIT 5:

Definition, importance, nature and principles, stages: Data collection, Hypothesis formation, Testing, Theory formation. Management of scenes of mass disasters. Important evidences for human identification.Introduction to homeland security-Basic concept,structure and function.

Suggested Readings

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques ofCrime Scene Investigation, CRC Press, Boca Raton (2013).

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

3. M. S. Dahiya, Priciples and Practices in Contemporary Forensic Sciences, Shanti Prakashan (2015).

4. Robert. C. Shaler, Crime Scene Forensics: A Scientific Method Approach, CRC Press (2011) 5. M. S. Maloney, Crime Scene Investigation: Procedural Guide, CRC Press (2014)

5. B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision forthe Twenty First Century, Select Publishers, New Delhi (2001).

6. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

7. M. Byrd, Crime Scene Evidence: A Guide to the Recovery andCollection of Physical Evidence, CRC Press, Boca Raton (2001).

8. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).

Course Outcomes:

1. Basic understanding of the Scientific method and the use of the problemsolvingin the field of the Forensic science.
2. Identify the role of the Forensic scientist and physical evidence within thecriminal justice system.
3. Identify and examine current and emerging concepts and practices within theForensic science field.
4. Gain basic knowledge of collecting, packaging and preserving different types ofphysical and trace evidence at crime scenes.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	S	M	M
CO 3	S	S	S	S
CO 4	S	S	S	M

CORE COURSE II

Course Title : Crime Scene Management Lab

Course code : 21UFS1C2P **Maximum marks : 60Exam hours : 3**

Learning Objectives:

a. To secure, search and document various types of crime scenes.

b. To prepare a report on Crime scenes

c. The right method of collecting, packaging and preserving different types ofphysical and trace evidence at crime scenes.

d. Reconstruction of Crime scenes.

Practical

1. Securing the scene of crime and following safety measures.
2. Documentation of crime scene with sketching and listing of evidences.
3. Photography of a scene of crime and individual evidences.
4. Collection, preservation, packaging, sealing and labelling of physical evidences.
5. Collection, preservation, packaging, sealing and labelling of biological evidences.
6. To prepare a report on evaluation of indoor crime scene.
7. To prepare a report on evaluation of outdoor crime scene.
8. Demonstration of reconstruction of crime scene.

9. A case study on the importance of crime scene management.

10. A visit to the police station to discuss about the present scenario of crimescene management and suggest improvements.

Course Outcomes:

1. Basic understanding of securing, searching and documenting various types ofcrime scenes.
2. Gain basic knowledge of collecting, packaging and preserving different types ofphysical evidences.
3. Asses the importance of evidences found at a crime scene.
4. Gain skills required for reconstruction of crime scene.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**S**	**M**
CO 2	**M**	**S**	**M**	**M**
CO 3	**S**	**S**	**S**	**S**
CO 4	**S**	**S**	**S**	**M**

ALLIED COURSE I

Course Title : Physics

Course code : 21UFS1A1 **Maximum marks : 75Exam hours : 3**

Learning Objective:

a) To provide knowledge and concepts of Physics related laws.

b) To give simple and basic ideas for better revelation of student.

c) To understand the basic principles in physics.

d) To have basic idea about acoustics and EMR.

e) To understand LCR circuits.

UNIT 1: Mechanics and Thermal Physics

Mechanics: Force, conservative and non-conservative force, rotational motion ofinertia, expression of M.I. of regular shaped bodies. Acceleration due to gravity.Simple Harmonic motion and compound pendulum.

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

UNIT 2: Optics

Optics: Cardinal Points, thin lens and its combinations, Aberration and its types, Newton's rings. Fresnel's diffraction – Diffraction at a (1) circular aperture (2) Straight edge (3) narrow wire. Lasers.

UNIT 3: Acoustics

Acoustics: The generation of sound, Properties, Velocity of sound, noise and sound intensity measurement, echo, propagation of sound waves, standing waves, modes of vibration. Sound and its perception. Principle of microphone and loudspeaker.

UNIT 4: Electronics

Electronics: Electric current, resistance, Ohm's Law, Resistivity, Capacitance, Voltage, Transistors, Basic LCR circuits, Growth and decay of current containing

resistance and inductance, Transformers and Amplifiers. Working of electricmeter.

UNIT 5: Electromagnetic Radiation

Introduction, Electromagnetic spectrum, Interaction between matter and radiation,Scattering, Raman and Rayleigh scattering.

Suggested Readings

1. R. Murugeshan, Properties of matter, S. Chand & Co. Pvt. Ltd., Revised edition,2012.
2. M. Narayanamurthi and N. Nagarathinam, Dynamics, The National PublishingCompany 2005, Chennai.
3. Brijlaland Subramaniyam, Heat and Thermodynamics & Statistical physics, S.Chand & Co. 2015.
4. M. Narayanamurthi and N. Nagarathinam, Statics, Hydrostatics and Hydrodynamics - The National Publishing Company 2005, Chennai.
5. Dr. N. Subramaniyam, Brijlal and Dr.M.N. Avathanulu, Optics, S. Chand & Co.Pvt. Ltd.- 9th revised edition, New Delhi, 2014.
6. R.L. Saihgal, A Text Book of Sound, S. Chand & Co. Pvt. Ltd, New Delhi, 1979.

Course outcome:

1. Demonstrate knowledge of selective topics of Mechanical and Thermal Physics.
2. To apply the knowledge to analyze broad range of physical phenomena.
3. Recognizing universal physical laws relevant to the problems
4. To apply the concept of electromagnetic spectrum.

ALLIED COURSE II

Course Title : Physics and Biology lab

Course code : 18UFS1A2P **Maximum marks : 60Exam hours : 3**

Learning Objective:

a) To provide knowledge and concepts of Physics related laws.

b) To understand the working of basic instruments.

c) To determine Refractive Index and focal length.

d) To calculate the specific gravity of glass.

LIST OF PRACTICALS:

1. Standard operating procedures for using Vernier Caliper, Micrometer ScrewGauge, Travelling Microscope.
2. Spectrometer: determination of angle of prism and the refractive index for a glassprism for sodium light.
3. Combination of lenses- Focal length of convex and concave lenses.
4. Newton's rings.
5. Basic LCR Circuits
6. Waves – Verification of laws- sonometer.
7. Specific gravity of glass.

Course outcome:

1. Use various basic instruments in physics.

2. Take measurements in Physics lab and analyze them to draw valid conclusions.
3. Use experimental, and theoretical methods to solve complex problems.
4. Use he concepts of gravity.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**S**	**M**
CO 2	**M**	**S**	**M**	**M**
CO 3	**S**	**S**	**S**	**S**
CO 4	**S**	**S**	**S**	**M**
S- Strong, M- Medium, L- Low				

CORE COURSE IV

COURSE TITILE: INTRODUCTION TO PSYCHOLOGY

COURSE CODE: 21UFS2C4 **MAXIMUM MARK:75**

EXAM HOURS:3 HR

Learning objective

a. The basic concepts of psychology and its scope.

b. The various perspectives of psychology.

c. The elements of brain and nervous system.

d. The basics of cognitive processes.

UNIT 1:

Definition, goals and scope of Psychology. Role of psychologist in society. Perspectives- Biological, Psychodynamic, Behavioristic, Humanistic, Evolutionary and Cognitive. Subfields of Psychology. Scope of Forensic Psychology. Duties and responsibilities of Forensic Psychologist.

UNIT 2:

Nervous system- Introduction, Classification. Structure of brain and its parts. Significance of left and right brain. Structure and psychological importance in thought and language. Neurons- Structure, Neural impulse- generation and transmission, neurotransmitters and their function.

UNIT 3:

Introduction to cognition. Sensation- Processes in sensation, types- receptors involved in each of the sensory modalities i.e., visual, auditory, gustatory,olfactory, tactile and others. Sensory adaptation. Sensory threshold, Absolute threshold, Weber's Law.

UNIT 4:

Attention- Introduction, definition, characteristics, selective and divided attention. Perception- Introduction, definition, Gestalt laws. Process of

perception- Depth perception, constancy, movement. Correlated of perception Awareness, motives, needs, illusion, sublimely perception and extra sensory perception.

UNIT 5:

Thinking- Introduction, definition, theories- information processing theory, S-R theory, cognitive theory, simulation models. Types- free association, imaginal thought, reasoning, problem solving, decision-making, creative thinking, concept formation, language. Intelligence-Introduction, definition, theories factor theories, cognitive models of intelligence. Intelligence tests characteristics and types. External andinternal influences.

Suggested readings

1. Robert A. Baron, Psychology, Prentice Hall.
2. Feldman R.S, Understanding Psychology, McGraw Hill.
3. Wayne Weiten, Psychology – Themes and variations, Brooke/Cole Publishing Co.

Course outcomes:

1. Describe key concepts, principles and overarching themes in Psychology
2. Develop a working knowledge of Psychology's content domains
3. Describe applications of Psychology.
4. Understand the basic concepts of brain and its components.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	M	S	M
CO 2	M	S	M	S
CO 3	S	M	S	M
CO 4	M	S	M	M

S- Strong, M- Medium, L- Low

ALLIED COURSE III

Course Title : Biology

Course code : 21UFS2A3 **Maximum marks : 75Exam hours : 3**

Objective:

a) To provide knowledge about various fields of biology.

b) To provide basic concepts of biology.

UNIT 1: Basics of cell

Introduction, Eukaryote and Prokaryote cell, Plant and Animal cell. Various cell organelles- Endoplasmic Reticulum, Golgi complex, Mitochondria, Chloroplast and Lysosomes - structure and function.

UNIT 2: Immunology

General concepts of Immune system. Innate and Adaptive immunity. Various cells of the immune system. Antigen: Structure, Properties, factors influencing antigenicity. Antigenicity and immunogenicity. Antibody: Structure, Properties, Function and Types. Antigenic determinants. Production of monoclonal and polyclonal antibodies. Immunological principles: Ag-Ab interactions. Affinity and Avidity. Cross-reactivity, precipitation and agglutination reactions.

Immuno-diffusion, immune-electrophoresis. ELISA-types.

UNIT 3: Microbiology

History and development. Classification and identification of microbes.Microbial role in diseases-Koch's postulates. Preventive medicines: VaccinesHistory and Types. The control and growth of microbes. Culturing techniques – Aerobic and Anaerobic. Batch and continuous culture. Types of media.

UNIT 4: Biomolecules

Amino acids – structure and functional group properties. Proteins and peptides – Composition of proteins – Primary, Secondary and Tertiary structure of protein. Enzymes and its functioning. Carbohydrates - Definition, biological importance and classification. Monosaccharides - Isomerism, anomerism. Sugar derivatives, Monosaccharides, Disaccharides, Polysaccharides. Structures of starch, glycogen and glycosaminoglycans. Lipids - Definition, Biological importance and classification, Fats and fatty acids, Introduction to compound lipids, Hydrophobic and hydrophilic groups, Cholesterol, Bile salts, Micelle. Bimolecular leaflet, Lipoproteins.

UNIT 5: Nucleic acids

DNA and RNA- Chemical Structure, types and function. Replication, Transcription and Translation.

Suggested readings

1. Lehninger, Principles of Biochemistry, 7th Edition.
2. Lydyard, A Whelan and M W Fanger, Instant notes in immunology
3. J m butler, Fundamentals of Forensic DNA typing

Course Outcomes:

1. Explain basic concepts of Biology.
2. Required skills to function as a Biologist.
3. Ability to demonstrate and evaluate Biological issues in context.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	S	M	M
CO 3	S	S	S	S

S- Strong, M- Medium, L- Low

SECOND YEAR SEMESTER-III CORE

COURSE V

Course Title : Fingerprints and Questioned Documents

Course code : 21UFS3C5 **Maximum marks:75 Exam hours: 3**

Learning Objectives:

a. The fundamental principles on which the science of fingerprinting is based.

b. The physical and chemical techniques of developing fingerprints on crime sceneevidence.

c. The significance of foot, palm, ear and lip prints.

d. The importance of examining questioned documents in crime cases.

e. The tools required for examination of questioned documents.

f. The significance of comparing hand writing samples.

UNIT 1:

Introduction. History and development of fingerprinting. Histology and formationof ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns.

Fingerprint characters/minutiae. Classification – Henry's classification and cataloguing of fingerprint record. Automated Fingerprint Identification System.

UNIT 2:

Constituents of sweat residue. Locating latent fingerprints and development by physical and chemical techniques and its mechanism. Preservation of developedfingerprints. Digital imaging for fingerprint enhancement. Recording of fingerprints of living and deceased. Plain and rolled fingerprints. Analysisi of fingerprints-ACE-V methodolgy.

UNIT 3:

Footprints- Introduction, types, development, collection and comparison. Footwear impressions- Introduction, types, location, collection, comparison and significance. Collection of standards. Gait pattern analysis. Palm printsIntroduction, examination and significance. Lip prints – Introduction, nature, classification, location, collection and examination of lip prints. Ear printsclassification, examination and their significance.

UNIT 4:

Questioned Documents- Introduction, Definition, History and development of questioned document examination. Forgery- Definition, types and Sections involved. Alterations in documents, including erasures, additions, over-writings and obliterations. Charred documents. Characteristic features of Indian currency notes and coins, passports, visas and stamp papers and their examination. Tools required- VSC, ESDA, UV-IR, and Comparison Microscope. HandwritingIntroduction and development of individuality. Characteristics of handwritingClass and individual characteristics. Factors influencing handwriting.Forgery and its types. Standards for comparison of handwriting.

UNIT 5:

Printer: Introduction, parts of a printer, types of printers and their working principle. Typewriter: Introduction, working principle, parts of a typewriter. Examination and comparison of printed, typed and Xeroxed documents- toner analysis, grabber marks, individual characteristics and defect marks.seal examination, paper and its types, ink and paper examination.

Suggested Readings

1. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other RidgeSkin Impressions, CRC Press, Boca Raton (2004).
2. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S.

Ramotowski (Ed.), CRC Press, Boca Raton (2013).

3. M. P. Caligiuri, The Neuroscience of Handwriting: Application for Forensic Document Examination, 1st Edition, (2012).
4. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
5. Albert S. Osborn, Questioned Documents, 2nd Edition.
6. Wilson Harrison, Suspected Documents, Rowman & Littlefield, (1958)
7. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982). 8. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
9. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts andPrinciples, Academic Press, London (2000).
10. E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997).

Course Outcome:

1. Understand the importance of fingerprints in Forensic Science.
2. Know the importance of document examination.
3. Learn about various components which help in determination of the Document.
4. Acquire skill required for handling questioned documents.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**S**	**M**
CO 2	**S**	**S**	**S**	**S**
CO 3	**S**	**M**	**M**	**S**
CO 4	**S**	**S**	**M**	**S**

S- Strong, M- Medium, L- Low

CORE COURSE VI

Course Title : Fingerprints and Questioned Documents Lab

Course code : 21UFS3C6P **Maximum marks : 60Exam hours : 3**

Learning Objectives:

a. To record fingerprints.

b. To classify fingerprints.

c. To develop latent prints.

d. To prepare a cast.

e. To analyze handwriting.

f. To identify forgery and alterations.

Practical

1. To record plain and rolled fingerprints.
2. To identify different fingerprint patterns.
3. To carry out ridge tracing and ridge counting.
4. To carry out ten-digit classification of fingerprint.
5. To develop latent fingerprints using physical and chemical methods.
6. To prepare cast of foot prints.
7. To identify handwriting characters and detect forgery.
8. To examine the security features of currency notes and passports.
9. A case study on the fingerprints / questioned documents.

Course outcomes:

1. Record and classify fingerprints.
2. Attain the ability to development latent fingerprints.

3. Gain skills to collect footprints by preparing a cast.

4. Identify features of currency notes.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**M**	**S**
CO 2	**S**	**M**	**M**	**S**
CO 3	**M**	**S**	**S**	**S**
CO 4	**M**	**S**	**M**	**S**

S- Strong, M- Medium, L- Low

ALLIED COURSE IV Course Title : Chemistry

Course code : 21UFS3A4 **Maximum marks : 75Exam hours : 3**

Objective:

a) To provide knowledge about various fields of chemistry.

b) To understand the basic principles in chemistry.

c) To understand the importance of Chromatographic and Spectroscopic techniques.

d) To understand about various concepts of Industrial and Pharmaceutical Chemistry.

UNIT: I

Introduction to inorganic chemistry: Atomic structure -de Broglie matter wave, Heisenberg uncertainty Principle, atomic orbitals, quantum numbers, Aufbau andPauli Exclusion Principle, Hund's multiplicity rule. Study of periodic table: Modern periodic table and periodic properties, electronic configuration, atomic and ionic radii, ionization potential, electron affinity, electro negativity, metallic,nonmetallic characters and magnetic properties. Comparative study of s and p block elements. Introduction to Noble gases, Lanthanide and Actinide series.

UNIT: II

Introduction to organic chemistry: Empirical and Molecular formula, Classification of Aliphatic and Aromatic compounds, IUPAC Nomenclature of alkanes, alkenes, haloalkanes, alcohols, aldehydes, ketones, ethers, carboxylic acids and nitro compounds. Introduction to chemical compounds: Aromatic hydrocarbons, Amines, Diazonium salts, Phenyl hydrazine, Sulphonic acids, Aromatic Alcohols, Phenols, quinones and also aromatic cyclic compounds Naphthalene, Anthracene, Phenanthracene and its carcinogenicity.

UNIT: III

Dyes: Introduction and classification synthesis and use of Congo red malachite green alizarin and indigo. Food Chemistry: Organic food preservatives and food additive. Detection of food adulterants. Textile Chemistry: Manufacture of synthetic fibers – Viscos rayon, acetate silk or rayon – properties and uses. Petrochemicals: Raw materials, production of petrochemicals from olefin and acetylene, alkanes and cycloalkanes, aromatic hydrocarbons. Synthetic petrol – Berguis process, petroleum products – ISS of Gasoline and kerosene. Pharmaceutical chemistry: Organic Pharmaceutical aids – preservatives, antioxidant, emulsifiers, stabilizing and suspending agents, ointments bases and related agents. Relationship between chemical structure and pharmacological activity – effect of unsaturation, chain length, isomerism, halogens, amine group,aldehydes and ketones group on structure property relations.

UNIT: IV

Spectroscopic Techniques: Introduction: Properties of light, Interaction ofElectromagnetic radiation with Matter, application in forensic science,Spectroscopy and its application in Forensic science/VisibleSpectrophotometry ,Molecular Fluorescence, IR spectroscopy, RamanSpectroscopy , Atomic Absorption Spectroscopy Chromatographic Techniques: General Principles, Paper, Column, TLC, Adsorption chromatography, PartitionChromatography, gas -liquid and gaschromatography, ion–exchangechromatography, HPLC and HPTLC techniques. Physical methods of analysis:X-ray spectroscopy: X-ray absorption and fluorescence methods, X-raydiffraction, EDX, AES (Auger Emission Spectroscopy) ESCA (electronspectroscopy for chemical analysis.

UNIT: V

Radioactivity. Fission, Fusion reactions. Half-Life Period. Alpha, Beta and Gammaemissions. Penetration of Matter. Nuclear reactors. Applications.Geiger counters. Scintillation detectors. Hazards of radioactivity.

Text Books:

1. R.D. Madan, "Modern Inorganic Chemistry", 2nd edition, S. Chand & CompanyLtd., 200
2. J. E. Huheey, Inorganic Chemistry; 4th Ed., Harper and Row Publishers,Singapore, 2006.
3. Bahl, B.S. and Bahl. A., Advanced Organic Chemistry, (12th edition), New Delhi,Sultan Chand & Co., (2010).
4. Finar I.L., Organic Chemistry, Volume 1&2, (6th edition) England, AddisonWesley Longman Ltd. (1996).
5. C. N. Banwell, Fundamentals of Molecular Spectroscopy; 4th Ed., McGraw HillEducation, Noida, 1994.
6. V. K. Srivastava and K. K. Srivastava, Introduction to Chromatography; 2nd Ed.,Holden Day, New York, 1985.
7. Gurdeep. R.Chatwal and Sham K. Anand, Instrumental Methods of ChemicalAnalysis, Himalaya publish house
8. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry,6th Edition, Saunders College Publishing, Fort Worth (1992).
9. Max Houck Forensic Chemistry, 1st edition Academic press 2015, Elesvier.
10. Tewari.S.N: Liquor and Narcotic drugs.
11. Egon Stahl, Thin Layer Chromatography-A Laboratory Manual.

Reference Books:

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rdedition, New Delhi, Shoban Lal Nagin Chand & Co., (1993). 2. J.D. Lee,

„Concise Inorganic Chemistry", 20th revised edition, Sultan Chand & Sons,2000.

3. Carey.F.A. and Sundberg.R.J., Advanced organic chemistry, partA and B, 5thspringer Germany.

4. Silverstein.R.M., Webster,F.X., Spectroscopic indentification of organic compounds 6th edition John wiley,sons Inc (1997).
5. G. H Stout and L. H. Jensen, X-ray Structure Determination: A PracticalGuide;John Wiley and Son.
6. R. Gopalan, P.S. Subramanian, K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand and Sons, New Delhi, 1997, New York, 1992.
7. F.A.Settle : Hand book of instrumental techniuqes for Analytical Chemistry,Prectise Hall 1997
8. Sharma.J and Fried.B., Hamnd book of TLC.
9. J.D. DeHaan, Kirk's Fire Investigation, 3rd Edition, Prentice Hall, New Jersey(1991).
10. F.G. Hofmann, A Handbook on Drug and Alcohol Abuse, 2nd Edition, OxfordUniversity Press, New York (1983).
11. Clark.E.G.C: Isolation and Identification of drugs, Vol I &II academic press.
12. Zweig.G., Analytical Methods of Pesticides, academic press.

Course outcomes:

1. Firm foundation in the fundamentals of chemistry.
2. Application of current chemical and scientific theories.
3. Explore various branches of chemistry.
4. Gain knowledge about various spectroscopic techniques.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**S**	**M**
CO 2	**M**	**S**	**M**	**M**
CO 3	**S**	**S**	**S**	**S**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

ALLIED COURSE V

Course Title : Basic Chemistry lab

Course code : 21UFS3A5P **Maximum marks : 60Exam hours : 3**

Learning Objective:

a) To have basic knowledge about various tests for explosives.

b) To understand the basic principles in chemistry.

c) To identify organic, inorganic and metallic slats.

d) To perform volumetric analysis.

Practical:

1. Preliminary tests for explosives.
2. Determination of melting, boiling and flash point determination.
3. TLC separation of Drugs.
4. Detection of adulterants from common food samples.
5. Volumetric analysis using Iodoform.
6. Volumetric analysis using Potassium Permanganate.
7. Tests for detection of Alcohols.
8. Identification of Organic compounds 9. 9. Identification of Inorganic compounds.
10. Identification of Metallic salts.

Course outcomes:

1. Understands programming methodologies by learning algorithm and flowchart tocarry out scientific experiments.
2. Explore various applications of chemistry
3. Accurately record and analyze the results of experiments. Explore various applications of chemistry.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	M	S	S
CO 2	M	S	M	M
CO 3	S	S	S	S
CO 4	M	S	S	M

S- Strong, M- Medium, L- Low

NON-MAJOR ELECTIVE I

Course Title: Criminalistics **Maximum marks: 75Exam hours: 3**

Course code: 21UFS3N1A

Learning Objectives:

a. The methods of securing, searching and documenting crime scenes.

b. The art of collecting, packaging and preserving different types of physical andtrace evidence at crime scenes.

c. The legal importance of chain of custody.

d. The importance of reconstruction of crime scene.

UNIT 1:

Functions of Forensic Science, Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensicscience. Tools and techniques in forensic science. Branches of forensic science. Data depiction. Forensic science in India: Organizational set up of forensic science laboratories.

UNIT 2: Criminology

Definition, Aim and Scope. Theories of criminal behavior. Criminal profiling. Elements, nature, causes and consequences of crime. Deviant behavior. Social change and crime. Understanding modus operandi. Investigative strategy. Police's power of investigation. Filing of criminal charges. Correctional measures and rehabilitation of offenders.

UNIT 3: Crime Scene Management

Crime scene investigations. Protecting and isolating the crime scene. Crime scene search methods. Documentation of crime scene by photography, sketching and field notes. Types, significance and classification of physical and trace evidence.Submission of evidence. Chain of custody. Reconstruction of crime scene.

Suggested Readings

4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime SceneInvestigation, CRC Press, Boca Raton (2013).
5. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
6. M. S. Dahiya, Priciples and Practices in Contemporary Forensic Sciences, ShantiPrakashan (2015).
7. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

Course Outcomes:

1. Basic understanding of the Scientific method and the use of the problemsolving inthe field of the Forensic science.
2. Identify the role of the Forensic scientist and physical evidence within the criminaljustice system.
3. Understand various branches of Forensic science and their functions.
4. Identify and classify various types of evidences.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	M	M	S
CO 3	S	S	S	S
CO 4	S	M	S	M

S- Strong, M- Medium, L- Low

Course Title : Questioned Document Analysis

Course code:21UFS3N1B

Learning Objectives:

a. To understand the history and development of Questioned DocumentExamination.

b. The importance of examining questioned documents in crime cases.

b. The tools required for examination of questioned documents.

c. The importance of detecting frauds and forgeries by analyzing questioneddocuments.

UNIT 1: Nature and Scope of Questioned Documents

Introduction, Definition and History and development of questioned documents.Qualifications, duties and responsibilities of Questioned document examiner. Government Examiner of Questioned Document. Basic tools- ESDA, VSC. Stages of Document examination.

UNIT 2: Forgery

Definition, types and Sections involved. Alterations in documents, including erasures, additions, over-writings and obliterations. Charred documents. Characteristic features of Indian currency notes, passports, visas and stamp papers and their examination. Seal examination. Paper and Ink examination.

UNIT 3: Other documents

Printer: Introduction, parts of a printer, types of printers and their working principle. Typewriter: Introduction, working principle, parts of a typewriter. Examination and comparison of printed, typed and Xeroxed documents- toner analysis, grabber marks, individual characteristics and defect marks.

Suggested Readings

1. Albert S. Osborn, Questioned Documents, 2nd Edition.

2. Wilson Harrison, Suspected Documents, Rowman & Littlefield, (1958)

3. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, BocaRaton (1982).

Course Outcome:

1. Know the importance of document examination.

2. Learn about various components which help in analysis of the Document.

3. Various tools and techniques involved.

4. Acquire skill required for handling questioned documents.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	M	M	S
CO 2	M	S	S	S
CO 3	S	M	M	M
CO 4	S	S	M	S

S- Strong, M- Medium, L- Low

Course Title: Fingerprint Science

Course code: 21UFS3N1C

Learning Objectives:

a) The fundamental principles on which the science of fingerprinting is based.

b) The method of classifying criminal record by fingerprints.

c) The physical and chemical techniques of developing fingerprints on crime sceneevidence.

d) The significance of foot, palm, ear and lip prints.

UNIT 1: Basics of Fingerprinting

Introduction. History and development of fingerprinting. Histology and formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns.

Fingerprint characters/minutiae. Henry's classification and cataloguing of fingerprintrecord. Automated Fingerprint Identification System.

UNIT 2: Development of Fingerprints

Latent prints. Constituents of sweat residue. Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents.

Application of light sources in fingerprint detection

UNIT 3: Other Impressions

Importance of footprints. Casting of foot prints, Electrostatic lifting of latent footprints. Lip prints - Nature, location, collection and examination of lip prints.

Ear prints and their significance. Palm prints and their historical importance.

Suggested Readings

1. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).

2. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S.Ramotowski (Ed.), CRC Press, Boca Raton (2013).

Course Outcome:

1. Understand the importance of fingerprints in Forensic Science.
2. Identify and classify fingerprints.
3. Understand the principle behind development of latent fingerprints.
4. Gain knowledge on various other types of impressions.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	M	M	S
CO 2	S	S	S	S
CO 3	S	M	S	M
CO 4	S	S	S	S

S- Strong, M- Medium, L- Low

SEMESTER IV CORE

COURSE VII

Course Title : Forensic Physics and Ballistics

Course code : 21UFS4C7 **Maximum marks : 75Exam**

hours : 3

Learning Objectives:

a. The classification of firearms and their firing mechanisms.

b. The methods of identifying firearms.

c. The characteristics of ammunition.

d. The importance of firearm evidence.

e. The nature of firearm injuries.

f. The methods for characterization of gunshot residue.

g. Analysis of other physical evidences.

UNIT 1:

History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms. Ammunition – classification and constructional features of different types of cartridge cases andbullets. Different types of marks produced during firing process – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.

UNIT 2:

Internal ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting.External Ballistics – Vacuum trajectory, effect of air resistance on trajectory, basedrag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Measurements of trajectory

parameters, introduction to automated system of trajectory computation and automated management of ballistic data.

UNIT 3:

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

Wound Ballistics.

UNIT 4:

Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire. Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothing. Identification and nature of firearms injuries.

Reconstruction with respect to accident, suicide, murder and self-defence.

UNIT 5:

Glass – Composition, types, collection, packaging and examination of glass samples, glass fracture. Soil – Composition, types, collection, packaging and examination of soil samples. Paint – Composition, types, collection, packaging and examination of paint samples. Fibre – Composition, types, collection, Packaging and examination of fibre samples. Tampering of electric meters.cement analysis.blood spatter analysis.

Suggested Readings

1. Vincent Di Maio, Gunshot wounds, 3rd Edition, CRC Press, Washington DC.

2. J. S. Wallace, Chemical Analysis of Firearms, Ammunition & Gun Shot Residue,2nd Edition, (2018).

3. B. R. Sharma, Firearms in Criminal Investigation & Trial, (2017).

4. T. Warlow, Firearms, the Law, & Forensic Ballistics, 3nd Edition, CRC Press, (2011) 5. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol.2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
6. A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot ResidueAnalysis, CRC Press, Boca Raton (2000).
7. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukkoand G.C. Knupfer (Eds.), Academic Press, London (2000).
8. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester(1997).
9. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

Course Outcomes:

1. Know in detail regarding the field of Forensic ballistics including history offirearms, about ammunitions and how firearms are classified.
2. Learn about the various types of mechanism of firing and also on what principles the identification and comparison of firearms, bullets and cartridge cases is based upon.
3. Understand about what are gunshot residues, and how can they be analysed using chemical and instrumental techniques.
4. Understand the importance of various physical evidences and their analysis.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	S	M	M	S
CO 3	S	S	M	S
CO 4	S	M	M	M

S- Strong, M- Medium, L- Low

CORE COURSE VIII Course Title: Instrumentation

Course code: 21UFS4C8

Learning Objectives:

a. *The general concepts of instrumentation.*

b. *The significance of microscopy in visualizing trace evidence and comparing it withcontrol samples.*

c. *The importance of Chromatographic and Spectroscopic techniques in processingcrime scene evidence.*

d. *The utility of Colorimetry, Electrophoresis and Neutron activation analysis inidentifying chemical and biological materials.*

UNIT 1:

General Physical and Biological concepts- Mass, Density, range of electromagnetic radiation, interaction between matter and radiation, fluorescence, phosphorescence. pH and buffers. Significance of instrumentation in Forensic Science. Centrifuge- Principles, types and Forensic applications.

UNIT 2:

Principles, ray diagrams, parts and working, sample preparation and Forensic applications of- Simple microscope, Compound microscope, Stereo microscope, Polarized light microscope, Dark-field microscope, Comparison microscope, Fluorescent microscope, Electron microscope.

UNIT 3:

Principles of spectroscopy- Beer Lambert's Law, ray diagram, parts and working and Forensic applications of- UV-Visible spectroscopy and IR spectroscopy. FTIR. Principles and Forensic applications of- Atomic Absorption and Emission

Spectroscopy, Raman spectroscopy, X-Ray spectroscopy. Principle,working and applications of Mass Spectroscopy. EDXRF-principle and working.

UNIT 4:

Principles, working and Forensic applications of Paper chromatography, Columnchromatography, and TLC. Principles and applications of LC, HPLC and GC. GC-MS. LCMS.

UNIT 5:

General principles, factors affecting, Types- Horizontal and Vertical, SDS PAGE,AGE, Crossed over electrophoresis and Capillary electrophoresis, Genetic Analyzer. Forensic applications. Principles and working and Forensic applications of Autoclave, Laminar Air Flow-HEPA filters, Incubators, CO2 incubators.

Suggested Readings

1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry,6th Edition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, Organic Spectroscopy, 3rd Edition, Macmillan, Hampshire (1991).
3. J.W. Robinson, Undergraduate Instrumental Analysis, 5th Edition, Marcel Dekker,Inc., New York (1995).
4. J.C.Giddings, Dynamics of Chromatography, Marcel Dekker, New York.

Course Outcomes:

1. Understand various principles involved in instrumentation.
2. Apply various techniques to visualize trace evidences.
3. Significance of various techniques involved in identifying various Chemical andBiological materials.
4. Understand the working of various instruments.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	M	M
CO 2	S	M	M	S
CO 3	S	M	M	S
CO 4	S	S	M	S

S- Strong, M- Medium, L- Low

ALLIED COURSE VI Course Title: Basics of ComputerCourse code: 21UFS4A6

Objective:

a) To impart knowledge about the fundamental concepts of computers in a logicaland informative manner.

b) To provide knowledge about different parts of computer.

c) To understand the basic of operating system.

d) To understand the importance of Internet.

UNIT-I

Introduction: Characteristics of Computers, Evolution of Computers, Computer Generations. Basic Computer Organization: Input Unit, Output Unit, Storage Unit, Arithmetic Logic Unit, Control Unit, The Central Processing Unit.

Processor and Memory: The Main Memory.

UNIT-II

Secondary Storage Devices: Sequential and Direct Access Devices – Magnetic Disk, Optical Disk, CD-ROM. Input-Output Devices: Input Devices – Keyboard, Point-and-Draw Devices, Data Scanning Devices, Electronic-card Reader. Output Devices – Monitors, Printers, Plotters. Various storage devices.

Computer Software: Types of Software.

UNIT-III

Operating Systems: Main Functions of an Operating System. Business Data Processing: Data Processing, Data Storage Hierarchy, Standard Methods ofOrganizing Data. File Management System: File Types, File Organizations, Database Management System: Database Models.

UNIT-IV

The Internet: Definition- Basic Services: Electronic Mail, File Transfer Protocol, Telnet, The World Wide Web. WWW Browsers – Uses of the Internet. Multimedia:Multimedia Computer System, Multimedia Components,

Multimedia Applications.

UNIT-V

Computer Networks- Introduction, Network topology. Working of LAN, MAN, WAN.

TEXT BOOK:

1. Pradeep K. Sinha and Priti Sinha, Computer Fundamentals, BPB Publications,Third Edition.

2. Comdex DTP Course Kit - Vikas Gupta

REFERENCE BOOK:

1. Introduction to Computers – Alexis Leon, Vikas Publication.

Course Outcomes:

1. Apply knowledge of computer programs to various disciplines.
2. Identify and define computing requirements appropriately to solve problems.
3. Design, implement and evaluate computer-based systems.
4. Ability to use current techniques, skills and tools necessary for computing practice.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	S	M	M
CO 3	S	S	S	S
CO 4	S	S	S	M

S- Strong, M- Medium, L- Low

NON-MAJOR ELECTIVE II

Maximum marks : 75Exam hours : 3

Course Title : Handwriting Analysis Course code : 21UFS4N2A

Learning Objectives:

a. The basic elements of handwriting.

b. The individuality of handwriting.

c. The significance of comparing hand writing samples.

d. The importance of detecting signature forgeries by analyzing questioneddocuments.

UNIT 1: Handwriting

Handwriting- Introduction and development of individuality. Characteristics of handwriting- Class and individual characteristics. Natural variation. Factorsinfluencing handwriting.

UNIT 2: Comparison of Handwriting

Process of comparison. Standards for comparison of handwriting. Exemplars – types and merits and demerits. Forgeries and its types, detection of forgeries in handwriting. Signature forgery- detection.

UNIT 3: Other analysis

Disguised writing and anonymous letters- identification of writer, secret writings,indented and invisible writings. Examination of alterations- erased writing, over- writings, additions, substitutions and obliterations. Charred writings. Built up

documents, determination of sequence of strokes, physical matching of documents.

Suggested Readings

1. M. P. Caligiuri, The Neuroscience of Handwriting: Application for Forensic Document Examination, 1st Edition, (2012).

2. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts andPrinciples, Academic Press, London (2000).

Course Outcome:

1. Basic understanding of handwriting analysis.
2. Identifying various class and individual characteristics.
3. Significance of Handwriting analysis.
4. Various tools and techniques involved in handwriting analysis.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	M	S	S
CO 2	M	S	M	S
CO 3	S	S	M	M
CO 4	S	M	M	S

S- Strong, M- Medium, L- Low

Course Title : Investigation of Scene of OccurrenceCourse code :

21UFS4N2B

Learning Objectives:

a. Basics of crime and crime scene.

b. The methods of securing, searching and documenting crime scenes.

c. The art of collecting evidences at various crime scenes.

d. The legal importance of chain of custody.

UNIT 1: Introduction

Crime- definition, causes, types. Scene of crime- Introduction, definition,types Indoor and outdoor, primary, secondary and tertiary, macroscopic and microscopic evidence, accidental, suicidal and homicidal. Various personnel involved and their role at the scene of crime.

UNIT 2: Crime Scene Management

Role of first responding officer. Steps to be followed ata crime scene. Documentation-Photography, Videography, Sketching. Crime scene search- Definition, objective, Patterns Strip/Lane method, Grid method, Zone method, Spiral method, Wheel method. Chain of Custody.

UNIT 3: Specific Crime Scenes

Management and important evidences and their collection and significance in Blast crime scene, Arson crime scene, Airplane crash crime scene, Motor Vehicle and Train accidents.

Suggested Readings

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's Techniques of Crime SceneInvestigation, CRC Press, Boca Raton (2013).

2. S.H. Jamesand J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC

Press, Boca Raton (2005).

3. M. S. Dahiya, Priciples and Practices in Contemporary Forensic Sciences,Shanti Prakashan (2015).

Course Outcomes:

1. Basic understanding of the Scientific method and the use of the problemsolving inthe field of the Forensic science.
2. Identify the role of the Forensic scientist and physical evidence within the criminaljustice system.
3. Understand various branches of Forensic science and their functions.
4. Handle and examine different types of crimes scenes.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	M	S	S
CO 2	S	S	M	S
CO 3	S	S	M	S
CO 4	S	S	M	M

S- Strong, M- Medium, L- Low

Course Title : Digital Forensics

Course code : 21UFS4N2C **Exam hours : 3**

Learning Objectives:

a. The basics of Digital forensics.

b. The cases which fall under the purview of Digital crimes.

c. The types of Digital crimes.

d. The elements involved in investigation of Digital crimes

UNIT 1: Fundamentals and Concepts Fundamentals of computers Hardware and accessories – Development of hard disk, physical construction,CHS and LBA addressing, encoding methods and formats. Memory andprocessor. Methods of storing data.

Operating system. Software. Introduction to network, LAN, WAN and MAN.

UNIT 2: Computer Crimes Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons forcommission of computer crimes. Breaching security and operation of digitalsystems. Computer virus, and computer worm – Trojan horse, trap door, superzapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computerterrorism, hate speech, private and national security in cyber space. An overviewof hacking, spamming, phishing and stalking.

UNIT 3: Computer Forensics Investigations

Seizure of suspected computer. Preparation required prior to seizure. Protocol to be taken at the scene. Extraction of information from the hard disk. Treatment ofexhibits. Creating bit stream of the original media. Collection and seizure of magnetic media. Legal and privacy issues. Examining forensically sterile media. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Tracking users.

Suggested Readings

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, Computer Crimes and ComputerForensics, Select Publishers, New Delhi (2003).
2. C.B. Leshin, Internet Investigations in Criminal Justice, Prentice Hall, New Jersey(1997).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, Digital Evidence and Computer Crime, Academic Press, London(2000).

Couse Outcome:

1. Conduct digital investigations that conform to accepted professional standards.
2. The investigative process: identification, preservation, examination, analysis andreporting.
3. Cite and adhere to the highest professional and ethical standards of conduct,including impartiality and the protection of personal privacy.
4. Identify and document potential security breaches of computer data that suggestviolations of legal, ethical, moral, policy and/or societal standards. 5.

   Knowledge of various types of digital crime and its detection.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	S	M	M	M
CO 3	S	M	S	S
CO 4	S	S	S	M
CO 5	S	S	M	M

S- Strong, M- Medium, L- Low

THIRD YEAR SEMESTER V CORE

COURSE IX

Course Title : Forensic Biology and Serology

Course code : 21UFS5C9 **Maximum marks : 75Exam hours : 3**

Learning Objectives:

a. *The significance of biological and serological evidence.*

b. *The Forensic importance of hair evidence.*

c. *Collection and Packaging of biological evidences.*

d. *The importance of biological fluids – blood, saliva, semen, sweat, urine, faecalstains and milk – in crime investigations.*

e. *How Forensic entomology assists in death investigations.*

f. *How wildlife Forensics aid in conserving natural resources.*

UNIT 1:

Nature and importance of biological evidence. Collection and preservation of common biological evidences. Significance and origin of hair evidence. Transfer,persistence and recovery of hair evidence. Structure of human hair.

Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair.

UNIT 2:

Common body fluids. Composition and functions of blood. Blood enzymes and proteins. Collection and preservation of blood evidence. Distinction between human and non-human blood- Origin determination. Determination of blood groups. Typing of dried stains. Forensic characterization of bloodstains.

UNIT 3:

Semen Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis ofsemen examination. Forensic significance of semen. Composition, functions andForensic significance of saliva, sweat, urine, feacal stains, milk and vomit.

Tests for their identifications.

UNIT 4:

Basics of Forensic entomology. Insects of Forensic importance. Collection of entomological evidence during death investigations. Structure and importance of pollen grains, wood and diatoms in forensic science.

UNIT 5:

Significance of Wildlife Forensics. Organizations involved. IUCN Red List Conservation Status- Extinct, Extinct in Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, Least Concern. List of protected species in India. Illegal trading of wildlife items. Identification of Physical evidences pertaining to wildlife crime.

Suggested Readings

1. J. M. Butler, Advanced Topics in Forensic DNA Typing, Academic Press,(2014).
2. Alan Gunn, Essential Forensic Biology, 2nd Edition, Wiley (2009)
3. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York(1988).
4. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, APPLETON & Lange, Norwalk (1993).
5. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
6. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey(1993).

7. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
8. W.G. Eckert and S.H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989).
9. G.T. Duncan and M.I. Tracey in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
10. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).

Course Outcomes:

1. Understand the general concepts and definitions used in Forensic Biology andserology.
2. Understand the role of Forensic biologists in crime scene investigation.
3. Locate and collect various types of biological evidences and also about thelaboratory handling procedures of such evidence.
4. Importance of Forensic Entomology and Wildlife Forensics.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**S**	**S**
CO 2	**S**	**S**	**M**	**S**
CO 3	**S**	**M**	**S**	**S**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

CORE COURSE X

Course Title : Forensic Biology and Serology Lab

Course code : 21UFS5C10P **Maximum marks : 60**

Exam hours: 3

Learning Objectives:

a. To identify hair specimen.

b. To examine and compare pollen grains and diatoms.

c. To conduct tests for blood and other serological fluids.

d. To analyze bloodstain patterns.

Practical:

1. To examine hair morphology and identify species.
2. To carry out microscopic examination of pollen grains.
3. To carry out microscopic examination of diatoms.
4. To carry out preliminary and confirmatory tests for blood.
5. To determine the blood group from fresh and dried blood stains.
6. To identify the given stain as saliva.
7. To identify the given stain as urine.
8. To identify various bloodstain patterns in a crime scene.
9. To prepare a case report on Wildlife Forensics.
10. To prepare a case report on Forensic Entomology.

Course Outcomes:

1. Identify and examine hair and other biological evidences.
2. Perform various tests to identify various biological samples.
3. Gain skills to carry-out serological tests.
4. Gain knowledge on the science of bloodstain pattern analysis.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**M**
CO 2	**S**	**S**	**M**	**M**
CO 3	**M**	**S**	**S**	**S**
CO 4	**S**	**S**	**M**	**M**

S- Strong, M- Medium, L- Low

CORE COURSE XI

Course Title : Cyber Crime and Cyber Law

Course code : 21UFS5C11 **Maximum marks : 75**

Exam hours : 3

Learning Objectives:

a. Various types of computer and cybercrimes.

b. The types of file systems.

c. The basics of computer Forensic tools.

d. The process of retrieving deleted data.

e. The role of first responding officer.

f. The elements of cyber law and I.T Act.

UNIT 1:

Cyber Crimes, Types of Cybercrime and Financial Crimes, Hacking, Cyberspace,A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Cyber Laws and Ethics, Law

Enforcement Roles and Responses, Incident response, First Responder.

UNIT 2:

Digital investigation, Digital crime scene evaluation process, Search & Seizure, Digital Forensic Lab Setup, Dead v/s Live Forensics, Types of Digital Evidences,Chain of Custody, Standard Operating Procedures of cyber Forensics, Investigation Guidelines, overview of tools, Slack Space, Virtual paging.

UNIT 3:

Evidence collection form different devices, Write Protect, Write Blockers, Disk Imaging, Data Recovery, Volatile and Non-Volatile Data Acquisition and

Analysis, File Systems and Signatures, Registry Forensics, Email analysis and IP,Stenography, Cryptography, Card crimes.

UNIT 4:

Metadata Analysis, Browser Forensics, History Extraction, Integrity, Hash Value, Data tampering, File Signature Analysis, Overview of Mobile Forensics, Network Forensics, Cloud Forensics and Malware Analysis.

UNIT 5:

Introduction to IT Act 2000, Basic terms and elements of the act. Amendmentsmade in IT Act. Electronic Governance, Certifying Authorities, Digital Signature and Electronic Signature Certificates, Case Study. LegalProcedure to gather information from Outside India.

Suggested Readings

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

Course outcome:

1. Understand the different theoretical and cross-disciplinary approaches (criminological, political, legal and information security/management) to the study of cyber-security and the regulation of the Internet and the Internet of Things.
2. Investigate assumptions about the behavior and role of offenders and victims in cyberspace, and use basic web-tools to explore behavior on-line.
3. Analyze and assess the impact of cybercrime on government, businesses,individuals and society.
4. Evaluate the effectiveness of cyber-security, cyber-laws (e.g. the Budapest Convention) and other countermeasures against cybercrime and cyber warfare.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	S	M	S
CO 3	S	S	S	S
CO 4	S	S	M	M

S- Strong, M- Medium, L- Low

CORE COURSE XII

Course Title : Cyber Crime and Cyber Law Lab

Course code : 21UFS5C12 **Maximum marks : 60**

Exam hours: 3

Learning Objectives:

a. How to respond to a cybercrime scene.

b. Various tools and techniques to analyze digital evidences.

c. To trace e-mails.

d. How to prepare a formal report.

Practical:

1. To identify, seize and preserve digital evidence from crime scenes.
2. To write protect a system.
3. Extraction of files with the help og various softwares -FTK,AUTOPSY ETC..
4. To identify encrypted and hidden files.
5. Analysis of metadata of files.
6. Analysis of graphic files - steganography.
7. Analysis of file systems and system registry.
8. To trace routes followed by e-mails and identify the IP address of the sender.
9. Case studies on digital/cybercrime – Reported Nationally and Internationally

Course outcome:

1. Respond to a cybercrime scene.
2. Gain the ability to perform various analysis on digital evidences.
3. Trace e-mails to the sender.
4. Prepare a report on Cybercrime case.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	S	M	M
CO 3	S	S	S	S
CO 4	S	S	S	S

S- Strong, M- Medium, L- Low

MAJOR BASED ELECTIVE I

Maximum marks : 75

Course Title : Forensic Anthropology

Course code : 21UFS5M1A

Exam hours : 3

Learning Objectives:

a. Importance of Forensic anthropology in identification of persons.

b. Different techniques of facial reconstruction and their Forensic importance.

c. Significance of Superimposition technique and its admissibility in court of law

d. Significance of Somatoscopy and Somatometry.

e. Significance of Forensic Odontology.

UNIT 1: Significance of Forensic Anthropology

Scope of Forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, differentiation of sex, estimation of stature from skeletal remains.

UNIT 2: Personal Identification – Somatoscopy and Somatometry Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasalbridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges,physiognomic ear breadth, circumference of head. Scar marks and occupationalmarks. Somatometry – measurements of head, face, nose, cheek, ear, hand andfoot, body weight, height. Indices - Cephalic index, nasal index, Cranial index,upper facial index. Facial reconstruction- Introduction, Steps and Importance.

Case study.

UNIT 3: Forensic Odontology

Definition and scope of odontology. Teeth- primary and secondary. Estimation ofage from teeth. Dental charting. Bite marks. Forensic significance of bite marks.

Collection, preservation, photography and comparision of bite marks evidence.Legal aspects of bite marks.

Practicals

1. To study identification and description of bones and their measurements.
2. To determine of age from skull and teeth.
3. To differentiate sex from skull.
4. To differentiate sex from pelvis.
5. To investigate the differences between animal and human bones.
6. To perform somatometric measurements on living subjects.
7. To carry out craniometric measurements of human skull.
8. To estimate stature from long bone length.

Suggested Readings

1. Narayan Reddy, The Essentials of Forensic Medicine and Toxicology, 34thEdition (2017)
2. C.K Parikh, Textbook of Medical Jurisprudence and Forensic Toxicology, 6thEdition, (2007).
3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime SceneInvestigation, CRC Press, Boca Raton (2013).
4. British Pharmacopeia
5. Indian Pharmacopeia
6. Warren, The Forensic anthropology laboratory, CRC Press (2008).
7. Henry gray, Gray's anatomy for students.
8. Pickrin and Bachman, Use of Forensic anthropology.

Course Outcomes:

1. Reconstruct a basic biological profile from a set of human skeletal remains.

2. Recover Forensic evidence using archaeological methods as part of a mockexcavation in the field.
3. Describe, explain, and critically evaluate methods used in Forensic Anthropology.
4. Discuss and construct an academic argument around an issue/issues in ForensicAnthropology and Archaeology case(s).
5. Understand the importance of bite-mark evidences.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**S**	**S**	**M**
CO 3	**M**	**S**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**
CO 5	**S**	**S**	**M**	**S**

S- Strong, M- Medium, L- Low

Course Title : DNA Forensics

Course code : 21UFS5M1B

Learning Objectives:

a. *The basic principle of DNA analysis.*

b. *The Forensic significance of DNA typing.*

c. *The importance of Short Tandem Repeats and Restriction Fragment LengthPolymorphism in DNA technique.*

d. *Role of DNA typing in disputed paternity and maternity testing, child swapping,kidnapping, murder, rape cases and immigration cases.*

UNIT 1: Basic Principles DNA as biological blueprint of life.

Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence. Restriction Fragment Length Polymorphism (RFLP), Short Tandem Repeats (STR) – role of fluorescent dyes, nature of STR loci, genetic markers, typing procedure and interpretation of results. Touch DNA.

UNIT 2: Forensic DNA Typing .

Extraction, amplification and identification of STR allies using Genetic analyzer.

UNIT 3: Parentage Testing, Principles of heredity and Individual Identification.

Genetics of paternity. DNA testing in disputed paternity. Mandelian laws of parentage testing. Mathematical basis of parentage identification. Missing body cases. Reference populations and databases. Allele frequency determination.

Hardy-Weinberg law. Probability determination in a population database.

Practical:

1. To carry out extraction of DNA from various body fluids.
2. Preparation of gel plates for electrophoresis.

3. To discuss case studies on the role of DNA typing in solving paternity andmaternity disputes.
4. Case studies on role of DNA typing in identifying unrecognizable bodies.
5. Case studies on Touch DNA.

Suggested Readings

1. J M butler, Advanced topics in forenics DNA typing - Methodology
2. J M butler, Fundamentals of Forensic DNA typing
3. J M butler, Forensic DNA typing - biology, technology and gentics of STRmarkings
4. J M butler, Advanced topics in forenics DNA typing – Interpretation
5. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime SceneInvestigation, CRC Press, Boca Raton (2013).

Course Outcomes:

1. Explain the key concepts in population, evolutionary and quantitative genetics including: the basis of genetic variation; heritability; Hardy- Weinberg Equilibrium; roles of migration, mutation.
2. Understand the range of molecular laboratory techniques used routinely in humanForensic analysis and population genetic analysis including sex typing, DNA profiling, Single Nucleotide Polymorphism (SNP) detection and DNA sequencing.
3. Perform by hand, calculator and computer software the statistical analysis of genetic data relevant to Forensic, conservation, quantitative and evolutionary genetics, and summarize and interpret the outcomes.
4. Understand the importance of DNA based evidences in various types of crimes.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**S**	**S**	**M**
CO 3	**M**	**S**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

Course Title : Accident Investigation

Course code : 21UFS5M1C

Learning Objectives:

a. The basic principle of motor vehicle accidents.

b. The Forensic significance of tyre marks, skid marks and scuff marks.

c. The various types of injuries resulting from accidents.

d. The importance of Tachographs.

UNIT 1: Motor Vehicle Accidents Accident scene.

Sources of Forensic information. Eyewitness accounts, Locard's principle Extent of vehicle damage. Examination of vehicular lights, Visibility conditions. Photographs of accident site. Estimation of speed. Tyre marks, skid marks, scuff marks. Maintenance of vehicles. Abandoned vehicles. Importance of air bags. Railway accidents.

UNIT 2: Accident Analysis

Pre-crash movement. Post-crash movement. Collision model. Gauging driver's reaction – Breathe analyzer, Occupant's kinematics. Types of injuries resulting from accident – Fake or real for clamming insurance. Hit and run investigations.Trace evidence at accident sites.

UNIT 3: Tachographs: Forensic significance.

Tachograph charts. Principles of chart analysis. Accuracy of speed record. Tyre slipeffects. Falsification and diagnostic signals. Route tracing.

Practical:

1. To lift tyre marks.
2. To study the pattern of skid marks.
3. To study the pattern of scuff marks.
4. To estimate the speed of the vehicle from skid marks.

5. Popular case study.

Suggested Readings

1. T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York(1988).
2. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
3. T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
4. S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

Course Outcomes:

1. Differentiate between an accident and incident;
2. Apply an understanding of the different steps of an investigation process;
3. Describe the roles and responsibilities of an investigator;
4. Detail the responsibilities of operators and other authorities within investigations;
5. Apply appropriate methods and protocols by which to collect and analyse evidencewithin an investigation

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**M**	**S**
CO 2	**S**	**S**	**S**	**M**
CO 3	**S**	**M**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**
CO 5	**S**	**M**	**S**	**S**

S- Strong, M- Medium, L- Low

SKILL-BASED ELECTIVE I

Maximum marks : 75
Exam hours : 3

Course Title : Forensic PhotographyCourse code : 21UFS5S1A

Learning Objectives:

a. The basics of camera and photography.

b. To know about the various techniques used in photography.

c. The importance of Photogrammetry.

d. The importance of videography.

e. The importance of photography in crime scene investigations.

UNIT 1: Introduction

Definition of photography, Introduction to Photography, photographic instruments: light sources, types of camera and lenses, optical filters, Cameras and its working fundamentals of light and vision, Basic principles and techniquesof Black & White and color photography. Spectral sensitivity of photographic materials, Concepts of colored photography, Camera exposure determination.

UNIT 2: Techniques

Linkage of cameras and film negatives, Modern developments in photography,digital photography. Image sensors, photo shop-development- digital images processing and manipulation- forensic application. Basic concepts of videography/high speed videography.

UNIT 3: Crime Scene Photography

Crime scene photography, photomicrography, macro photography, photography of fingerprints and documents, IR and UV photography, photogrammetry, crime scene videography / high speed videography, and laboratory photography, Courtrepresentation and admissibility in court of law.

Suggested Readings

1. D.R. Redsicker, The Practical Methodology of Forensic Photography, 2nd Edition,CRC Press, Boca Raton (2000).
2. Duncan, Advanced crime scene photography.

Course Outcomes:

1. Understand the general concepts of Photography.
2. Gain Knowledge about different components of camera.
3. Importance of photography and videography in Crime Scene Management.
4. Understand the principles and concepts involved in Photogrammetry.
5. Issues relating to admissibility of photographs in court of law.

Course Title : Biometry

Course code : 21UFS5S1B

Learning Objectives:

a. The basis of biometry.

b. The classification of Biometric processes.

c. The importance of behavioral Biometry.

d. The importance of physiological Biometry.

UNIT 1: Fundamental Aspects

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

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

UNIT 2: Physiological Biometrics

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

UNIT 3: Behavioral Biometrics

Handwriting, signatures, keystrokes, gait and voice.

Suggested Readings

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

Course Outcomes:

1. Understand the general concepts of Biometrics.
2. Gain knowledge of various Biometric systems.
3. Understand the working of different Biometric systems.
4. Importance of behavioral and physiological biometry.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**M**	**S**	**M**
CO 3	**M**	**M**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**
CO 5	**S**	**S**	**M**	**S**

S- Strong, M- Medium, L- Low

Course Title: Audio and Video Analysis & Speaker Recognition

Course code: 21UFS5S1C

Learning Objectives:

a. The uniqueness of voice.

b. The inter and intra-speaker variation and their importance in speaker recognition.

c. To know the various types of alterations done to Audio and Video evidences.

d. Basic features of audio and video analysis.

UNIT 1: Audio Analysis

Sound recording and Playback devices: Analog tape recorders, Digital tape recorders, Microphone and its types. Advantages and disadvantages. Handling of audio recording evidences and its physical examination. Marking of speakers, Procedure for preparation of working copies. Authentication and its significance:Types of alterations.

UNIT 2: Video Analysis

Introduction to video technology: Video formats, recording formats- analog and digital. Video devices. Linear and non-linear editing, Forensic Video analysis, establishing the authenticity of video recordings, Processing of video media, Capturing, Enhancement techniques, Specific frame analysis, Resolution, Imageanalysis. CCTV working and its importance. Case study.

UNIT 3: Speaker Recognition

Voice production theory, uniqueness in person's voice, Scope of voice analysis, collection of standards for comparison. Acoustic parameters of sound, analogue to digital conversion, Frequency and time domain representation of speech signal,Fast Fourier transform. Speaker recognition- approaches to speaker recognition, speaker profiling, and enhancement of speech signal/audio recordings. Interpretation of voice evidence and Elaborate on cases reported.

Suggested Readings

1. Phil Rose, Forensic Speaker Identification, CRC Press (2003).
2. Ray D. Kent, Charles Read, Acoustic Analysis of Speech, 2nd Edition.
3. Nirmala Devi

Course Outcomes:

1. Critically evaluate different methodologies used in forensic voice/text comparisons.
2. Demonstrate high level analytical skills required for forensic voice/text comparisons.
3. Carry out forensic voice/text comparison experiments with a small set of data.
4. Present the outcomes in a written and/or oral format.
5. Exercise higher-level critical thinking and judgment in identifying and solvingproblems related to forensic voice/text comparisons

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**M**	**S**
CO 2	**S**	**S**	**S**	**M**
CO 3	**M**	**M**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**
CO 5	**S**	**M**	**M**	**S**

S- Strong, M- Medium, L- Low

SKILL-BASED ELECTIVE

SKILL BASED ELECTIVE-II

Maximum marks: 75
Exam hours : 3

Course Title : Tools and Impression analysisCourse code : 21UFS5S2A

Learning Objectives:

a. Understand the different types of tools and impressions made by them.

b. Factors affecting the impressions.

c. The importance of restoration of erased markings.

d. The various types of impressions found on firearm evidences.

e. The significance of impression evidence.

UNIT 1: Tool marks

Introduction. Tool mark evidence. Classification of tool marks. Forensicimportance of tool marks. Collection, preservation and matching of tool marks. Restoration of erased serial numbers and engraved marks.

UNIT 2: Firearm tool marks

Introduction. Different types of tool marks seen in firearm evidences. Classification. Comparison. Importance and significance in forensic science.

UNIT 3: Other Impressions

Seal impressions- Introduction, comparison, significance. Tyre impressionsIntroduction, comparison and significance.

Suggested Readings

1. Max Houck, Firearms and Tool marks Examination and Identification, 1stEdition.
2. David Baldwin, John Birkett, Owen Facey, Gileon Rabey, Forensic Examination and Interpretation of Tool Marks.
3. Nicholas Petraco, Color Atlas of Forensic Toolmark Identification, 1st Edition.

Course Outcomes:

1. Summarize differences between identifying, class, and individualizing characteristics.
2. Understand factors affecting impressions.
3. Explain the process of and perform physical comparisons.
4. Gain knowledge about significance of evidence.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**M**	**S**	**M**
CO 3	**S**	**M**	**S**	**M**
CO 4	**S**	**M**	**S**	**M**

S- Strong, M- Medium, L- Low

SKILL-BASED ELECTIVE

Course Title : Research Methodology and Statistics

Course code : 21UFS5S2B

Learning Objectives:

a. Understand the importance of Research.

b. Steps and methodologies involved.

c. Basics of Patent and Intellectual Property Rights.

d. Basic statistics- Measure of central tendency.

UNIT 1: Research

Introduction, objectives, characteristics, criteria of good research, scope and significance of research. The research cycle, the process involved in research. Problems in research. Types of research- descriptive, analytical, applied, fundamental, qualitative, quantitative, conceptual, empirical and others.

UNIT 2: Intellectual Property Rights, Patents and Trademarks Introduction to IPR and types. Patents- Introduction, conditions, what can andcannot be patented. Trademarks- Introduction, well-known marks, criteria andduration.

UNIT 3: Statistics

Definition, Basic terms of statistics- variable, constant, central tendency.Measure of central tendency- Mean, Median and Mode. Standard deviation.

Regression, Their advantages and disadvantages.

Suggested Readings

1. John W. Creeswell, Research Design: Qualitative, Quantitative and MixedMethods Approaches, 2nd Edition.
2. Matthew B. Miles, Qualitative Data Analysis: An expanded Source Book.

Course Outcomes:

1. Understand the process involved in research.
2. Understand the various types of Research Methodologies.
3. Importance of IPR, Patents and Trademarks.
4. Basic Statistical methods.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**M**	**S**
CO 2	**S**	**M**	**S**	**M**
CO 3	**M**	**M**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- low

SKILL-BASED ELECTIVE

Course Title : Handwriting Identification

Course code : 21UFS5S2C

Learning Objectives:

a. Important features in Handwriting identification.

b. Basis of handwriting characteristics.

c. Tools used in handwriting examination.

d. Significance of forensic documentation.

UNIT 1: Handwriting Identification

Basis of handwriting identification. Characteristics of handwriting – scope and application. Class and individual characteristics. Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting – physical, mechanical, genetic andphysiological.

UNIT 2: Handwriting Examination

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

UNIT 3: Handwriting Recognition

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

Suggested Readings

1. M. P. Caligiuri, The Neuroscience of Handwriting: Application for Forensic Document Examination, 1st Edition, (2012).
2. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts andPrinciples, Academic Press, London (2000).
3. Osborn, Problems of proofs.
4. Osborn, Mind of Juror.
5. Osborn, Questioned Document Problems.

Course Outcome:

1. Basic understanding of handwriting analysis.
2. Identifying various class and individual characteristics.
3. Significance of Handwriting analysis.
4. Use of various tools to analyse handwriting sample.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**M**	**M**	**S**
CO 2	**S**	**M**	**S**	**M**
CO 3	**M**	**M**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

THIRD YEAR SEMESTER

VI CORE COURSE XIII

Course Title : Forensic Medicine and Toxicology

Course code : 21UFS6C13 **Maximum marks : 75**

Exam hours : 3

Learning Objectives:

a. The duties of the first responding officer who receives a call on homicide orsuicide case.

b. The steps involved in processing the death scene.

c. The importance of ascertaining whether the crime was staged to appear assuicide or accident.

d. The stages of decomposition.

e. The importance of autopsy.

f. The significance of toxicological studies in Forensic science.

g. The classification of poisons and their modes of actions.

h. The absorption of poisons in body fluids.

UNIT 1:

Definition, History and scope of Forensic Medicine. Role of first responding officer. Approaching a crime scene of death. Documenting the death scene. Medical Jurisprudence. Post Mortem Changes- Rigor Mortis, Cadaveric Spasm, Putrefaction, Mummification, Adipocere formation. Handling buried body cases-search for buried bodies, methods of exhumation. Identification of various bones.Personal identification.

UNIT 2:

Death- Definition, types- natural and unnatural deaths. Suspended animation.

Modes of death – Coma, Syncope and Asphyxia. Manner of death and Cause of death. Medico-legal aspects and Forensic significance of asphyxia death, drowning, death due to starvation, electrocution, heat and cold. Asphyxia – Typesand classification. Medico-legal aspects Infanticide and foeticide. Signs of live birth, Determination of age of foetus.

UNIT 3:

Injuries- Types and classification. Antemortem and post mortem injuries. Aging ofinjuries.
Artificial injuries. Burns and scalds.

UNIT 4:

Poisons: Definition, Classification of poisons. Physico-chemical characteristics and mode of action of poisons, route of administration. Elaboration on Accidental, suicidal and homicidal poisonings. Insecticides and Pesticides. . .

Signs and symptoms of common poisoning and management of poisoning cases. Collection and preservation of viscera, blood and urine for various poison cases. Beverages: Types of alcoholic and nonalcoholic, Illicit liquors. Symptoms, analysis and tests of alcohol. Estimation of ethyl alcohol in blood and urine.

Drugs of abuse-Introduction, Classification. Symptoms and Antidotes. Radioactive poisoning, Anthrax poisoning. Date-rape drugs.

UNIT 5:

Toxicology- Introduction, definition, characteristics of exposure, spectrum of toxic effects. Basic steps of analytical Toxicology. Significance of toxicological findings. Techniques used in Toxicology. Human performance Toxicology. Extraction from visceral samples. Stass-Otto Method. Basic tests for identification of common poisons. Post Mortem findings in poisoning cases. Pharmacology-Introduction, Definition, Scope of Forensic Pharmacological studies, Absorption, Distribution, Metabolism and Excretion (ADME) of drugs.

Pharmacokinetics and Pharmacodynamics. Dose-response relationship. Lethal dose 50 and effective dose 50.

Suggested Readings

1. Narayan Reddy, The Essentials of Forensic Medicine and Toxicology, 34th Edition (2017) 2. C.K Parikh, Textbook of Medical Jurisprudence and Forensic Toxicology, 6th Edition, (2007).

3. K. Smyth, The Cause of Death, Van Nostrand and Company, New York (1982).

4. Casserats and Doulls

5. Dictionary of Forensic

6. J. Singh. Modi

7. Paul Krik, Crime Investigation

8. M. Bernstein, Forensic odontology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

9. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton(1999).

Course outcome:

1. Gain knowledge on various aspects of Forensic Medicine.
2. Understand the basis of presumptive and confirmation testing, and compare andevaluate the use of a variety of biological matrices in toxicological analysis
3. Discuss the pharmacological characteristics and analytical considerations ofseveral major drugs classes commonly encountered in Forensic Toxicology
4. Explain how pharmacokinetic/ pharmacodynamic parameters can be used tointerpret toxicological findings
5. Summarize the role of Forensic Toxicology in areas such as sports drug testingand drug facilitated sexual assault cases.

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**S**	**S**	**M**
CO 3	**M**	**S**	**S**	**S**
CO 4	**S**	**S**	**S**	**S**

S- Strong, M- Medium, L- Low

CORE COURSE XIV

Course Title : Forensic Medicine and Toxicology Lab

Course code : 21UFS6C14P **Maximum marks : 60**

Exam hours : 3

Learning Objectives:

a. To know the various stages of decomposition.

b. To differentiate and identify various types of injuries.

c. To perform tests to identify various poisons.

d. Basic chemical tests to identify various types of drugs and poisons.

Practical:

1. To identify different stages of decomposition.
2. Case studies reported on infanticide / foeticide.
3. To identify and report on the different types of injuries.
4. To identify ethyl alcohol.
5. To identify methyl alcohol.
6. To identify metallic poisons from food samples.
7. To identify organic poisons from food samples.
8. To perform color tests for acidic and basic drugs.
9. Case studies on metallic poisons.
10. To perform color tests for pesticides.
11. To discuss case studies on methanol poisoning.

Course outcome:

1. Gain knowledge and the ability to identify various stages of decomposition.
2. Ability to differentiate between various types of injuries.

3. Perform various color tests for different types of drugs and poisons.

4. Identify the presence of pesticides.

MAPPING WITH PROGRAMME OUTCOMES

COS/POS	PO1	PO2	PO3	PO4
CO 1	S	S	S	M
CO 2	M	S	M	M
CO 3	S	S	S	S

S- Strong, M- Medium, L- Low

CORE COURSE XV Advanced Forensic Psychology

Course code : 21UFS6C15 **Maximum marks : 60**

Exam hours : 3

Learning Objectives:

a. *The overview of Forensic Psychology and its applications.*

b. *The legal aspects of Forensic Psychology.*

c. *The significance of criminal profiling.*

d. *The importance of psychological assessment in gauging criminal behavior.*

e. *The tools and techniques required for detection of deception.*

f. *The critical assessment of advanced Forensic techniques like Polygraph, Narco analysisand brain electrical oscillation signatures*

g. *The elements of substance abuse disorders, delusional disorders and personalitydisorders.*

UNIT 1:

The relationship between Forensic Psychology and Law. Development of Forensic Psychology. Ethical issues in Forensic Psychology. Importance of assessments in civil and criminal cases. Mental disorders and Forensic Psychology. Psychology of evidenceWitnesstestimony, Confession and Statement verification.

UNIT 2:

Crime and Psychopathology. Biological factors and crime – social learning theories, psychosocial factors, abuse. Juvenile delinquency – theories of offending (social cognition,moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies. POCSO Act. Delusional disorders. Meaning, Symptoms, Treatment and Outcome. Personality disorders- Cluster A, B and C.

UNIT 3:

Introduction, Definition, History, Types of profiling – Inductive and Deductive, its advantages and disadvantages. Steps and approaches to Offender profiling. Geographical profiling. Salient features of Serial murderers. Case study. Profiling of sexual offenders. Paraphilias. Assessments- Introduction, Classification, Hypothesis formulation, Data gathering- Interview, psychometric assessment, Data analysis -Reliability, Validity, Specificity, Sensitivity. Importance in Forensic Scenario.

UNIT 4:

Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis. Polygraph – 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. A critical review of Supreme Court on Polygraph and Narco analysis. BEOSP- brain electrical oscillation signatures

UNIT 5:

Alcohol Abuse and Dependence- Clinical picture, Causes, Treatment and Prevention. DrugAbuse and Dependence- Types: Narcotics, Sedatives, Stimulants, Hallucinogens.

Clinical picture, Causes, Treatment and Prevention.

Suggested Readings

1. David A. Crighton and Graham J. Towl, Forensic Psychology, 2nd Edition, Wiley(2010).
2. Scott-Snyder, Introduction to Forensic Psychology: Essentials for Law Enforcement, (2016). 3. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidencein Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
4. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
5. J.C. DeLadurantey and D.R. Sullivan, Criminal Investigation Standards, Harper & Row, New York (1980).
6. J. Niehaus, Investigative Forensic Hypnosis, CRC Press, Boca Raton (1999).
7. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
8. J. Singh Modi

9. Crime investigation, Paul Krik

Course outcome:

1. Describe the contribution of Psychology at all levels of the criminal justice system (i.e., from interviewing witnesses and suspects of crime, to jury decision making, to the incarceration and rehabilitation of offenders, to lie detection etc.)
2. Demonstrate an awareness of basic theory, research findings and methods of investigation used in Forensic Psychology
3. Evaluate current knowledge of psychological motivation towards violent and sexual behavior.
4. Gain in-depth knowledge of Criminal Profiling Evaluate current knowledge of psychological motivation towards violent and sexual behavior.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**S**	**S**	**S**
CO 3	**M**	**M**	**S**	**S**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

Economic Offences

Course code : 21UFS6M2A

Learning Objectives:

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 1: 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. Corruptionand 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 humans and organs. Cultural objects trafficking. Role of NCRB, NCRB crime rates in India. Racketeering in employment. Racketeering in false travel documents.

UNIT 2: Applied Economics in Processing Evidence

Basics of Forensic accountancy and Forensic auditing. Valuation of Economic losses.Violation of Intellectual Property Rights.

UNIT 3: Prevention of Economic Offences, Legislations to deal with different formsof Economic offences.

RBI Act. SEBI Act. Competition Commission of India Act. Credit card frauds. Enforcementagencies to deal with different forms of Economic offences. International perspectives – measures adopted by FBI and INTERPOL. Cases related to Economic offences.

Practical

1. To prepare a draft on fraudulent bankruptcy.
2. To cite a case of money laundering and hawala transactions in India and prepare a note onit.
3. To cite a case involving bank fraud and suggest measures to prevent such crimes.
4. To study a case involving illicit drug trafficking and trace the route by which the item wasbeing smuggled.
5. To prepare a report on trafficking of heritage artefacts, including religious deities in India.
6. To study the applications of accounting software.
7. To study the applications of TELLY software.
8. To review the legislative measures to deal with a particular Economic offence, identifyingthe loopholes and suggesting ways to plug the loopholes.
9. To prepare a Schedule of National agencies involved in curbing Economic offences.Outline their specific duties.

Suggested Readings

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

Course Outcomes:

1. Understand Economic and financial terminologies.
2. Gain knowledge on various types of Economic offences and their consequence.
3. Prevention of Economic crimes.
4. Identify crimes linked with Economic crimes in India.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	S	S	M	S
CO 2	S	S	S	S

CO 3	**M**	**M**	**S**	**S**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

Fire and Explosives Investigation

Course code: 21UFS6M2B

Learning Objectives:

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.

b. The method of searching, collecting, preserving and analyzing arson evidence.

c. The classification of explosives, including the synthesis and characterization ofrepresentative analogs.

d. The significance of bomb scene management.

e. The techniques of locating hidden explosives

UNIT 1: Fire and Arson

Chemistry of fire. Conditions for fire. Fire scene patterns. Location of point of ignition. Recognition of type of fire. Searching the fire scene. Collection and preservation of arson evidence. Analysis of fire debris. Analysis of ignitable liquid residue. Post-flashoverburning.

Scientific investigation and evaluation of clue materials. Information from smoke staining.Insurance claim cases.

UNIT 2: Petroleum and other Accelerants

Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Adulteration. Cases reported. Other commonly used accelerants and their properties.

UNIT 3: Explosives Substances

Classification of explosives – low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents. Synthesis and characteristics of TNT, PETN and RDX.Explosion process. Blast waves. Bomb scene management. Searching the scene of explosion. Mechanism of explosion. Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives,

Practical:

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To analyze arson accelerators.
5. To perform color tests for explosives.
6. A case study report on arson case.
7. Analyze the difference between arson and fire cases.
8. A case study report on bomb blast.

Suggested Readings:

1. Jean Ford, Explosives & Arson Investigation.
2. James B. Crippin, Explosives and Arson.

3. Alexander Beveridge, Forensic Investigation of Explosions, 2nd Edition 4. Textbook ofQuantitative analysis

5. Kirk's fire investigation

6. Crime investigation, Paul L Kirk

7. J. S Modi

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	**S**	**S**	**M**	**S**
CO 2	**S**	**S**	**S**	**M**
CO 3	**M**	**S**	**S**	**M**
CO 4	**S**	**S**	**S**	**M**

S- Strong, M- Medium, L- Low

Course Outcomes:

1. Understand the applicable codes and standards related to Forensic investigations
2. Understand the legal frameworks in which Forensic investigations take place
3. Understand notable fire events
4. Have an ability to apply fire dynamics to Forensic investigations
5. Understand the basic terminology and techniques involved in Forensic investigations

Wildlife Forensics

Course code : 21UFS6M2C

Learning Objectives:

a. Importance of wildlife.

b. The list of animals facing threat due to wildlife crimes.

c. To know the various agencies involved in conservation of wildlife.

d. Elements of Wildlife Protection Act.

e. How wildlife Forensics aid in conserving natural resources.

UNIT 1: Introduction

Introduction to wildlife. Common terms related to wildlife. Importance of wildlife. Conceptof wildlife crime. The current scenario of illegal wildlife trade in India and the world. The steps involved- from capturing wildlife to the selling of the goods in black markets.

UNIT 2: Agencies and Law

The list of agencies involved and their function in combating wildlife crime- IUCN, CITES,TRAFFIC, WTI, Wildlife crime Control Bureau, WII, ZSI, CCMB, Institute of wood science and technology, FSL. Wildlife Protection Act.

UNIT 3: Wildlife Crime Scene

Search and seizure, documentation, types of evidences found, crime scene sketch, collectionand packaging, chain of custody. Forensic Significance. Wildlife investigation team and roleof each member.

UNIT 4: Genetics and Wildlife conservation

Introduction to genetics. Species identification, Mitochondrial DNA. Importance of geneticsin wildlife protection and conservation. Case elaboration.

Suggested Readings:

1. Linacre & Tob, Wildlife dna analysis: applications in Forensic science.
2. Jane E. Huffman, John R. Wallace, Wildlife Forensics: Methods and Applications, 1st Edition.

Course Outcomes:

1. Understand the historical context of the development of wildlife conservation, and anunderstanding of what constitutes wildlife crime.
2. Understand the significance of international trade in wildlife and a knowledge of the mainprovisions of CITES.
3. Have a knowledge of what types of activities are incorporated under the term "poaching",and of the legislation which exists to combat it.
4. Be aware of the law relating to the cruelty and persecution of animals and to habitatprotection.

MAPPING WITH PROGRAMME OUTCOMES

Cos/Pos	PO1	PO2	PO3	PO4
CO 1	S	S	M	S
CO 2	S	S	S	M
CO 3	M	S	S	M
CO 4	S	S	S	M

S- Strong, M- Medium, L- Low

MAJOR BASED ELECTIVE III

Course Title : Dissertation

Course code : 21UFS6M3A **Maximum marks : 75**

Exam hours : 3

The dissertation will be based on a research topic in Forensic Science/Criminology. The topic will be assigned in consultation with police, giving due consideration to the problem areas faced by these institutions. The students will be expected to undertake extensive fieldwork.

Course Title : Digital and Cyber Forensics Lab

Course code : 21UFS6M3B **Maximum marks : 75Exam hours : 3**

The students will undertake certain projects pertaining to Digital and Cyber Forensics.The projects will be assigned in consultation with respective departments experts.

Course Title : DNA Analysis Lab

Course code : 21UFS6M3C **Maximum marks : 75Exam hours : 3**

The students will undertake certain projects pertaining to DNA Analysis. The projects willbe assigned in consultation with respective departments experts.