UG. Forensic Science(4 Years Honors)
CBCS - 2020-21

B.Sc
Forensic Science

Syllabus and Model Question Papers

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Note: BOS is to provide final soft copy in PDF and word formats and four copies of hard copies in bounded form to the office of Dean Academic affairs.

1. Resolutions of the Board of Studies

Meeting held on: 22/01/2021.Time: 10:00 AM
At: Adikavi Nannaya University, NTR Convention Centre, Rajamahendravaram.

Agenda: Revision of Syllabus of B.Sc. Forensic Science, as per the guidelines and model curriculum provided by APSCHE for implementation from 2020-21 admitted batches.

Members present:

BOS-Chairman: Dr. D. Kalyani, Asst. Professor,
ANUR Members: Mr. E. Mohan, Principal, Aditya Degree College

Resolutions:

The Board of Studies members of B.Sc. Forensic Science thoroughly discussed on Forensic Science course structure, framing of syllabus, eligibility of students, qualifications of teachers and career prospects of the students.

The following were the resolutions made in the meeting. It was resolved

1. It was resolved to adopt revised common programme structure as per the guidelines issued by APSCHE.
2. Resolved to adopt regulations and scheme of examinations and marks/grading system of the university UG-Programmes.
3. Resolved to prepare model question Courses in the given prescribed format.
4. Resolved to prepare a list of equipment/software required for each Lab/Practicals.
5. Resolved to give the eligibility criteria for students for joining the course.
6. Resolved to give the eligibility criteria for faculty for teaching the course.
7. Resolved to prepare a list of Course setter/Course evaluators/project evaluators in a given format

UG Program (4 years Honors) Structure (CBCS)

2020-21 A. Y., onwards
BACHLOR OF SCIENCE
(3rd and 4th year detailed design will be followed as per APSCHE GUIDELINES)

Subjects/ Semesters		I		II		III		IV		V		VI			
		H/W	C	H/W	C	H/W	C	H/W	C	H/W	C	H/W	C		
Languages												THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester		FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations).	
English		4	3	4	3	4	3								
Language (H/T/S)		4	3	4	3	4	3								
Life Skill Courses		2	2	2	2	2+2	2+2								
Skill Development Courses		2	2	2+2	2+2	2	2								
Core Papers															
M-1	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-2	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-3	C1 to C5	4+2	4+1	4+2	4+1	4+2	4+1	4+2 4+2	4+1 4+1						
M-1	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-2	SEC (C6,C7)									4+2 4+2	4+1 4+1				
M-3	SEC (C6,C7)									4+2 4+2	4+1 4+1				
Hrs/ W (Academic Credits)		30	25	32	27	32	27	36	30	36	30	0	12	4	4
Project Work															
Extension Activities (Non Academic Credits)															
NCC/NSS/Sports/Extra Curricular									2						
Yoga							1		1						
Extra Credits															
Hrs/W (Total Credits)		30	25	32	27	32	28	36	33	36	30	0	12	4	4

M= Major; C= Core; SEC: Skill Enhancement Courses

Marks & Credits distribution: UG-Sciences

Sl. No	Course type	No. of courses	Each course teaching Hrs/wk	Credit for each course	Total credits	Each course evaluation			Total marks
						Conti-Assess	Univ-exam	Total	
1	English	3	4	3	9	25	75	100	300
2	S.Lang	3	4	3	9	25	75	100	300
3	LS	4	2	2	8	0	50	50	200
4	SD	4	2	2	8	0	50	50	200
5	Core/SE -I	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -II	5+2	4+2	4+1	35	25	75+50	150	1050
	Core/SE -III	5+2	4+2	4+1	35	25	75+50	150	1050
6	Summer-Intern	2		4	8		100	200	200
7	Internship/ Apprentice/ on the job training	1		12	12		200	200	200
		38			**159**				**4550**
8	**Extension Activities (Non AcademicCredits)**								
	NCC/NSS/Sports/ Extra Curricular			2	2				
	Yoga	2		1	2				
	Extra Credits								
	Total	**40**			**142**				

2. DETAILS OF COURSE TITLES & CREDITS

Sem	Course no.	Course Name	Course type (T/L/P)	Hrs./Week (Science:4+2)	Credits (Science:4+1)	Max. Marks Cont/Internal /Mid Assessment	Max. Marks Sem-end Exam
I	1	Introduction to Forensic Science & Criminology	T	4	4	25	75
		Forensic Science Lab	L	2	1		50
II	2	Crime Scene Management	T	4	4	25	75
		Crime Scene Management Lab	L	2	1		50
III	3	Questioned Documents &Finger Impressions	T	4	4	25	75
		Questioned Documents &Finger Impressions Lab	L	2	1		50
IV	4	Forensic Biology& DNA Fingerprinting	T	4	4	25	75
		Forensic Biology& DNA Fingerprinting Lab	L	2	1		50
	5	Forensic Chemistry & Ballistics	T	4	4	25	75
		Forensic Chemistry & Ballistics Lab	L	2	1		50
V	6A	Instrumentation	T	4	4	25	75
		Instrumentation Lab	L	2	1		50
	7A	Forensic Toxicology	T	4	4	25	75
		Forensic Toxicology Lab	L	2	1		50
	OR						
	6B	Forensic Psychology	T	4	4	25	75
		Forensic Psychology Lab	L	2	1		50
	7B	Narcotic Drugs & Psychotropic Substances	T	4	4	25	75
		Narcotic Drugs & Psychotropic Substances Lab	L	2	1		50
	OR						
	6C	Forensic Physics	T	4	4	25	75
		Forensic Physics Lab	L	2	1		50
	7C	Forensic Engineering	T	4	4	25	75
		Forensic Engineering Lab	L	2	1		50
	OR						
	6D	Forensic Medicine & Anthropology	T	4	4	25	75

		Forensic Medicine & Anthropology Lab	L	2	1		50
	7D	Wildlife Forensics	T	4	4	25	75
		Wildlife Forensics Lab	L	2	1		50

Note: *Course type code: T: Theory, L: Lab,

Note 1: For Semester–V, for the domain subject **Forensic Science**, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C or 6D&7D. The pair shall not be broken (ABC allotment is random, not on any priority basis).

Note 2: One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

Note 3: To insert assessment methodology for Internship/ on the Job Training/Apprenticeship under the revised CBCS as per APSCHE Guidelines.

- **First internship (After 1st Year Examinations):** Community Service Project. To inculcate social responsibility and compassionate commitment among the students, the summer vacation in the intervening 1st and 2nd years of study shall be for Community Service Project (the detailed guidelines are enclosed).
  - **Credit For Course: 04**

- **Second Internship (After 2nd Year Examinations):** Apprenticeship / Internship / on the job training / In-house Project / Off-site Project. To make the students employable, this shall be undertaken by the students in the intervening summer vacation between the 2nd and 3rd years (the detailed guidelines are enclosed).
  - **Credit For Course: 04**

- **Third internship/Project work (6th Semester Period):**
  During the entire 6th Semester, the student shall undergo Apprenticeship / Internship / On the Job Training. This is to ensure that the students develop hands on technical skills which will be of great help in facing the world of work (the detailed guidelines are enclosed).
  - **Credit For Course:12**

a. Proposed combination subjects: Chemistry & Cyber Forensics

b. Student eligibility for joining in the course:
Intermediate Examination (10+2) with Botany or Zoology or Mathematics and ChemistryOR
12th Standard (ICSE/CBSE with Science group)

c. Faculty eligibility for teaching the course:
M.Sc. in Forensic Science with minimum 60% or above in Forensic Science subjects (Minimum qualification); Ph.D. is desirable.

d. List of Proposed Skill enhancement courses with syllabus, if any

e. Any newly proposed Skill development/Life skill courses with draft syllabus and required resources.

f. Required instruments/software/ computers for the course:
(Lab/Practical course-wise required i.e., for a batch of 15 students)

Sem. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
1	Introduction to Forensic Science & Criminology	NA	NA	NA
2	Crime Scene Management	Digital Camera &Crime Scene Simulations General Crime Scene kit, Fingerprint kit, Casting kit, Various light sources	Nikon/Canon	4
	Questioned Documents & Finger Impressions	TLC, VSC,RUVIS,ESDA, Iodine Fuming Chamber, Cyanoacrylate Fuming Chamber, Fingerprint Development Powders	Regula/F&F/ Projectina F&F	1
3	Forensic Biology & DNA Fingerprinting	UV- Spectrophotometer, PCR, Stereo Microscope, Compound Microscope, Comparison Micrscope, Human Skelton, RFLP Kit	Schimadzu / Thermo/ Leica/ Olympus Magnus/Lawrence & Mayo Analytica/ Leica/Olympus	2
4	Forensic Chemistry & Ballistics	Stereo Microscope, Comparison Microscope, TLC,		

g. List of Suitable levels of positions eligible in the Govt./Pvt. organizations
Suitable levels of positions for these graduates either in industry/govt. organization like., technical assistants/ scientists/ school teachers., clearly define them, with reliable justification

S.No	Position	Company/ Govt. organization	Remarks	Additional skills required, if any
1	Scientific Assistant	CFSL/State FSL/ Regional FSL/CDTI	Upgrade their skills and get promoted	Communication skills Language skills Computational skills
2	Crime Scene Officer	Clues Team/ Crime Spot	,,	,,
3	Lab Assistant	CFSL/State FSL/CDTI	,,	,,
4	Cyber Crime analyst	CFSL/State FSL	,,	,,
5	Record Assistant	State or District Crime Records Bureau	,,	,,
6	Lab Technician	Chemical Examiner's Laboratory	,,	,,
7	Forensic Faculty	Police Academies		
8	Forensic Faculty	Central Detective Training Institutes		
9	Cyber Expert	Cyber Security		
10	Cyber Security Expert	IT Companies		
11	Forensic Consultant	Forensic Consultancies		
12	Document Expert	Banks		

h. List of Govt. organizations / Pvt. companies for employment opportunities or internships or projects

S.No	Company/ Govt organization	Position type	Level of Position
1	Central / State FSLs	Intern/Project Assistant	Basic (can be upgraded)
2	FPB/NCRB	Intern/Project Assistant	Basic (can be upgraded)

i. Any specific instructions to the teacher /Course setters/Exam-Chief Superintendent:
Course setter may strictly follow the syllabus and blue print of question Course while setting the Course.

Course evaluators may strictly follow the scheme of evaluation.

3. Program objectives, outcomes, co-curricular and assessment methods

B.Sc.	Forensic Science

1. Aim and objectives of UG program in Subject:
   a. Students will understand history of forensic science, development and its role in criminal investigation.
   b. Application of a computer to everyday tasks using standard procedures
   c. Need to effectively protect and process various physical evidences at SoC
   d. Documents and finger impressions can be used for the identification of culprit.
   e. How to protect ourselves from various kinds of cyber attacks
   f. Importance of biological evidences encountered in crime scene investigation.
   g. Applications of Chemistry and Ballistics for criminal investigation
   h. Investigation techniques, requirement and analyzing of digital evidences are covered.
   i. Mobile devices and its analysis in solving the crimes.
2. Learning outcomes of Forensic Science :
   After successful completion of B.Sc. Forensic Science, students will be able to answer the importance of forensic science in solving the crimes through the scientific investigation of crime scene and analysis of various physical evidence including digital evidence.
3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class-cum-lab work
4. Recommended Co-curricular activities: (Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)
   A. Measurable:
      1. Assignments on: Crime Scene Management, Questioned Documents & Finger Impressions
      2. Student seminars (Individual presentation of Courses) on topics relating to: Cyber Security, Digital Forensics, Mobile Forensics
      3. Quiz Programmes on: Forensic Biology & DNA Fingerprinting, Chemistry & Toxicology
      4. Individual Field Studies/projects: Crime Scene Management
      5. Group discussion on: Digital Forensics, Mobile Forensics
      6. Group/Team Projects on: Crime Scene Management, Questioned Documents & Finger Impressions, Forensic Biology & DNA Fingerprinting, Chemistry & Toxicology, Cyber Security, Digital Forensics, Mobile Forensics

   B General
      1. Collection of news reports and maintaining a record of Course-cuttings relating to topics covered in syllabus
      2. Group Discussions on: Crime Scene Management, Digital Forensics, Mobile Forensics
      3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
      4. Any similar activities with imaginative thinking.
5. Recommended Continuous Assessment methods: Workshops, Conferences & Course presentations to be conducted regularly.

DETAILS OF COURSE-WISE SYLLABUS

4. Details of course-wise Syllabus

B.Sc.	Semester: I	Credits: 4
Course: 1	Introduction to Forensic Science & Criminology	Hrs/Wk: 4

Aim and objectives of Course: Students will understand history of forensic science, development and its role in criminal investigation.

Learning outcomes of Course: After studying this course the students will know-

- The significance of Forensic Sciences to the Criminal Justice System.
- The working conditions of Forensic Science Laboratory.
- The importance of criminology and penology for crime detection.
- The working of Indian courts and role of criminal justice system in crime detection.

UUNIT I:

Forensic science- Introduction – History & Development in India & Worldwide. Basic terminology. Principles of Forensic science with Examples - Allied institutions - CFPB, BPR&D, CDFD, CDTI, NIA, CCMB, LaCONES, IICT, NIN, NCB. Different agencies involved in Crime Detection- History-Development of- Police, Central Bureau of Investigation (CBI), Crime Investigation Department (CID), Intelligence Bureau (IB), Research & Analysis Wing (RAW), CRPF, BSF, SPG etc.

Forensic Science Laboratories - DFSS, SFSL, CFSLs. Various Divisions of FSLs- Functions and types of cases dealt in various divisions, ISO-17025, NABL Accreditations, etc. Opinion/ Reports from FSL's.

UNIT II:

Criminal Justice System in India- Introduction, Administration of Civil and Criminal Laws. Introduction to constitution of India- Fundamental Rights, Indian Penal Code (IPC), Criminal Procedure Code (Cr. PC), Indian Evidence Act (IEA), IT Act-2000, Wild Life Protection Act-1972, POCSO Act, etc. Indian Courts- Introduction, Hierarchy of courts- Powers of courts, types of courts, Lok Ayukta & Lok Adalat, etc. Role and responsibilities of Public Prosecution – Defense Council -Admissibility of Expert Testimony.

UNIT III:

Instrumentation: Introduction, Working Principle & Applications of various Instruments / Techniques used in Forensic Science – TLC, HPLC, GC, GC-MS, LC-MS, Microscopes-Stereo, Comparison, SEM, TEM, VSC, RUVIS, AAS, AES, EMR, Cyanoacrylate Fuming Chamber, Iodine Fuming Chamber, UV-Spectrophotometer, PCR, etc.

UNIT IV:

Criminology – Introduction - Definitions, Development and Scope of Criminology. Crime – Definitions, Characteristics and Classification of Crime: Classification by Pioneers, Classification under law: IPC. Professional & Organized Crime: Characteristics and Types.

Penology- Introduction- Punishment: Definition, Types and Theories of Punishment. Institutional system of correction: Prison – types, Functions – Prison Labor, Prison Education and Prison Discipline. Non-Institutional system of correction: Probation & Parole - Principles, advantage & Limitation. Victimology: Definition, Historical developments. Classification of Victims, Victimizing factors & Restitution.

UNIT V:

Criminal Psychology: Introduction, Definition & Scope. Mc. Naughten Rule, Insanity in IPC, Sensation and Perception. Gestalt principle of perceptual process. Personality – definition, traits and approaches. Freuds psychoanalytical theory. Personality disorders, delusional disorder, anti-social personality. Psychological Motives and its impact on behavior. Mental disorder and Mental deficiency as factor in the causation of Crime. Psychological methods of control and rehabilitation of offenders – Psychotherapy and counselling – Victims, Witnesses and Suspects. Polygraphy, Narcoanalysis& BEOS in the Criminal Justice System.

REFERENCE BOOKS:

1. Forensic Science in Criminal Investigation in trials – B.R.Sharma
2. Forensic Science in Criminal Investigation – Dr. (Mrs) Rukmani Krishnamurthy
3. Encyclopedia of Forensic Science Vol I, II& III, - Siegel.J.A , Sukoo.R.J and Knufer
4. Forensic Science: Advanced investigations, Cengage learning – Brown & Davenport.
5. Criminology The basics – Taylor & Francis – SandraWalklate
6. Criminology – Ram Ahuja
7. Criminal major acts – Padala Rama Reddi – Asian law house 27thedition
8. The Indian Penal code. 28th edition – Rattan lal and Dhirajlal
9. Forensic Science, Its Techniques & Court Evidence
10. An Interdisciplinary Approach to Forensic science – Dr. Praveen Kumar Janjua, Dr. G.Sunil Babu , Dr.Navjot Kaur Kanmai
11. Challenges to Internal Security of India – Ashok – Spectrum Publications

Suggested Co-Curricular Activities:

- Visit to FSL and Allied institutions.
- Quiz and seminars on Forensic Science.
- Jurisdiction & Powers of various courts in India.
- Study projects on instruments & techniques used in Forensic Science.
- Debate on Criminology & its importance
- Case studies and assignments on criminal psychology.

B.Sc.	Semester: I	Credits: 1
Course: 1	Forensic Science Lab	Hrs/Wk: 2

List of Experiments:

1. Experiments on Locard's principle of Exchange
2. Experiments on working principle of TLC, HPLC, GCMS, VSC, RUVIS.
3. Case studies - Civil and Criminal cases
4. Demonstration of Instruments and specimens
5. Internal – External locus of control scale

a. Self – Concept Questionnaire.

B.Sc.	Semester: II	Credits: 4
Course: 2	**Crime Scene Management**	Hrs/Wk: 4

Learning objectives: Crime scene is the key point for the entire investigation and this course emphasizes the need to effectively protect and process various physical evidences.

Outcomes: After studying this Course the students will know-.

- The importance of protection of crime scene.
- The significance of photography and videography at scene of crime.
- The importance of physical evidences.
- The Integrity of chain of custody.
- The role of crime scene reconstruction in crime investigation.

UNIT I:
Crime Scene- Definition, Types- Primary, Secondary & Tertiary. Crime scene safety: Golden rules, Types of hazards- Biological & Chemical. General precautions- Personal protective equipment. Processing of Crime Scene- Where, What & How to search. Search Methods – Strip/ Lane, Spiral, Wheel/Radial, Zone, Methods, etc.

UNIT II:
Crime Scene Photography & Sketching: Introduction, History -cardinal rules, Basic principles– Macro & Micro Photography- Forensic photogrammetry Variations of Photography- Mid range, Close-up, Aerial & over all Photography – EMR photographic techniques – SWGIT – Photo images as evidences – Documentation of Crime scene Photography – Forensic Videography. Sketching of Crime Scene- Rough Sketch & Fine Sketch- Rectangular Coordinate Method, Polar method, Baseline Method, Triangulation Method etc. optical methods of mapping, 3D laser Scanning.

UNIT III:
Physical Evidence- Definition, Importance, Types – Biological, Chemical, Digital Evidence and their handling- Identification of Physical Evidence - Trace Evidence. Type of information to be elicited from various types of Physical Evidence. General precautions while collecting Physical Evidence– Evidence collection equipments, techniques. Chain of Custody of Physical Evidence.

UNIT IV:
Packing Materials of Physical Evidence, Importance of Packing & Packing Materials. Sealing, Marking, & labelling of various physical evidence, Letter of Advice, Precautions while transporting Physical Evidence. General precautions - Types of Preservatives for various Physical Evidence- Biological, Chemical & Digital Evidence, etc.

UNIT V:
Crime Scene Reconstruction- Definition – Nature & Importance - Types of Crime Scene Reconstructions - Role of pattern analysis in reconstruction - Blood stain pattern, Glass fracture pattern, Fire burn or smoke patterns, Gait Pattern, Tyre impression patterns, Furniture pattern. Sequence of events – Recording, Documentation required for Crime Scene Reconstruction. CAD etc.

REFERENCE BOOKS:

1. Criminal Investigation - Karen M Hess & Christine Hess Orthmann.
2. Techniques of Crime Scene Investigation - Barry A.J. Fisher.
3. Criminal Investigation: The Art & the Science - Michael D.Lynn
4. Forensic Science in Criminal Investigation in trials – B.R.Sharma
5. Crime Scene Management – Dr.M.S.Rao & Dr.B.P.Mathil
6. Forensic Science in Criminal Investigation – Dr. (Mrs) Rukmani Krishnamurthy
7. Encyclopedia of Forensic Science Vol I, II & III, - Siegel. J. A, Sukoo. R. J and Knufer
8. Physical Evidence – Lee – Elsevier 2000
9. Forensic science: Advanced investigations, Cengage learning – Brown &Davenport.
10. Criminalistics – An introduction to Forensic science 5th edition –Saferstein
11. Introduction to criminalistics: Foundation of Forensic science – Elsevier2009
12. Interdisciplinary Approach to Forensic science – Dr. Praveen Kumar Janjua, Dr. G.Sunil Babu , Dr.Navjot Kaur Kanmai
13. Forensic Digital Photo Imaging – PatrickJones.
14. Crime Scene Photography – Robinson 3rded
15. The Practical Methodology of Forensic Photography – Red Sicker.D.R – CRCPress

Suggested Co-Curricular Activities:

- Flow chart preparation-Crime scene investigation
- Poster making –Photographic skills
- Seminar on crime scene management
- Collection of samples-for museum
- Simulation of various crime scenes
- Workshop on crime scene sketching techniques

B.Sc.	Semester: II	Credits: 1
Course: 2	**Crime Scene Management Lab**	Hrs/Wk: 2

List of Experiments:

1. Search methods for the Identification of physical evidence.
2. Handling, Lifting & Packing of physical evidence.
3. Sealing, Labelling & Preservation of different physical evidence.
4. Methods for sketching the crime scene- Rough & Fine Sketch
5. Mapping techniques of crime scene- Baseline, Rectangular, Triangulation & Polar techniques.
6. Crime scene Photography
7. Mock crime scene analysis

B.Sc.	Semester: III	Credits: 4
Course: 3	Questioned Documents and Finger Impressions	Hrs/Wk: 4

Learning objectives: Documents and Finger impressions are very important areas in forensic field to investigate the crime in right direction. Documents and finger impressions can be used for the identification of culprit.

Outcomes: After studying this course the students will know-

- The significance of questioned document examination.
- The handwriting analysis and its importance in detecting the culprit.
- The various techniques used for examination of questioned documents.
- The role of fingerprints and poroscopy in crime investigation.

UNIT I:

Document Examination- Introduction, History & Development of Document examination. Classification of Documents- Questioned & Standard Documents. Various types of documents – Property, Educational, Security, Travel, Business or Financial transactions, etc. Types of documents in various crimes- Frauds in co-operative societies, Lottery tickets, Vigilance cell cases, Marks list, Passports, Chit fund frauds, R.C. books, Registered documents, Postal frauds, Insurance frauds, Threatening letters etc.

UNIT II:

Handwriting Examination–Definition, Development & Evolution of Handwriting. General & Individual characteristics of handwriting. Factors affecting handwriting, Principles of Handwriting. Disguised writing and anonymous letters. Comparison of Handwriting- Questioned writings, Standard writings -Admitted or Non-requested, Specimen or requested writings. Examination of signatures. Characteristics of forged and genuine signatures. Types of forgeries. Instrumentation and Principles of Electrostatic Detection Apparatus, Video Spectral Comparator, Stereomicroscope, TLC.

UNIT III:

Types of Frauds. Examination of alterations, erasures, over writings, additions and obliterations in various disputed documents. Decipherment of secret writings, indented writings and writings on charred documents. Examination of seals, impressions and mechanical impressions.

Examination of black and white, colour photocopies, carbon copies and fax messages- Examination of type writings, various printed documents-dot matrix, ink-jet and laser printers, electronic type writers, security documents, Security features of currency notes. Examination of counterfeit currency, passports, visa, stamp Courses, postal stamps etc.

UNI IV:

Fingerprints-History, Evaluation and Contributions to fingerprint science - Galton, Herschel, Faulds Henry, Aziz-ul-Haque and Hema Chandra Bose. Poroscopy & Edgeoscopy, Classification of Fingerprint Patterns, Systematic methods of classification of Fingerprints. Types of Fingerprints- Visible, Plastic, & Latent. Development of Latent Fingerprints by Physical, Chemical & Modern methods. Recording & lifting of Fingerprints -Collection of Fingerprints at Scene of crime, from Victims, Suspects andCadavers.

UNIT V:

Papillary ridge, methods of comparison of papillary ridges, need of comparison and marking of ridge characteristics in identical and non-identical prints. Ridge counting and tracing. Computerization of Fingerprints- Evolution & History of AFIS, FACTS, Modern AFIS Manual Fingerprint and AFIS; live scanner (FED) and AFIS comparison. Advantages of AFIS, NIST & WSQ standards.

REFERENCE BOOKS:

1. Cross Examination of handwriting Expert – B.Lal & R.Chandra
2. Forensic Science in Criminal Investigation in trials – B.R.Sharma
3. Scientific Examination of Documents Methods and techniques – David Ellen _ 3rded
4. Forensic Document examination: Fundamentals & Current Trends – Jane A.Lewis
5. The Problem of Proof – A.S.Osborn – Universal Law
6. Typewriting Identification ISQD – Thomas CC – Billy Prior Bates1971
7. Suspect Documents: Their Scientific Examination, Universal Law Publishers
8. Forensic Handwriting Identification Fundamental Concepts and Principles – Morris, Ron – Academic Press.
9. Biometrics & Fingerprint Analysis – Mrs. Indira Sudha
10. Fingerprints Analysis & Understanding– Mark Hawthorne
11. Graphology & Fingerprinting – Gupta & Agarwal.
12. Fundamentals of Fingerprint Analysis- Hillary Moses Daluz

Suggested Co-Curricular Activities:

- Assignments on questioned documents examination
- Visiting of Course Manufacturing companies
- Collection of various types of inks
- Seminars on latent finger print development
- Crime scene visit for latent finger prints on various objects
- State Finger Print Bureau visit

B.Sc.	Semester: III	Credits: 1
Course: 3	Questioned Documents and Finger Impressions Lab	Hrs/Wk: 2

List of Experiments:

1. Detection of types of Forgeries.
2. Examination of rubber stamps and seals.
3. Examination of Printed Material
4. Examination of Alterations, Additions, Erasures, Obliterations and over writings by VSC.
5. Deciphering of indented writing, secret writing and charred documents
6. Examination of inks by TLC.
7. Examination of inks & Course by VSC
8. Examination of security features in Currency notes, Passports, Visas, Stamp Courses, Educational certificates, Driving License by VSC.
9. Development of Finger prints by Physical & Chemical methods
10. Lifting of developed Latent Fingerprints
11. Collection of Plain & Rolled Fingerprints

B.Sc.	Semester: IV	Credits: 4
Course: 4	Forensic Biology & DNA Fingerprinting	Hrs/Wk: 4

Learning objectives: Understand the importance of biological evidences encountered in crime scene investigation.

Outcomes: After studying this course the students will know-

- The various techniques used for examination of biological evidences.
- Applications of entomology in death investigation
- Importance of Wildlife Forensics in Wildlife Protection and Conservation
- Forensic examination of bodily fluids of human body
- DNA fingerprinting technology in crime investigation.
- Laws related to DNA technology in India and other countries.

UNIT I:

The Cell Theory, Structure of Prokaryotic & Eukaryotic cells (Plant & Animal), Structural organization and functions of plasma membrane and cell wall. Cell-organelles and cytoskeletal elements (Microtubules, microfilaments and intermediate filaments); Biomolecules – Proteins (Amino acids, Enzymes), Nucleic acids, Carbohydrates, Lipids; Minerals & Vitamins.

Immunity: Definition, Types: Innate - physical & chemical barriers, Acquired, Active, Passive. Immunogens & Antigens - Definition, types of antigens, factors influencing antigenicity; Antibody - Definition, structures, types, properties and functions of immunoglobulin. Antigen - Antibody Reactions –Agglutination & Precipitation.

Human Physiology: Introduction to Nervous system, Respiratory system, Circulatory system, Endocrine system, Excretory system & Digestive system

UNIT II:

Biological Evidence – Nature, Importance and Identification of Blood, Semen, Vaginal fluids, Saliva, Urine, Feces, Sweat, Skin, Nails, Tissues, Tooth, Bones, Uterine fluids, Vomit, Vitreous humor, CSF, Colostrum.

Diatoms – Structure, Identification Tests & Importance. Hair – Structure & growth - Differences between human & animal hair. Fibre - Classification of fibres- Identification and comparison of fibres by Physical & Chemical methods - Forensic Significance.

Blood and its function, Composition of blood, Formation of Blood cells, Types of Blood cells and blood groups, (ABO systems & Rh factor).

UNIT III:

Wildlife Forensics – Importance, Wildlife Crimes - Smuggling & Poaching. Wildlife Products and articles – illegal possession. Organizations involved in Wildlife Protection & Conservation. Wildlife Protection Act- 1972- Important Schedules & Endangered Species.

Forensic Entomology: Introduction, importance. Life cycle of insects, Role of insects in decomposition of human body- collection of insects.

UNIT IV:

Basics of Genetics - Mendelian principles, Sex determination and Sex-linked inheritance Prokaryotic & Eukaryotic Genetic material: Discovery, Experiments, Composition and Structure of DNA & RNA, Organization of DNA in Chromosomes, DNA replication, Genetic code, Proteins synthesis, Introduction to recombinant DNA technology - its Forensic applications.

DNA isolation, Extraction methods – Phenol Chloroform, Chelation, Differential & Silica based. DNA Quantification – Slot blot Assay, FID Assay & PCR Amplification.

UNIT V:

DNA Separation techniques – Supporting matrices, Gel & Capillary Electrophoresis. Advances in DNA testing: VNTR, STR, STR multiplex, STR Polymorphism, SNPs, mtDNA, Y - chromosome analysis; DNA profiling and applications. Rapid DNA Testing. DNA Database & Databank – CODIS. Human Genome Project. Admissibility of DNA evidence in court of law. The DNA legislation-India, USA, UK. The DNA Profiling Regulation bill. Application of DNA Fingerprinting in Wildlife Forensics.

REFERENCE BOOKS:

1. Forensic Biology – Richard Li
2. Forensic DNA collection at Death Scenes - Rhonda Williams & RogerKahn
3. Forensic DNA Analysis: Current Practices and Emerging Technologies – Jaiprakash G. Shewale.
4. Forensic DNA Evidence Interpretation - Jhon S. Buckley on, Jo-Anne Bright, Duncan Taylor.
5. Forensic Biology - Dr. (Mrs) Rukmani Krishnamurthy, Sharikant H.Lade, Dr. Trupti Khedkar
6. Encyclopedia of Forensic Science Vol I, II & III, - Siegel.J.A , Sukoo.R.J and Knufer
7. Forensic Science in Criminal Investigation in trials – B.R.Sharma
8. Interdisciplinary Approach to Forensic science – Dr. Praveen Kumar Janjua, Dr. G.Sunil Babu , Dr.Navjot Kaur Kanmai
9. Forensic Science in Criminal Investigation – Dr. (Mrs) Rukmani Krishnamurthy
10. Criminalistics – An Introduction to Forensic science 5th edition –Saferstein
11. Statistical Methods in Human Population Genetics, ISI,1988 – Malhotra.K.C
12. An Introduction to Software tools for Biological Applications -Jambeck, P &Gibas.C
13. Bioinformatics Basics: Applications in Biological Sciences and Medicine - Rashidi, HH &Bueler.

Suggested Co-Curricular Activities:

- Seminars on wild life forensics
- Assignments on cell structure & cell organelles

B.Sc.	Semester: IV	Credits: 1
Course: 4	Forensic Biology & DNA Fingerprinting Lab	Hrs/Wk: 2

List of Experiments:

1. Serological Test – ABO Blood grouping
2. Identification tests for other bodily fluids.
3. Antigen - Antibody reactions – Agglutination and Precipitation
4. Identification of Diatoms & Pollen grains
5. Morphological Examination of Human Hair, Animal hair & Fibres
6. Isolation & Extraction of DNA from Blood
7. Gel electrophoresis of DNA
8. Gel electrophoresis of Protein.
9. Identification of Diatoms

B.Sc.	Semester: IV	Credits: 4
Course: 5	**Forensic Chemistry and Ballistics**	Hrs/Wk: 4

Learning objectives: Applications of Chemistry and Ballistics for criminal investigation. Understand the principles of several chemical methods for analysis of evidence.

Outcomes: After studying this course the students will know-

- The roles of chemistry and Ballistics in Forensic Science.
- The classification and characteristics of NDPS.
- The analysis of drugs and its importance in detecting the culprit.
- The introduction to explosives and petroleum products.
- Classification of Firearms, bullets &cartridges

UNIT I:

Forensic Chemistry: Introduction & Significance, Qualitative analysis of Precious metals –Gold, Silver & Platinum, Agrochemicals, Industrial chemicals. Chemical Etching techniques. Bribe Trapping by Phenophthalein.

Chemistry of fire – Fire triangle. Definition of Arson & Incendiary Fire. Motive of Arson – Indicators of arsons in SoC. Collection for Evidence. Chemical analysis of Arson residues & Charred debris. Relevant IPC sections – 285,435, 436 & IEA 113B.

UNIT II:

Narcotic Drugs and Psychotropic Substances- Classification- Sedatives, Stimulants, Hallucinogens, Solvents, Designer Drugs and Miscellaneous – Fentanyl, GHB, LSD. Physiological & Psychological effects of drugs. Crimes related to NDPS – Drug abuse, Illegal cultivation, Possession, Smuggling, and Clandestine laboratory operations. Role of NCB & CBN in NDPS crime control. Acts: NDPS Act 1985, Drugs and Cosmetics act – 1945 & Drug Control Act -1940.

Chemical screening of Drugs – Colour tests, Microcrystal techniques. Examination of Morphological characters in Cannabis, Cocoa, Poppy and *Ephedra* plants. Screening of Controlled substances – Phenethylamines – Methyl derivatives, Hydroxyl derivatives, Ketone derivatives, Methylene dioxy & Methoxy derivatives. Tertiary Amines & Tryptamines – Natural & Synthetic.

UNIT III:

Beverages: Classification & Composition of Alcoholic & Non-Alcoholic beverages. Collection of samples for identification of alcohols – Blood, Urine, Vitreous fluid, Brain, Liver etc. Tests and Evaluation - Blood alcohol content (BAC), Urine Alcohol Content (UAC), Breath Analysis. Clinical Features, Diagnosis and Treatment for Chronic and Acute effects of Alcohol. Relevance of Central Excise Act -1944 on Beverages. Motor Vehicles Act - 1988 (Penalties for Drunk n Drive).

UNIT IV:

Explosives - Definition of Explosives & Explosion. Combustion, Deflagration and Detonation. Classification & Composition of Explosives. Components of Military & Industrial Explosive Devices and Improvised Explosive devices. Approach to SOC – Post blast Residues Collection – Analysis of Explosives and explosive substances. Explosives act & Explosive substances act.

Adulteration of Petrol & Petroleum products & Substance. Distillation and fractionation of petroleum products and BIS. Properties & Examination of Petroleum products. Petroleum act - 1934. Essential Commodities Act - 1955

UNIT V:

Forensic Ballistics & Firearms: History, classification of firearms. Ammunition- classification, types of cartridges. Gunshot Residue-types, collection, Methods - Dry and wet, Identification tests- dermal nitrate test, Walker's test, Harrison and Gilroy's test, price's spot test. Internal and external ballistics - Range of fire-, Scorching, Blackening, Tattooing. Terminal Ballistics, Wound ballistics- entry and exit wounds. Different types of marks- firing pin marks, breech, face marks, chamber marks, extractor and ejector marks.

REFERENCE BOOKS:

1. Analytical chemistry: An Introduction – Skoog, D.A.West.D.M,Holler
2. Fuels and Combustion – Sarkar – Orient longmann1990
3. Modern Techniques of Bomb Detection and Disposal & Security– Narayanan,T.V.
4. The Analysis of Explosives, - Yinon, J. and Zitrin –Oxford
5. Kirks Fire Investigation – Dettean, J.D – Prentice Hall2002
6. Bureau of Indian standards: Specifications and Methods of Analysis for Alcoholic Beverages
7. Bureau of Indian standards: Specifications and Methods of Analysis for Petroleum Products
8. Explosive act with Amendments
9. Explosive Substances act with Amendments
10. Working Procedure Manual: Chemistry, Explosives & Narcotics, BPRd2000
11. Forensic Science in Criminal Investigation in trials – B.R.Sharma
12. Forensic Biology - Dr. (Mrs) Rukmani Krishnamurthy, SharikantH.Lade, Dr. Trupti Khedkar
13. Interdisciplinary Approach to Forensic science – Dr. Praveen Kumar Janjua, Dr. G.SunilBabu , Dr.Navjot KaurKanmai
14. Encyclopedia of Forensic Science Vol I,II & III, - Siegel.J.A , Sukoo.R.J andKnufer
15. Forensic Science in Criminal Investigation – Dr. (Mrs) Rukmani Krishnamurthy
16. Criminalistics – An Introduction to Forensic science 5th edition –Saferstein
17. Analytical chemistry: An Introduction – Skoog, D.A.West.D.M,Holle

Suggested Co-Curricular Activities:

- Seminars on explosives
- Assignments on screening of drugs
- Quiz on various 'Acts'.
- Examination of various ballistics wounds.
- Visit of Bell of Arms.

B.Sc.	Semester: IV	Credits: 1
Course: 5	**Forensic Chemistry and Ballistics Lab**	Hrs/Wk: 2

List of Experiments:

1. Analysis of alcohol as per BIS Specifications
2. Detection of Methanol, Chloral Hydrate, Diazepam & Alprazolam in Alcoholic Liquors
3. Density/ Specific gravity Determination of petroleum products by Hydrometer
4. Filter Course test for detecting adulteration of petrol
5. Phenolphthalein test for Bribe Trap cases
6. Preliminary examination of Explosives (tests for nitrite, nitrate, thiocynate, chlorate, Thiosulphate, Perchlorate, Sulphite, Phosphate etc.)
7. Identification tests-GSR
8. Demonstration of Bullets, Cartridge cases, etc.

5. BLUE PRINT OF MODEL QUESTION COURSE (Sem-End. Examinations)

MODEL QUESTION COURSE - THEORY
Semester: I
Course: ….., Title of the Course

Time: 3 Hours. Max Marks: 75

SECTION – A

Answer any 5 questions. Each question carries 5 marks **5 X 5 = 25M**
(Total 8 questions, questions 1-5 from Units 1-5 & questions 6-8 from any of the units)

1. Unit -I
2. Unit-II
3. Unit-III
4. Unit-IV
5. Unit-V
6. From any Unit
7. From any Unit
8. From any Unit

SECTION – B

Answer all the questions. Each question carries 10 marks. **5 X 10 = 50M**
(Each question (both 'A' or 'B') from each Unit.

9. A.
   or
   B
10. A.
    or
    B
11. A.
    or
    B
12. A.
    or
    B
13. A.
    or
    B

14. MODEL QUESTION COURSES FOR THEORY

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc DEGREE EXAMINATIONS
Semester – I
Course 1:Introduction to Forensic Science & Criminology

Time: 3hrs Max Marks: 75

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. What is CFPB & CDFD?
2. Write about Cr.P.C.
3. Write about CCMB & LaCONES.
4. Write about POSCO act.
5. Write about TLC
6. Define Criminology & Penology
7. What is Mc. Naughten Rule
8. What is Freuds psychoanalytical theory.

Section – B

Answer **ALL** the following questions. **5X10=50M**

9. (a) Explain organization of FSL in India.
   (OR)
   (b) Explain role of CID & IB in crime investigation.

10. (a) Explain Fundamental Rights & Duties.
    (OR)
    (b) Explain role of LokAyukta & LokAdalat in justice system of India

11. (a) Explain working principle and instrumentation of HPLC.
    (OR)
    (b) Explain difference between AAS & AES.

12. (a) Explain socio-economic causatives of crime.
    (OR)
    (b) Classify crimes and give IPC sections to all.

13. (a) Explain various personality disorders.
    (OR)
    (b) Explain principle and procedure of Polygraphy.

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – II
Course 2 :Crime Scene Management

Time: 3hrs Max Marks: 75

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Define Crime Scene?
2. Write about Golden Rules of Crime Scene Safety.
3. Write about Micro Photography.
4. Write about EMR photographic techniques.
5. Define Physical Evidence
6. Write about digital evidence.
7. What is Chain of Custody
8. What is Crime Scene Reconstruction.

Section – B

Answer **ALL** the following questions. **5X10=50M**

9. (a) Explain Processing of Crime Scene.
(OR)
(b) Explain role of Search Methods in crime scene investigation.

10. (a) Explain Crime Scene Sketching.
(OR)
(b) Explain methods of crime scene photography.

11. (a) Explain Collection, Preservation and Packing of various biological evidence.
(OR)
(b) Explain Collection, Preservation and Packing of various digital evidence.

12. (a) Explain importance of packing material in evidence packing.
(OR)
(b) Explain documentation required in evidence packing & forwarding.

13. (a) Explain Blood pattern analysis in crime scene reconstruction.
(OR)
(b) Explain gait pattern analysis.

MODEL QUESTION COURSE (Sem-end. Exam)
B. Sc - DEGREE EXMINATIONS
Semester – III
Course 3: Questioned Documents and Finger Impressions

Time: 3hrs Max Marks: 75

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Define Document.
2. Classify various documents.
3. Write about Handwriting characteristics.
4. Write about Standards.
5. Write about alterations
6. Define Poroscopy & Edgeoscopy
7. What are secret writings
8. What is Papillary ridge.

Section – B

Answer **ALL** the following questions. **5X10=50M**

9. (a) Explain contributions of AS Osborn.
   (OR)
   (b) Explain General & Individual characteristics of handwriting.

10. (a) Explain Types of forgeries.
    (OR)
    (b) Explain Instrumentation and Principles of Electrostatic Detection Apparatus

11. (a) Explain working principle of VSC.
    (OR)
    (b) Explain Types of Fingerprints.

12. (a) Explain Development of Latent Fingerprints by various methods.
    (OR)
    (b) Explain henrys classification of fingerprints.

13. (a) Explain Recording & lifting of Fingerprints from Cadavers.
    (OR)
    (b) Explain process of AFIS.

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – IV
Course 4: Forensic Biology & DNA Fingerprinting

Time: 3hrs Max Marks: 75

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. What is cell theory?
2. Draw structure of prokaryotic cell.
3. Define Immunity.
4. Write about nature of blood.
5. Write about diatoms
6. Define Smuggling & Poaching.
7. Draw structure of DNA with all components
8. What is VNTR & STR.

Section – B

Answer **ALL** the following questions. **5X10=50M**

9. (a) Explain types of antigens.

(OR)

(b) Explain types of immunity.

10. (a) Explain difference between animal and human hair.

(OR)

(b) Explain composition of blood & Blood groups.

11. (a) Write about role of various organizations involved in Wildlife Protection & Conservation.

(OR)

(b) Explain Life cycle of insect.

12. (a) Explain Composition and Structure of DNA & RNA.

(OR)

(b) Explain r-DNA technology.

13. (a) Explain DNA Separation techniques.

(OR)

(b) Explain principle and procedure of DNA Amplification.

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – IV
Course 5: Forensic Chemistry and Ballistics

Time: 3hrs Max Marks: 75

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. What are precious metals?
2. Write about Chemical Etching techniques
3. Write about Fire triangle.
4. Write about NDPS act.
5. Write about BIS & Petroleum act
6. Define Explosives & Explosion
7. What is Deflagration and Detonation
8. What is Range of fire.

Section – B

Answer **ALL** the following questions. **5X10=50M**

9. (a) Explain Indicators of arsons in SoC.
(OR)
(b) Classify & Explain NDPS.

10. (a) Explain Physiological & Psychological effects of drugs.
(OR)
(b) Explain role of NCB & CBN in NDPS crime control

11. (a) Explain Blood alcohol content (BAC).
(OR)
(b) Explain difference between BAC & UAC.

12. (a) Explain Classification & Composition of Explosives.
(OR)
(b) Explain Distillation and fractionation of petroleum products.

13. (a) Classify Firearms & Ammunition with explanation.
(OR)
(b) Explain ballistics of entry & exit wounds.

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 6A	**Instrumentation**	**Hrs/Wk: 4**

Learning Outcomes:

1. The students will be able to understand about the principle and working of optical and electronic microscope used for characterization of micro evidences.
2. Students will be able to gain knowledge about the concept of different chromatographic techniques which are used to separate chemical compounds.
3. Students will be aware about the basics of Spectroscopy, sources of radiation, their utility and limitations.
4. Student will able to recognize the best suited techniques to be employed for examination of evidence.

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Microscopy**:** Principles and techniques: Light Microscope, Phase contrast, Fluorescence, stereomicroscope, polarizing, comparison and Electron Microscope (Scanning, Transmission), Forensic and their applications.

UNIT II: Chromatography: Basic principles. Thin Layer Chromatography Theory and Instrumentation, HPLC - Principle and Instrumentation application, HPTLC, densitometer, applications.
Gas chromatography: Principle and Instrumentation, types of GC (GLC, and GSC) and column types, Detectors for GC -TCD,FID, ECD, NPD etc, Pyrolysis GC, GC-MS; applications.

UNIT III: Spectroscopy: Spectrum of EMR, Interaction of EMR with matter, Source of radiations wavelength selector, Optical detector UV-Visible, IR and Raman spectroscopy Principle of single and double beam spectrophotometer, Instrumentation of IR, UV, spectroscopy qualitative and quantitative analysis of spectroscopy and their Forensic applications.

UNIT IV: Mass Spectroscopy: Principle, instrumentation, ion sources, types mass analyser-quadrupole time of flight, double focusing, tandem mass spectroscopy, detectors for mass spectroscopy their applications.

UNIT V: NMR Spectroscopy, Neutron Activation Analysis: Principle, techniques and Forensic application. X-rays spectroscopy: Principles of X ray diffraction and X ray florescence technique, their forensic applications.

TEXT BOOKS:

1. Instrumental Methods Forensic Science Analysis 2022 Dr A K Jaiswal
2. Forensic Science UGC Net / JRF MCQ's Dr Anusinghla
3. Past 10 Years Question Bank with Answers UGC Net / JRF Khushal Singh
4. Question Answers Criminology & Forensic Science UGC Net/ JRF V N Sehgal
5. Forensic Science UGC Net / JRF MCQ s Anil Kumar Sigh
6. Barbara Wheeler and Lori J. Wilson. Practical Forensic Microscopy: A Laboratory Manual,Wiley
7. Lee and Caensstem. Advances in Forensic Science, Vol. 2. Instrumental Analysis.
8. B. K. Sharma. Instrumental Methods of Chemical Analysis, Goel Publishing House, 26thEdition (2007).

9. D. A. Skoog, D. M. West, F. James Holler and S. R. Crouch, Fundamentals of AnalyticalChemistry, 8th Edition, Thomson, 2004.
10. G.Chatwal and S. Anand, Instrumental Methods of Chemical Analysis, 7 Edition HimalayaPublishing House.
11. Hobart H. Willard, Instrumental Methods of Analysis (Chemistry) Wadsworth PublishingCompany.

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 6A	**Instrumentation Lab**	**Hrs/Wk: 2**

Instrumentation Practicals:

1. Separation of various compounds by TLC
2. Separation and identification of various compounds by HPLC
3. Separation of various volatile compounds by GC
4. Microscopic examinations of hair and fibers.

Suggested Co-Curricular Activities:

- Visit to IICT, NIN, CDFD, CCMB

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 7A	**Forensic Toxicology**	**Hrs/Wk: 4**

Learning Outcomes:

1. Able to describe the major effects on the rate of absorption of alcohol from the stomach into the bloodstream
2. Students will be able to classify various poisons depending on their toxicity
3. Will be able to answer different techniques to detect poisons in viscera sample
4. Post-mortem appearances of poisons in the body
5. Antidotes for lethal poisons

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Introduction to Forensic Toxicology - History & Development. Poisons Act 1919, Sections
– IPC 193, 201, 202, 270, 271, 272, 273, 274, 275, 276, 277, 278, 284, 328. Cr.P.C. 39, 40, 175. National Poisons Information Centre (NPIC). Definitions – Toxins, Drug, Toxicodynamics, Toxicokinetics, Dose, Lethal Dose, LD50, Tolerance, Role of Forensic Toxicologist in Criminal Justice System.

UNIT II: Poisons – Definition, Forms of Poison – Physical, Chemical & Mechanical state. Classification – Corrosives/caustics – Strong acids & Alkalis, Irritants – Organic (Plant & Animal) Inorganic (Metallic & Non Metallic). Neurotoxic Poisons – Cerebral & Spinal. Cardiovascular Poisons. Asphyxiants. Pesticides.

UNIT III: Toxicokinetics. Routes of Administration of poisons - Inhalation, Ingestion, Injection, Topical etc. Mode of Action, Clinical features, Elimination of poisons - Urinary excretion, Faecal Excretion, and other routes of elimination. Definition of Antidote– Types of antidotes.

UNIT IV: Post mortem Toxicology – Types of samples. Collection of visceral samples, other body fluids - Blood, Saliva, Urine, and Stomach washes etc. their Preservation.

UNIT V: Toxicology of alcohol – Alcohol testing for intoxication. Alcohol in Circulatory system. i.e., Mode of Action. Analysis of alcohol samples. Analytical Toxicology – Isolation and Purification, Screening tests, Methods of Identification, Quantitative estimation of individual poisons.

SUGGESTED READINGS:

1. Analytical Methods in Forensic Toxicology Dr S N Tiwari
2. Practical Book for Forensic Chemistry and Toxicology Dr Ashok Jaiswal
3. Forensic Toxicology Dr S P Singh
4. Handbook of Environmental Chemical Toxicology Dr B Singh
5. Practical Manual of Food Chemistry and Nutrition Dr Neetu Singh
6. Environmental Administration in India Dr Namita Gupta
7. Environmental Studies Systems & Solutions Dr Archana Mishra
8. Biochemistry U. satyanarayan
9. Practical crime scene analysis and reconstruction Ross m gardner , tom bevel
10. Concise book of forensic medicine and toxicology R.K Sharma
11. Bloodstain pattern analysis Tom bevel
12. Introduction to spectroscopy Pavia
13. Techniques of crime scene investigation Barry A.J fisher
14. Principles of forensic toxicology Nicholas lappas
15. Review of forensic medicine and toxicology Gautam biswas

16. Essentials of forensic medicine and toxicology Anil aggrawal

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 7A	**Forensic Toxicology Lab**	**Hrs/Wk: 2**

Forensic Toxicology Practicals

1. Preliminary tests for various poisons smell of metallic, Pesticides and Alcohols etc.
2. Detection of Ethanol by Kozelka & Hine Method
3. Identification of pesticides by TLC
4. Separation of Pesticides by HPLC

Suggested Co-Curricular Activities:

- visits to Forensic science Laboratories for detection of different lethal poisons
- visits to botanical gardens containing poisonous plants
- simulation of animal poisoning and their treatment technique

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 6B	**Forensic Psychology**	**Hrs/Wk: 4**

Learning Outcomes:

1. Description of different interviewing techniques
2. The science of lying
3. Psychophysiological aspect of speech and deception
4. Polygraphy technique of lie detection
5. Brain signature profiling
6. Law related to mental health and psychology
7. Different interrogation techniques
8. Deception Detection Techniques.
9. Legal aspects of Psychology.

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Interviewing and Interrogation Techniques: Importance of Investigative Interviewing, Influence of Psychology, P.E.A.C.E Model of Interviewing, Cognitive Interviewing, Ethical Interviewing, Other Interviewing Techniques.

UNIT II: Interrogation and the related Techniques, Brain Electrical Oscillation Signature Profiling (BEOS), Voice-Stress Analysis/ Layered Voice Analysis, Reliability, Limitations, NHRC Guidelines, Admissibility in the Court, Case Studies.

UNIT III: Polygraph/Lie Detector Test: Objectives, theoretical basis, stages of examination (Pre- test, In-test. post-test), Questioning techniques, Stim test, Limitations, Admissibility in the court oflaw, NHRC guidelines, case studies, etc.

UNIT IV: Brain Fingerprinting/Brain-Mapping: Principle, Importance, History, Process, brain waves (P300, delta, theta, gamma, alpha), reliability, case studies, admissibility, etc. Narco-analysis: Principle, History, drugs used, procedure, reliability, admissibility, limitations, Indian scenario. case studies, etc.

UNIT V: Legal & Correctional Aspects: The mentally ill, Competency to stand trial Mental Health Act, 1987: (Object, Relevant Definitions, Central & State authority, Reception Orders, Human Rights of Mentally ill persons, Penalties & Case-Studies), Indian Penal Code, 1860 Relevant general exceptions. Rehabilitation & Correctional Treatment of Offender(s)/ Victim(s). Techniques, Strategies and Types of Treatments.

READING BOOKS:

1. Handbook of Forensic Psychology Prof. (Dr) Vimala Veeraraghavan
2. Criminology Prof. (Dr) Vimala Veeraraghavan
3. Organized Crime Dr Minakshi Sinha
4. 'Handbook of Forensic Psychology, Prof Dr. Vimala Veeraraghwan, Edition 1st , 2009,Selective and Scientific Books Publications, New Delhi.
5. 'Introduction to Forensic Psychology-Research and Application', Curt R. Bartol, Anne M.Bartol, Editon 2nd, 2008,Sage Publication.
6. Psychology, (2006) Ciccarelli, S. K. & Meyer G. E. New Delhi; Perason Education
7. Criminology and Penology', Mittal S., Saxena S. K., [2012], Commonwealth

PublishersPvt. Ltd., New Delhi.

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 6B	**Forensic Psychology Lab**	**Hrs/Wk: 2**

Forensic Psychology Practicals:

1. NEO-PI
2. Minnesota Multiphasic Personality Inventory-2/A (MMPI-2/A)
3. Rorschach Test
4. Bhatia's Battery for Intelligence
5. Thematic Apperception Test
6. Word Association Test
7. Polygraphy / Psychological evaluation test

Suggested Co-Curricular Activities

- Visit to police stations to know the procedure of interrogation
- Visit to polygraphy unit at Forensic Science Laboratory
- Visit to mental hospitals and juvenile courts

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 7B	**Narcotic Drugs & Psychotropic Substances**	**Hrs/Wk: 4**

Learning Outcomes:

1. To differentiate between various classes of illicit drugs
2. The concept of analytical techniques for analysis of drugs
3. The laws related to narcotic drugs
4. Classification of NDPS and their effect on the human body
5. Trend cases of NDPS in India

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*
UNIT I: Narcotics- Introduction, Legal Definitions, Classification- Sedatives, Stimulants, Hallucinogens, Synthetic Narcotics, Designer Drugs.

UNIT II: Drugs and crimes- nonviolent crimes, violent crimes, drug problems in India-cannabis and poppy cultivation – illegal possession – Smuggling – Transportation – Drug Profiling – Clandestine laboratories – Drug abuse in sports – Preliminary tests for Narcotic Drugs and Psychotropic Substances (NDPS).

UNIT III: Sedatives-opium and opium derivatives- Morphine- Administration, Physiological Effects, Addiction, Identification - Heroin- Abuse, Physiological Effects and Identification - Barbiturates- Nature, Administration and Identification.

UNIT IV: Stimulants: Cocaine, Amphetamine, Benzodiazepines and their Use, Abuse, Physiological, Psychological, Effects, Addiction, and Identification. Hallucinogens: Cannabis, Quinazolones- Administration, Effects, Addiction and Identification- LSD (Lysergic Acid Diethylamide), Psylocybin, Mescaline and MDMA: Administration, Effects, Addiction and Identification.

UNIT V: NDPS Act 1985 - Drug law enforcements in India- Narcotic control bureau, Central Bureau of Narcotics, Narcotics Control and Intelligence Bureau– Prevention of Drug trafficking - Penalties for NDPS related offenses – NDPS Amendments 2014 – United Nations Drugs Conventions.

SUGGESTED READINGS:

1. Pharmacological classification of drugs K . D Tripathi
2. Essentials of medical pharmacology K . D Tripathi
3. Chromatographic analysis of pharmaceuticals John a adamovics
4. Pharmaceutical analysis David G watson
5. Pharmaceutical chemical analysis: methods for identification and limit test Olepederson
6. Drug testing in alternate biological specimens Amanda j. jenkins

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 7B	**Narcotic Drugs & Psychotropic Substances**	**Hrs/Wk: 2**

Narcotic Drugs & Psychotropic Substances Practicals:

Detection of following of Narcotic Drugs & Psychotropic Substances by spot/colour test

a. Opiates

b. Barbiturates

c. Benzodiazepines

d. Amphetamines and Cannabis

Suggested Co-curricular activities:

- Visit to narcotics control bureau
- Visits to Rehabilitation Centers

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 6C	**Forensic Physics**	**Hrs/Wk: 4**

Learning Objectives: After studying this paper the students learn about

1. Types of glass and their composition.
2. Photographic examination of tool marks.
3. Able to determine direction of force on a piece of glass
4. Able to describe the common methods for the analysis of soil
5. Different types of tools involved in criminal activity
6. How other types of polymer-based evidences are analyzed
7. How paint evidence is encountered, collected and preserved

UNIT I: Soil, Cement and Concrete - Types and composition of soil, sample preparation, molecular particle size distribution, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignition-loss test, elemental analysis, interpretation of soil evidence. Cement bromoform test, fineness test, ignition-loss test. Identification of adulterated cement. Mortar and concrete analysis.

UNIT II: Paint - Types of paint and their composition, macroscopic and microscopic analysis of paint pigments, pigment distribution, micro-chemical analysis- solubility test, pyrolysis gas chromatography, IR spectroscopy and X-ray diffraction, elemental analysis, interpretation of paint evidence.

UNIT III: Types of fibres, forensic aspects of fibre examination- fluorescence, optical properties, refractive index, birefringence, dye analysis. IR-micro spectroscopy, Py-MS. Difference between natural and man-made fibres.

UNIT IV: Glass - Types of glass and their composition-soda-lime, boro-silicate, safety glass, laminated, light sensitive, tampered/ toughened, wire glass, coloured glass. Forensic examinations of glass fractures- rib marks, hackle marks, cone fracture, wavy, backward fragmentation, concentric and radial fractures. Refractive index, density gradient, becke-line, specific gravity examination.

UNIT V: Toolmarks - Types of toolmarks- compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks. Restoration of crased/ obliterated marks- Method of making-cast, punch, engrave, method of restoration- etching (etchings for different metals), magnetic, electrolytic etc.

SUGGESTED READINGS:

1. Physical Evidence in Criminal Investigation and Trials Dr B P Maithil
2. Forensic Evidence Real Cash Study Dr H K Pratihari
3. Introduction to Forensic Science in Crime Investigation Dr Rukmani Krishnamurty
4. Caddy, B; Forensic Examination of Glass and Paint Analysis and Interpretation, CRCPress, New York, 2001.
5. Shaw, D; Physics in the Prevention and Detection of Crime, Contem Phys. Vol.17,1976.
6. Saferstein, R; Forensic Science Handbook. Vol. I,II, (Ed.), Prentice Hall, New Jersey, 1988.
7. Working Procedure Manual; Physics BPR&D Publication, 2000.

8. Sharma, B.R; Forensic Science in Criminal Investigation and Trials (3rd Ed.), UniversalLaw Publishing Co., New Delhi, 2001.
9. Working Procedure Manual- Physics, BPR&D Publication. 2000
10. Hess, K.P; Textile Fibers and their Use, 6th Edn, Oxford and IBH Publishing Co., 1974.
11. Trace Evidence By Max M. Houck.
12. Laboratory Procedural manual , Physics Section, DFSL, Mumbai.
13. Forensic science in criminal investigation and trail by B R Sharma
14. Forensic Science in Criminal Investigation & Court Evidence V N Sehgal

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 6C	**Forensic Physics**	**Hrs/Wk: 2**

Forensic Physics Practicals:

1. Microscopic examination of soil.
2. Particle size distribution of soil sample.
3. Density gradient method for soil
4. Microscopic examination of Paint.
5. Examination of glass fracture.
6. Examination and Comparison of tool marks.
7. Restoration of erased/obliterated punch marks.

Suggested co-curricular activities

- Visit to glass manufacturing units
- Examination of window glass, or car front glass

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 7C	**Forensic Engineering**	**Hrs/Wk: 4**

Learning Outcomes:

1. This paper describes and explains the investigation of various accidents.
2. Use of forensic investigation techniques to determine of causes failure.
3. assess vulnerable engineering details such as electrical MCB Circuit, eccentric connections, rating criteria of electrical appliances, using well documented failure casestudies.
4. Rigorous assessment and evaluation of engineering mistakes such as fire cases .
5. Causes of arson -automotive failure- vehicular fire

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Introduction to Forensic Engineering and Various Types of Failures, Initiation of Failures and associated investigations (Electrical, Mechanical, Structural)- An overview of Electrical System failure (House hold materials such as cables, wires, switchboards/MCBs, MCB faults, Improper Ratings/layout of appliance fitting according to safety criterion etc.) Mechanical Failures manufacturing defects, inadequate quality control measures,

Structural Failures (Structural material composition analysis leading to failures, an investigation view of multi components failures due to any one module manufacturing defects, etc.)

UNIT II: Investigation of Arson and Incendiary Fires - General - Arsonist Profile - Typical Characteristics of an Arson or Incendiary Fire Daisy Chains and Other Arson Precursors - Liquid Accelerant Pour Patterns, Spalling, Detecting Accelerants after a Fire

Automotive Fire Failure: General, Vehicle Arson and Incendiary Fires, Electrical and Mechanical Causes

UNIT III: Traffic, Road Safety Failures - Vehicle Performance: Engine Limitations, Deviation fromTheoretical Mode, Peel Out, Lateral Tyre Friction, Bootlegger's Turn

UNIT IV: Traffic Accidents: General, Basic Momentum Equations, Properties of an Elastic Collision, Coefficient of Restitution, Properties of Plastic Collision, Analysis of Forces during Fixed Barrier Impact, Energy Losses, Centre of Gravity, Moment of Inertia, Torque, Angular Momentum, Simple Skids, Tyre Friction, Skid Deceleration and Speed Reduction, Brake Failure, Low Velocity Impacts, Measuring Roadway Curvature, Motorcycle Turns, Simple Vehicular Falls

UNIT V: Investigation of Civil and Structural Failures - Forensics of Building Failure - Forensics of Bridge Failure - Forensics of Civil Engineering Materials Failure (Bricks, Mortar, Concrete etc.) Buildings/ Bridges / Flyovers / Roads Multi storeyed Buildings / Parking Lots - Surface Inadequacies of Road Profile- Airport Runways and Railway Tracks - Forensics of Civil Engineering Structures after Natural Disasters

Building Collapses, Bridge Collapses - Activities in the Investigation Process, Site Investigation and Sample Collection

SUGGESTED READING:

1. Structure Elucidation of Organic Compounds by Spectroscopic TechniquesDr. Pradip V Tekade
2. Crime Scene Management A Forensic Approach Dr M S Rao
3. Recurrent Neural Network and Application Neeraj Sahu

4. Network Analysis Technique for Project Management Dr R K Tewari
5. Forensic Engineering Fundamentals By Harold Franck.
6. Elements of Civil Engineering By Mimi Das Saikia
7. Electronic Principles By Albert Malvino and D. J. Bates.
8. Electronics Communication Systems By Kennedy and Davis
9. Measurement, Instrumentation and Experiment Design in Physics and Engineering ByMichael Sayer and Abhaaiman Singh.
10. Randall K. Noon: Forensic Engineering Investigation CRC Press, 2000
11. Robert R.: Forensic Structural Engineering Handbook. 2a edn. McGraw-Hill, 2009
12. Robert D.: Forensic Geotechnical and Foundation Engineering, 2a edn. McGraw-Hill, 2011
13. Stephen E. P.: Forensic Engineering: Damage assessments for Residential and CommercialStructures. CRC Press. 1° edn, 2013
14. Kennet L. C.: Forensic Engineering, (Civil engineering- Advisors). 2nd edn. 1998
15. Harol F., Darren F.: Forensic Engineering Fundamentals. CRC Press. 1" edn. 2012

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 7C	**Forensic Engineering Lab**	**Hrs/Wk: 2**

Forensic Engineering Practicals

1. Analysis of fire debris by GC
2. Collection of samples at scene of fire
3. Analysis of cement samples
4. Examination of mortar samples
5. Examination of bricks samples

Suggested curricular activities:

- Accident Reconstruction Project
- Road accident crime scene visits
- Learning Techniques of collection of tyre impressions from RTO offices
- Visits to RTO offices
- Visits to fire station
- Guest lectures on structural failures on building
- Learning the rules for prevention of automotive accident

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 6D	**Forensic Medicine &Anthropology**	**Hrs/Wk: 4**

Learning Outcomes:

1. Able to define the postmortem interval and explain how short- and long-term PMIs are estimated
2. Able to define and describe the medicolegal autopsy and explain when a coroner or medical examiner must perform an autopsy
3. Define and distinguish between the cause of death and the manner of death
4. Able to describe the development and structure of bones
5. The various anthropological tests that can be done on skulls to help identify them
6. Able to describe how bones are individualized

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Introduction to Forensic Medicine – Pathology, Medical Jurisprudence. Medical Law and Ethics. Introduction, History & Development of Forensic Anthropology & Archaeology, F.Odontology & F.Taphonomy. Role of Anthropologist.

UNIT II: Introduction to Human anatomy and Physiology- Axial Skeleton- Skull, Sutures of skull, Cranial bones, Facial bones, Sternum, thoracic bones, vertebral column, Appendicular Skeleton- Bones of Upper limbs, Lower limbs, Pelvic Girdle etc. Determination of sex & age from skull, mandible, pelvis, Femur, scapula etc.

UNIT III: Medico-legal Autopsy- Death and its Causes- External examination of deceased body – Internal Examination- Determination of time since death and cause of death- Injuries - classification- Medico-legal aspects of injuries- Postmortem changes. Exhumation process and its importance.

UNIT IV: Sexual offences- rape- unnatural sexual offences- sexual perversions- Abortion- Infancide- foeticides- impotence and sterility- virginity, Thermal deaths- eletrocution- starvation Asphyxia- Drowning deaths.

UNIT V: Forensic Odontology- Basic principles, Applications in crime investigations- Bite mark Analysis, Age estimation etc., Development of teeth- Dentition, Architecture of teeth, growth of teeth- Milk, Permanent. Dentition Library, Forensic Odontology limitations

SUGGESTED READING:

1. Forensic Medicine and Toxicology S N Tiwari
2. A Handbook of Forensic Anthropology Meenal Dhall Renu Tyagi Prof. Anup KumarKapoor
3. Handbook for Forensic Odontology Dr Vikram Ahuja
4. Anthropology and Forensic Science the Current Dynamism Prof. Anup Kumar Kapoor
5. Practical Manual on Human Physiology Prof. Sunita Mishra
6. Nutrition Health and Life Style ManagementPro Sunita Mishra
7. Forensic Science in India, A Vision for the Twenty first Century B B Nanda
8. Forensic Biology Dr Rukmani Krishnamurty

9. Forensic Serology & Blood Examination Dr Archana Tripathi
10. An Introduction to Forensic Hair Examination Shubhra Goutam
11. Women Victimization Dr Deepti
12. Forensic Science for Criminal Justices System Dr Anu Singhla
13. An Interdisciplinary Approach to Forensic Science Dr P K Janjua
14. Women Nutrition and Health Dr Neetu Sing
15. Perceived Status of Women in India Prof. Vimala Veerarghavan
16. Introduction to Forensic Anthropology, Steven N. Byers, Pearson/Allyn and Bacon, 2011.
17. Forensic Anthropology Laboratory Manual, Steven N. Byers, Pearson Education, USA,2011.
18. Forensic Anthropology: Current Methods and Practice, Angi M. Christensen, Nicholas V.Passalacqua and Eric J. Bartelink, Academic Press, USA, 2014.

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 6D	**Forensic Medicine &Anthropology Lab**	**Hrs/Wk: 2**

Forensic Medicine & Anthropology Practicals

1. Autopsy

   i) External Examination of Deceased body

   ii) Internal Examination of Deceased body

   iii) Post-mortem Changes

2. Collection and Preservation of Visceral Samples.
3. Identification and differentiation of Human Bones (Male & Female)

   iv) Skull

   v) Pelvis

   vi) Upper limbs

   vii) Lower limbs

Suggested co curricular activities:

- visits for post-mortem autopsy
- visits to clinical laboratories for testing procedures
- handling and studying human skeleton

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 4**
Course: 7D	**Wildlife Forensics**	**Hrs/Wk: 4**

Learning Outcomes:

1. To be able to define entomology and forensic entomology and give example
2. To be able to list and describe the various types of arthropods that invade a body afterdeath
3. to be able to describe the contributions of forensic entomology to the determination of the presence of drugs and poisons in a body
4. able to classify endangered species of animal wildlife.
5. To identify the natural habitat of different species
6. To investigate the drowning cases using diatoms
7. Analysis of Botanical evidences

Syllabus: *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

UNIT I: Wildlife Forensics - Importance of wildlife and Environment; Wildlife (Protection) Act-1972, Protected and endangered species of animals and plants; Sanctuaries and their importance; Types of wildlife crimes, Recovering evidence at poaching scenes, locating the burial: Wild animals as pharmacopeias, Wildlife artifacts (Bones, skin, fur, hair, nails, blood, feather, etc.), Trade in wild animals.

UNIT II: Entomology – introduction**,** Insects & their Biography, the life cycle of insects, collecting insects at the scene of crime, the PMI, classification of insects, rearing insects' calculation if PMI, other Forensic use and case study.

UNIT III : Forensic Botany, Botonical Evidence - Introduction, types, location, collection evaluation and forensic significance of fungi and plants in forensic science, wood and pollen grains, Methods of identification and comparison, various types of planktons and diatoms and their forensicimportance; Limnology.

UNIT IV: Environmental Forensics - Introduction to Environmental Forensics. Mercury-Natural and anthropogenic sources, detecting mercury in indoor environment and forensic aspects. Asbestos-sources and detection in air, water, fibres etc. Arsenic- sources, compounds, analytical methods and forensic aspects.

UNIT V: Environment and Ecosystems - Concept of biosphere, communities and ecosystems; Ecosystem characteristics structure and function; Xenobiotic and recalcitrance, Bioremediation using microorganisms and plants, Genetically Modified Organisms to treat effluents; introduction to BOD and COD, use of biosensors, bioremediation of solid waste, industrial effluent containing organic pollutants and metal ions. Environmental Management Introduction and scope of environmental management, basic concepts of sustainable development, Environmental Impact Assessment. Wildlife Protection Act 1972, Forest Conservation Act 1981, Environment (protection) Act 1986.

SUGGESTED READINGS:

1. Forensic biology – Richard Li
2. Forensic Medicine – P.V. Guharaj & M. R. Chandran
3. A textbook of Medical jurisprudence and toxicology- Modi
4. Wildlife forensic investigation-Principles and practice: Cooper and Cooper, CRCpress
5. Forensic Palynology in the United States of America (1990)- Bryant, V.M. Jr, Mildenhall, D.C.and Jones, J.G.14.PP.193-208
6. Textbook of Pollen Analysis 4th Edition- Faegri, K. Iverson, J. and Krzywinski, K. John Wiley& Sons, New York 1989.
7. Microbial forensics -Roger Breeze, Bruce Budowle, Steven E. Schutzer. Elsevier AcademicPress
8. The Forensic Laboratory Handbook Procedures and Practice - Ashraf Mozayani, CarlaNoziglia. 2nd edition. 2011. Human Press.
9. Forensic Science in Wildlife Investigations - Adrian Linacre Taylor and Francis,2009
10. The Wildlife Detectives: How Forensic Scientists Fight Crimes Against Nature B Donna M.
11. Jackson, Wendy Shattil, Bob Rozinski Universal Athenaeum (Denver, CO, U.S.A.)
12. Forensic palynology Dallas Mildenhall, Patricia Wiltshire, Vaughn Bryant Elsevier, 2006
13. Forensic palynology: an in-depth look at its indispensable value National University,SanDiego,2002
14. Medical microbiology by Ananthnaraya.

B.Sc.	**Semester: V** (Skill Enhancement Course- Elective)	**Credits: 1**
Course: 7D	**Wildlife Forensics Lab**	**Hrs/Wk: 2**

Wildlife Forensics Practicals

1. Identification of starch granules
2. Identification and classification of diatoms
3. Identification of pollen grains to genus level
4. Identification of wood using physical and anatomical features
5. Section and cutting of plant material and their examination
6. Staining techniques and laboratory exercises for identification of different plant cell types
7. Collection and packaging of wildlife evidences.
8. Extraction of plant poisons
9. Separation of plant poisons by TLC.
10. Quantification of plant poisons by UV-Visible spectrophotometer

Suggested co-curricular activities

- Visits to wildlife sanctuaries and zoos
- Visits to botanical gardens for poisonous plants
- Visits to LaCONES, CCMB & CDFD
- Collection of pollen grains related to criminal activities

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 6A: Instrumentation

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. What causes chemical shifts in NMR Spectroscopy? Explain with diagram.
2. What are the differences between Raman Spectra and Infrared Spectra?
3. Give the principles of Ultra-Violet Spectrometry & its double beam diagram.
4. Write down the forensic applications of X-Ray Spectroscopy.
5. Write a short note on Tandem Mass Spectroscopy.
6. Explain the principles of TLC.
7. Explain the working of compound microscope with well labelled diagram.
8. Define: FID, TCD and NPD with well labelled diagram.

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a)Give selection rule for UV, IR and rotational energies.
   (OR)
   (b)Write difference between SEM &TEM.

2. (a Explain instrumentation, working and principle of HPLC.
   (OR)
   (b) Explain about various detectors of mass spectroscopy with well labelled diagram

3. (a) Explain stretching & vibrational frequency of IR.
   (OR)
   (b)Explain with diagram:
   a) Spin -spin coupling
   b) Equivalent hydrogen
   c) Up field & Downfield
   d) Integral curve
   e) Coupling constant

4. (a) Write down the principle, working and diagram of polarizing microscopy.
   (OR)
   (b) What is Raman Effect? Explain with instrumentation.

5. (a) write the instrumentation and functioning of mass spectroscopy.
   (OR)
   (b) What do you mean by Neutron Activation Analysis?

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 7A: Forensic Toxicology

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Explain in detail Toxico Dynamics.
2. Classify corrosives and irritants with examples.
3. Explain in detail urinary excretion of poisons.
4. Explain the procedure of collection of different visceral samples.
5. Explain mode of action of alcohol. Give flow chart.
6. Discuss various preservatives used while forwarding samples for chemical toxicological analysis.
7. Explain different types of antidotes with their examples.
8. Explain in detail NPIC.

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a) Write down in detail about roots of administration of poisons..

   (OR)

   (b) Classify poisons with flowchart.

2. (a) Write about history and development of Forensic Toxicology in India

   (OR)

   (b) Explain the detection of metal poisons from blood and saliva

3. (a) Give at least four purification/extraction technique.

   (OR)

   (b) Explain in detail Toxico Kinetics.

4. (a) Give the examples of neurotoxic poisons. Mention at the mode of action least five.

   (OR)

   (b) What are the types of viscera samples collected at SoC? Explain the significance of each.

5. (a) Give identification tests for ethanol and methanol.

   (OR)

   (b) What do you mean by antidote? Explain their types.

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 6B: Forensic Psychology

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Write any 4 Interrogation Techniques.
2. Differentiate Cognitive Interview & Ethical Interview.
3. Write about admissibility of BEOSP in court of lay with a case study.
4. What are the three principle of polygraphy? Explain.
5. Write about NHRC guidelines of Polygraphy.
6. Explain principles of Brain Mapping/ Brain Fingerprinting.
7. What are the Human Rights of Mentally challenged Person in India? Explain.
8. What are the various classes of drugs in Narco Analysis?

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a) PEACE Model of Interview. Explain in detail with hierarchal chart.

   (OR)

   (b) Explain the principle & working of BEOSP.

2. (a Explain the principle & working of Polygraphy

   (OR)

   (b) Explain the process of Brain Fingerprinting with all types of waves & their diagrams

3. (a) Write about rehabilitation and correction treatment given to mentally ill offenders

   (OR)

   (b) Write any 3 case studies of polygraphy.

4. (a) Define Forensic Psychology. Write the significance of it with types of crime.

   (OR)

   (b) Write down the Sections of General Exceptions (IPC) 1862x.

5. (a) Explain reliability of Voice Stress Analysis.

   (OR)

   (b) explain the conduction of any 3 psychological tests?

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 7B: Narcotic Drugs & Psychotropic Substances

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Give the brief introduction of narcotics with their examples.
2. Explain the role of drugs with respect to different types of crime.
3. Mention 5 drugs which are categorized in drug abuse in sports.
4. Discuss in brief the problems associated with addiction.
5. Explain psychological and physiological effects of barbiturates.
6. Write a short note on dope testing. Give examples.
7. Write a note on NDPS Act 1985 with all transportation & smuggling act.
8. What are the various preliminary test for Narcotic drugs?

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a) Give the brief classification of NDPS.

   (OR)

   (b) Explain in detail issues of drug related law in India with a case study.

2. (a What are psychological effects, addiction & identification of heroine.

   (OR)

   (b) Explain the process of extraction of cocaine from blood.

3. (a) Write about Central Bureau of Narcotics & Narcotics Control Bureau in details.

   (OR)

   (b) Write about administration effects, addiction & identification of LSD.

4. (a) What are designer drugs? Give examples with molecular structure.

   (OR)

   (b) Write the amendments of NDPS in 2014.

5. (a) what are hallucinogens? Gives classification with detection techniques.

   (OR)

   (b) write a note on preliminary test for detection of NDPS?

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 6C: Forensic Physics

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Difference between natural fibers and manmade fibers.
2. Explain the modes of adulteration in cement and their detection methods.
3. Write short note on physical measurement refractive index density gradient, of glass evidences
4. Discuss in brief the technique of casting a toolmark.
5. Write a short note on class characteristics and individual characteristics of tool marks.
6. Discuss the process of collection and preservation of glass evidence.
7. Give a brief explanation on types of paints and their composition.
8. Write a note on forensic significance of fibre as evidence.

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a) Explain in detail the forensic examination of glass evidences and fracture.

   (OR)

   (b) Discus the process of restoration of erased serial numbers.

2. (a Write a short note on elemental analysis of paint.

   (OR)

   (b) Give detailed information of tools in crime and types of toolmarks

3. (a) What are fibres? Explain their types and in detail.

   (OR)

   (b) Discuss about elemental analysis of soil in detail.

4. (a) what is cement? Explain the analysis of cement sample with examples.

   (OR)

   (b) What is Raman Effect? Explain with instrumentation for examination of paint.

5. (a) Explain the analysis of paint sample by gas chromatography.

   (OR)

   (b) write the protocol for collection of differen physical evidences?

MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 7C: Forensic Engineering

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Explain the procedure of short circuit.
2. Explain crime scene management of arson case.
3. Explain the causes of vehicular failure.
4. Explain reconstruction of bridge failure.
5. Briefly explain laws of momentum & law of inertia with examples.
6. Write down the procedure for diagnosis & assessment of deterioration in structures with examples,
7. What are electrical and mechanical causes of vehicular arson cases?
8. Write road safety measures to prevent accidents.

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a) Explain the crime scene management of structural failure of building..

(OR)

(b) Explain collection techniques of accelerants of arson case & their detection techniques.

2. (a Discuss classification & chemistry of fire. Write its chemical equilibrium.

(OR)

(b) Write in detail quality control measures of civil engineering materials

3. (a) Explain the types of collisions and their role in vehicular accidents.

(OR)

(b) Illustrate in detail about utilization of the energy method in forensic engineering.

4 (a) What is the quality control measures of NCB?

4. (OR)

(b) write the types of brake failures and its crime scene management.

5. (a) Explain the prone accidents to Airport Runways and Railway Tracks

(OR)

(b) write a note crime scene management of bridge collapse.

MODEL QUESTION COURSE (Sem-end. Exam)
B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 6D: Forensic Medicine & Anthropology

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Define Forensic Anthropology.
2. Write a short note on facial reconstruction.
3. Write note on the estimation of stature from bones.
4. Define cause of death, manner of death and mode of death.
5. Explain about types of drowning.
6. How can you estimate age of a person on the basis of teeth examination?
7. Define forensic medicine and medical jurisprudence.
8. Explain the determination of time and cause of death using skeletal remains..

Section – B

Answer **ALL** the following questions. **5X10=50M**

9. (a) Elaborate on the subject matter, scope and application of Forensic Anthropology..

(OR)

(b) Elaborate on the methods of determining sex and age from skull and bones.

10. (a Describe early signs of post mortem changes with the help of examples.

(OR)

(b) explain the changes in cadaver during putrefication.

11. (a) Describe the classification of injuries. Support the answer with the help of examples.

(OR)

(b) Explain:
   a) Sodomy
   b) Tribadism
   c) Bestiality
   d) Buccal Coitus
   e) Electrocution

12. (a) How Forensic Odontology can be useful in Mass Disaster cases?.

(OR)

(b) explain age wise eruption of teeth in human body? Write the formula for it.

13. (a) explain the types of death caused dure to thermal injuries or excess heat.

(OR)

(b) what is medicolegal autopsy? Write different types of incision.

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MODEL QUESTION COURSE (Sem-end. Exam)

B. Sc - DEGREE EXAMINATIONS
Semester – V (Skill Enhancement Course- Elective)
Course 7D: Wildlife Forensics

Time: 3hrs **Max Marks: 75**

Section – A

Answer any **FIVE** of the following questions. **5X5=25M**

1. Define in brief about the basic elements in Wildlife Forensics.
2. What do you understand by Endangered Species? Give examples.
3. How diatoms can be useful in forensic investigation?
4. Write a short note on the analytical chemical techniques.
5. What are biosensors? What is the use of biosensors?
6. Establish the link between Wildlife crime and Forensic Science with the help of a case study.
7. Describe various ethical issues to be followed in Wildlife Forensics.
8. Classify types of insects with well labelled diagram.

Section – B

Answer **ALL** the following questions. **5X10=50M**

1. (a) Outline and explain the objectives of Wildlife Protection Act 1972

   (OR)

   (b) Give a detailed description of a Wildlife Crime Case and establish the role of Wildlife Forensic Scientist
2. (a) "Endangered species are most prone to wildlife crimes". Justify the statement.

   (OR)

   (b) What are the various sources, compounds and various analytical methods for Arsenic?

3. (a) What is the various forensic significance of Wood, Pollen grains, Planktons, Fibers, Insects?.

   (OR)

   (b) What are various wildlife artifacts? Also comment on Trade of Wild life animals in India

4. (a) what is forensic botany? Explain the procedure for collection of botanical evidences.

   (OR)

   (b) what is trafficking? Explain its types.

5. (a) what is entomology? Explain the its forensic significance with PMI.

   (OR)

   (b) explain the lifecycle of blow fly for calculation of time since death?