Rayat Shikshan Sanstha's

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA
LEAD COLLEGE OF KARMAVEER BHAURAO PATIL UNIVERSITY, SATARA

Reaccredited by NAAC with 'A^{+}' Grade

As per NEP Guidelines 2020 For

Subject – Forensic Science

B. Sc. II
Semester - III & IV

Syllabus to be implemented w. e. f. June, 2024 onwards

Structure of the course:

1. **TITLE : Forensic Science**
2. **YEAR OF IMPLEMENTATION**:-

   Syllabus will be implemented from June, 2024 onwards.

3. **PREAMBLE:**

   This syllabus

   s is framed to give sound knowledge with understanding of Forensic Science to undergraduate students. The goal of the syllabus is to make the study of Forensic Science popular, interesting and encouraging to the students for higher studies including research.

   The aim of the syllabus is to prepare the students to gain knowledge in Forensic science and CSI. The new and updated syllabus is based on a basic and applied approach with vigor and depth. At the same time, precaution is taken to make the syllabus comparable to the syllabi of three Government Institute of Forensic Science, other universities and the needs of Government sector, private sector and research.

   The syllabus is prepared after discussion at length with a number of faculty members of the subject and experts from Government and private sectors and research fields.

   The units of the syllabus are well defined, taking into consideration the level and capacity of students.

4. **GENERAL OBJECTIVES OF THE COURSE / PAPER:**

   1. To make the students knowledgeable with respect to the subject and its practical applicability.
   2. To promote understanding of basic and advanced concepts in Forensic Science.
   3. To expose the students to various emerging areas of Forensic Science.
   4. To prepare students for further studies, helping in their bright career.
   5. To expose the students to different processes used in Government and private areas and in the research field.
   6. To develop their ability to apply the knowledge of Forensic Science in Crime Scene investigation.
   7. To prepare the students to accept the challenges in Crime scene investigation.
   8. To develop skills required in various private sectors like banking, private investigative agencies, and research labs and in the field of Government sectors.

5. **DURATION:** The course shall be a full time course.
6. **EXAM PATTERN:** Pattern of examination will be semester.

7. **MEDIUM OF INSTRUCTION:** The medium of instruction shall be in English.

8. **STRUCTURE of B.Sc. II Forensic Science:**

Four Year UG Honours Degree Credit Distribution

Level	Sem	Subject - 1 Major				Subject - 2 Minor		Subject - 3 GE / OE		VSEC		AEC, VEC, IKS			OJT, FP, CEP, CC, RP,RM					Total
		DSC		DSE						VSC	SEC	AEC	IKS	VEC	CC	FP	CEP	OJT	RM	
		T	P	T	P	T	P	T	P											
4.5	I	4	2	---	---	4	2	6	--	---	---	---	2	---	2	---	---	---	---	22
	II	4	2	---	---	4	2	6	--	---	2	---	---	2	---	---	---	---	---	22
5	III	4	4	---	---	2	2	---	---	2	2	4	---	2	---	---	---	---	---	22
	IV	4	4	---	---	2	2	---	---	2	2	4	---	---	2	---	---	---	---	22
5.5	V	4	2	4 (2 Papers out of four)	2	---	---	---	---	4	---	---	---	---	2	2	2	---	---	22
	VI	4	2	4 (2 Papers out of four)	2	---	---	---	---	2	--	---	---	---	2	2	---	4	---	22
6	VII	12 (3 Papers)	2	4 (1 Paper out of Two)	--	--	---	---	---	---	---	---	---	---	---	---	---	---	4	22
	VIII	12 (3 Papers)	2	4 (1 Paper out of Two)	--	---	---	---	---	---	---	---	---	---	---	---	---	4	---	22
Total		48	20	16	4	12	8	12	--	10	6	8	2	4	8	4	2	8	4	176
		88				20		12		16		14			26					

9. **EXAMINATION STRUCTURE: As per college guidelines**

10. **Structure and titles of the course of B.Sc. II for Semester III & IV**

Total credits - 2, Total Hours – 30				
Sem	**Paper no. & Code**	**Paper Title**	**Unit**	**Unit name**
Sem III	Major Paper I **BFST 231**	Advanced Forensic Science I	Unit I	Basics of Criminology
			Unit II	Crime Scene Management
			Unit III	Crime Scene Investigation
			Unit IV	Crime Scene Documentation
	Major Paper II **BFST 232**	Advanced Computer and Digital Forensics I	Unit I	Introduction to Cyber Forensic
			Unit II	Fundamentals of Network Security
			Unit III	Basics of Mobile Phone Investigation
			Unit IV	Basics of Cyber Security
	Practical **BFSP 233**	Major Practical	Practical	Major Practical Paper III
	Practical **BFSP 234**	Major Practical	Practical	Major Practical Paper IV
	Minor Paper I **BFST 235**	Advanced Forensic Chemistry I and Forensic Physics I	Unit I	Petroleum Products
			Unit II	Cases involving Arson and Explosives
			Unit III	Forensic Trace Analysis
			Unit IV	Tool and Tool Marks
	Practical **BFSP 236**	Minor Practical	Practical	Minor Practical Paper III
	Major Paper II **BFST 241**	Advanced Forensic Science II	Unit I	Physical Evidences – I
			Unit II	Impression Evidences – I
			Unit III	Impression Evidences – II
			Unit IV	Bloodstain Pattern and Crime Scene Reconstruction
	VEC: BFSTVEC 2	Environmental studies	Theory	
	VSC: BFSPVSC1	Essential components in cyber security	Practical	

Sem IV	Paper **BFST 242**	Computer II And Digital Forensics II	Unit I	Computer Networks
			Unit II	Mobile Crime Investigations
			Unit III	Cyber Forensic Tools and Utilities
			Unit IV	Legal Provisions for Digital Evidences
	Practical **BFSP 243**	Major Practical	Practical	Major Practical Paper V
	Practical **BFSP 244**	Major Practical	Practical	Major Practical Paper VI
	Minor Paper I **BFST 245**	Advanced Forensic Biology II and Forensic Psychology II	Unit I	Forensic Genetics, DNA and Protein Extraction techniques.
			Unit II	Forensic Biology and serology.
			Unit III	Aggression and Behavioural abnormalities.
			Unit IV	Investigative psychology and criminal profiling.
	Practical **BFSP 246**	Minor Practical	Practical	Minor Practical Paper IV

11. **OTHER FEATURES:**

(A) LIBRARY :

Reference Books – Latest Editions, Journals and Periodicals.

(B) SPECIFIC EQUIPMENTS NECESSARY TO RUN THE COURSE:

OHP, Computer, L.C.D. Projector.

(C) INTERNET

(D) LIST OF THE LABORATORY EQUIPMENTS :

Instruments	**Instruments**	**Instruments**
Colorimeter	Glassware	Soxhlet extraction apparatus.
Spectrophotometer	Chromatographic jar	Micropipettes
pH meter	Chromatography column	LASER
Electrophoresis apparatus	CSI Kit	Sonometer
Computer with printer & internet	CSI Management Kit	Electromagnetic device

Water bath	Fingerprint development kit	Travelling Microscope
Incubator	Fingerprint collection kit	Polari meter
Oven	Blood detection Kit	Logic gate Kit
Balance	Semen detection Kit	Bridge rectifier
Centrifuge machine	GSR detection Kit	OS forensic

Semester – III

Major Paper I: Advanced Forensic Science I

SEMESTER – III Major Paper – III **Advanced Forensic Science I**		
Course Objectives: Students should be able to, 1. Study the fundamentals of Criminology and Crime scene Investigation. 2. Know about investigative techniques. 3. Gain knowledge about handling of evidence and crime. 4. Understand about the handling of crime scenes.		
Credits (Total Credits 2)	**SEMESTER – III Major Paper – III**	**No. of hours per unit (30)**
Unit – I	**Basics Of Criminology**	**(08)**
	1.1 Introduction to Criminology- Definition, aim and scope, Theories of Criminal behavior- Classical school, Positivist school, Italian school and Chicago school of criminology. **1.2 Criminal Justice System-** Definition, objective and goals of criminal justice system. Principles of criminal justice, Criminal justice system in India: Major components and Steps. **1.3 Juvenile Delinquency**- Causes and theories, Juvenile justice system, Prevention and intervention strategies. **1.4 Crime Typologies-** Violent crimes, Property crimes, White-collar crimes, Cybercrimes.	
Unit – II	**Crime Scene Management**	**(08)**
	2.1 Introduction to Crime Scene Management: Definition and Significance of crime scene management, Roles and responsibilities of first responders. **2.2 Securing the Crime Scene:** Establishing and maintaining the perimeter, Controlling access and managing personnel at the crime scene. **2.3 Crime Scene Protocols:** Step-by-step procedures from arrival to release of the scene, ensuring scene safety and preservation of evidence.	

	2.4 Documentation and Reporting: Importance of accurate and thorough documentation, Reporting procedures and record maintenance.	
Unit – III	**Crime Scene Investigation**	**(07)**
	3.1 Introduction to Crime Scene Investigation: Overview of crime scene investigation principles, Types of crime scenes (indoor, outdoor, vehicle, etc.).Types of evidence (physical, biological, digital, etc.). **3.2 Crime Scene Survey and Search Methods:** Initial walkthrough and scene survey, Search patterns and methods (grid, spiral, strip/line, quadrant/zone), Prioritization of evidence collection. **3.3 Evidence Collection and Preservation:** Techniques for collecting different types of evidence (fingerprints, trace evidence, biological samples), Use of personal protective equipment (PPE), Packaging and transportation of evidence to avoid contamination. **3.4 Crime Scene Reconstruction:** Reconstructing the sequence of events, Role of forensic science in crime scene reconstruction, Use of 3D modeling and other advanced techniques.	
Unit – IV	**Crime Scene Documentation**	**(07)**
	4.1 Introduction to Crime Scene Documentation: Importance and purpose of documentation, Types of documentation (written notes, sketches, photographs, videography). **4.2 Crime Scene Notes:** Writing detailed and accurate notes during the investigation, Recording observations, actions taken, and evidence collected. **4.3 Crime Scene Photography**: Principles of crime scene photography. Techniques for photographing evidence, scene overviews, and close-ups. Use of scales, markers, and lighting in photography. **4.4 Crime Scene Sketching and Mapping**: Creating rough and final sketches. Measuring and mapping the crime scene. **4. 5 Crime Scene Reports**: Structuring a comprehensive crime scene report, Legal requirements and considerations for reports. **4.6 Courtroom Presentation**: Presenting crime scene documentation in court. Preparing for testimony as an expert witness, Handling cross-examination related to documentation.	

Course Outcomes: After completion of the units students will be able to:

1. Comprehend the significance of crime scenes.

2. Analyze the various types of cases.

3. Evaluate and interpret crucial information from various types of trace evidence.

4. Analyze the scientific principles of crime scene investigation including proper evidence handling.

Reference Books:

1. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
2. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
3. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
4. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)
5. Sharma, B.R. Forensic Science in Criminal Investigation and Trails. Universal Law Publishing: (2003).
6. Meguire, M., Morgan, R. and Reiner, R.The Oxford Handbook of Criminology 2nd ed. Oxford University Press: New York; (2002)
7. Bell, W.R. Practical Criminal Investigation in Correctional Facilities. CRC Pres: London; (2001).
8. Lyman M.D. Criminal Investigation- The Art and the Science. Pearson Education: India; (2013) .
9. Henry Lee‟s Crime Scene Handbook:Henry C Lee (2001)
10. Stuart H. James Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed.(2012)

SEMESTER – III Major Paper – IV Advanced Computer and Digital Forensics I		
Course Objectives: Students should be able to, 1. Study the digital crime scene and its process. 2. Learn the cyber forensic investigative steps. 3. Understand the roles and responsibilities of cyber experts. 4. Gain knowledge about mobile forensic investigative techniques.		
Credits (Total Credits 2)	**SEMESTER – III Major Paper – IV**	**No. of hours per unit (30)**
Unit – I	**Introduction to Cyber Forensic**	**(08)**
	1.1 Introduction to Cyber Forensic, Cyber Forensic Steps (Identification, Seizure, Acquisition, Authentication, Presentation, Preservation), 1.2 Computer Forensic Expert, Cyber Forensic Investigation Process. The Goal of the Forensic Investigation, 1.3 Why Investigate (Internet usage exceeds norm, Using e-mail inappropriately, Use of Internet, e-mail, or PC in a non-work-related manner, 1.4 Theft of information, Violation of security policies or procedures, Intellectual property infractions, electronic tampering) 1.5 Establishing a Basis or Justification to Investigate, Determine the Impact of Incident, Auditing V/s Cyber Forensic Investigations.	
Unit - II	**Fundamentals of Network Security**	
	2.1 Network Security: Definition, Objectives, Threats 2.2 Network Security Concepts: The CIA Triad (Confidentiality, Integrity, Availability), Network Security Models. 2.3 Network Threats and Vulnerabilities: Common Network Attacks (DoS, DDoS, Phishing, Malware), Network Security Vulnerabilities. 2.4 Network Security Controls: Firewalls, Intrusion Detection and Prevention Systems (IDS/IPS), Access Control Lists (ACLs).	

Unit - III	**Basics of Mobile Phone Investigation**	
	3.1 Role of different agencies involved in crime scene management: Police, Forensic Science Laboratories, Medico legal experts, Judicial officers. 3.2 Duties of first responders at crime scenes. 3.3 Crime Scene Management-Technology Management, Logistic Management, Manpower Management, 3.4 Golden rules for an ideal crime scene Management. 3.5 Mobile crime investigation. Investigating- mobile handset theft, Flash SMS, SMS tampering, back/postdated SMS, SMS spoofing, and MMS Scandals.	
UNIT - IV	**Basics Of Cyber Security**	
	4.1 Cryptography: Introduction, Types, Cryptographic Algorithms, Applications of Cryptography. 4.2 Encryption: Definition, Types of Encryptions, Application of Encryption 4.3 Wireless Security: Wireless Network Threats, Wireless Security Standards (WPA, WPA2), Wireless Intrusion Detection Systems (WIDS). 4.4 Application Security: Web Application Security, Mobile Application Security, Secure Coding Practices.	

Course Outcomes: After completion of the units students will be able to:

1. Differentiate between conventional crime scene and digital crime scene.
2. Identify the different types of digital evidence.
3. Extraction processes form digital evidence..
4. Analyse the digital evidence by utilizing different investigative applications.

Reference Books:

1. Digital forensics for legal professionals, by Larry Daniel (Second edition) (Unit-I)2009
2. Investigating computer related crime, by Peter Stephenson (Second edition)(Unit II) 2007
3. Incident Response & Computer Forensics by KavinMandia, Chrisporsis, Mattpepe (Second Edition)(Unit-IV). 2003
4. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation

Major Practical Paper - III

Credits (Total Credits 2)	SEMESTER – III Major Practical Paper – III List of Practical	No. of hours per Practical
Course Objectives: Students should be able to, 1. Study initial response in crime scene and investigation techniques of indoor and outdoor crime scene. 2. Understand the crime scene management and crime scene documentation.		
1	Organize a mock trial where students take on roles as prosecutors, defense attorneys, judges, and jury members.	
2	Analyze a case from a forensic psychology perspective, focusing on the psychological aspects of criminal behaviour and mental health issues.	
3	To perform Note taking, photography and videography of crime scene	
4	To prepare a crime scene sketch by using various methods	
5	Searching evidence on crime scene using different methods	
6	Collection, packaging and forwarding of different types of evidences.	
7	To prepare report on crime scene investigation.	
8	To investigate the indoor crime scene.	
9	To investigate the outdoor crime scene.	
10	To maintain chain of custody of evidence and its importance.	
11	To study different types of crime scene kit and its uses.	
12	Understand the principles behind blood spatter patterns on their crime scene and their interpretation.	
13	Analyze case studies to understand victimization, focusing on different types of crimes	
14	Analyze the structure of different types of correctional facilities.	

Course Outcomes- Students should be able to:

1. Utilize the crime scene investigation process.
2. Operate the different photographic techniques.
3. Perform Crime scene management, crime scene photography, videography and sketching

Reference Book

1. Siegel, Larry J., and John L. Worrall. Essentials of Criminal Justice. 10th ed. Boston: Cengage Learning, 2019.
2. O'Hara, Charles E., and Gregory L. O'Hara. Fundamentals of Criminal Investigation. 7th ed. Springfield: Charles C Thomas Publisher, Ltd., 2013.
3. Gardner, Ross, and Donna Krouskup. Practical Crime Scene Processing and Investigation. 2nd ed. Boca Raton: CRC Press, 2018.
4. Peterson, Joseph L., Steven G. Mihajlovic, and Michael J. Gilliland. "Forensic Science and the Courts: The Uses and Effects of Scientific Evidence in Criminal Case Processing." Journal of Forensic Sciences 29, no. 4 (1984): 959-971.
5. Turvey, Brent E. "Criminal Profiling: An Introduction to Behavioral Evidence Analysis." Journal of Forensic Psychology Practice 1, no. 3 (2001): 29-53.
6. Inman, Keith, and Norah Rudin. "The Origin of Evidence and the Role of the Crime Laboratory in the Criminal Justice System." Science & Justice 42, no. 1 (2002)
7. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation, Second Edition 2nd Edition by Lee Reiber.
8. Practical Mobile Forensics: Forensically investigate and analyze iOS, Android, and Windows 10 devices, 4th Edition Paperback -April 9, 2020 by Rohi Tamma (Author), Oleg Skulkin (Author), Heather Mahalik (Author), Satish Bommisetty (Author).
9. Handbook of Digital Forensics and Investigation 1st Edition by Eoghan Casey, ElsevierAcademic Press 2010.

Major Practical Paper - IV

Credits (Total Credits 2)	SEMESTER – III Major Practical Paper – IV List of Practical	No. of hours per Practical
Course Objectives: Students should be able to: 1. Learn the Process of Recovery of Data and Analysis Process for Data. 2. Learn the Use of Software's & tools for Analysis Purpose.		
1	Installation of LINUX on VMWARE	
2	To study basic commands of LINUX	
3	To Study Tools in LINUX	
4	Network mapper (Nmap) Active devices and ports	
5	Recent accessed file analysis (Recent files view)	
6	Steganography	
7	Network History (Wi-Fi history view)	
8	Disk imaging and analysis (FTK imager)	
9	File metadata analysis (exiftool)	
10	Data encryption and Decryption (VeraCrypt)	
11	Reviewing windows software uninstall history (Uninstall viewer)	
12	.Extracting call logs (ADB) analysis of files with SQLite viewer	
13	Extracting SMS messages (ADB) analysis of files with SQLite viewer	
14	.Extracting contacts (ADB) analysis of files with SQLite viewer	
15	.Extracting contacts (ADB) analysis of files with SQLite viewer	
16	Examination of app permission using ADB	
17	Extracting Wi-Fi connection history.	

Course Outcomes- Students should be able to:

1. Perform retrieves the deleted data from various pen drives, flash drives etc.
2. Understanding of Fundamental Cybersecurity Concepts
3. Acquire thorough knowledge regarding collection of digital evidence and their analysis.
4. Securing network communications by implementing firewalls, VPNs, and intrusion

Reference Book

1. 1.Siegel, Larry J., and John L. Worrall. Essentials of Criminal Justice. 10th ed. Boston: Cengage Learning, 2019.
2. O'Hara, Charles E., and Gregory L. O'Hara. Fundamentals of Criminal Investigation. 7th ed. Springfield: Charles C Thomas Publisher, Ltd., 2013.
3. Gardner, Ross, and Donna Krouskup. Practical Crime Scene Processing and Investigation. 2nd ed. Boca Raton: CRC Press, 2018.
4. Peterson, Joseph L., Steven G. Mihajlovic, and Michael J. Gilliland. "Forensic Science and the Courts: The Uses and Effects of Scientific Evidence in Criminal Case Processing." Journal of Forensic Sciences 29, no. 4 (1984): 959-971.
5. Turvey, Brent E. "Criminal Profiling: An Introduction to Behavioral Evidence Analysis." Journal of Forensic Psychology Practice 1, no. 3 (2001): 29-53.
6. Inman, Keith, and Norah Rudin. "The Origin of Evidence and the Role of the Crime Laboratory in the Criminal Justice System." Science & Justice 42, no. 1 (2002)
7. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation, Second Edition 2nd Edition by Lee Reiber.
8. Practical Mobile Forensics: Forensically investigate and analyze iOS, Android, and Windows 10 devices, 4th Edition Paperback -April 9, 2020 by Rohi Tamma (Author), Oleg Skulkin (Author), Heather Mahalik (Author), Satish Bommisetty (Author).
9. Handbook of Digital Forensics and Investigation 1st Edition by Eoghan Casey, ElsevierAcademic Press 2010.

SEMESTER – III Minor Paper – III **Advanced Forensic Chemistry I & Forensic Physics I**		
Course Objectives: Students should be able to, 1. Understand the quality control criteria for petroleum products and motor fuels. 2. Determining the origin and cause of a fire. 3. Learn the forensic applications of trace evidence such as glass, paint.		
Credits (Total Credits 2)	**SEMESTER – III Minor Paper – III**	**No. of hours per unit (30)**
Unit – I	**Petroleum Products**	**(07)**
	1.1 Distillation and fractionation of petroleum 1.2 Commercial uses of different petroleum fractions 1.3 Analysis of traces of petrol, diesel, ATF, Kerosene in forensic exhibits. 1.4 Comparison of petrol, Diesel, ATF and Kerosene, Case Study.	
Unit – II	**Cases Involving Arson and Explosive**	**(08)**
	2.1 Chemistry of fire. Conditions for fire. Collection and preservation of arson evidence. 2.2 Analysis of fire debris. Analysis of ignitable liquid residue. 2.3 Scientific investigation and evaluation of clue materials. Information from smoke staining, 2.4 Classification of explosives, Blasting agents, Bomb scene management, 2.5 Synthesis and characteristics of TNT, PETN and RDX. Explosion process Searching the scene of the explosion, Post blast residue collection and analysis	
Unit – III	**Forensic Trace Analysis**	**(08)**

	3.1 Physical properties of materials: temperature, weight and mass, density, refractive index and their forensic importance. 3.2 Glass: Composition of glass, Comparison of glass fragments, Measuring and comparing density and refractive index of glass, classification of glass samples, Glass fractures, Collection and preservation of glass evidence. 3.3 Paint: Composition of paint, Classification of common paints, Pigment Volume concentration number, Microscopic examination of paint, Analytical tools used in paint comparison, significance of paint evidence, collection and preservation of paint evidence. Forensic examination of paint.	
Unit – IV	**Tools and Tool Marks**	**(07)**
	4.1 Common Hand Tools: Levers (screw drivers, crow bars, pry bars, nail pullers, pinch bars, moulding bar, wrecking bar) 4.2 Hand saw (Rip saw, cross cutting saw, bow saw, teeth saw, compass saw, dip cut, coping saw, wallboard saw, bow saw, hacksaw, chisel teeth saw, coarse cut carpenter saw) 4.3 Striking Tools (Hammers, Hatches and Axes), 4.4 Grasping Tools (Wrenches, Vise grips, Pliers) 4.5 Cutting Tools (Metal snips, wire cutters, bolt and cable cutters) 4.6 Crimping Tools, Knives, Scissors and shears, Chisels and punches, Drill bits. 4.7 Tool Marks: Marks made by hand tools (Impression / compression marks, dent, saw marks, drill marks and holes, punctures, point to point blade cut marks, scratch and scour marks. 4.8 Collection and documentation of tool mark	

Course Outcomes: After completion of the units students will be able to:

1. Understand comparison of petrol, diesel, Kerosene and ATF.
2. To Analyze classification of explosives.
3. Discuss forensic applications of trace evidence such as glass, paint.
4. Elaborate the basics of tools and tool marks.

Reference Books:

1. J.D. DeHaan, Kirk‟s Fire Investigation, 3rd Edition, Prentice Hall, New Jersey . (Unit III)
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York(1995).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004). (Unit-III,IV)
4. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in Forensic Science, (2013)
5. D.H. Ubelaker (Ed.), Wiley - Blackwell, Chichester (2013).(Unit - III, IV)
6. Instrumental Method of Chemical Analysis. Chatwal & Anand, Himalaya Publication.(2011)(Unit - I, II, III)
7. SeropeKalpakjian, Steven R Schmid. “Manufacturing Engineering and Technology”. International edition. 4th Ed. Prentice Hall, Inc. 2001. ISBN 0-13-017440-8. (Unit-I,II).
8. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
9. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
7. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
8. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)
9. Sharma, B.R. Forensic Science in Criminal Investigation and Trails. Universal Law Publishing: (2003).
10. Meguire, M., Morgan, R. and Reiner, R.The Oxford Handbook of Criminology 2nd ed. Oxford University Press: New York; (2002)
11. Bell, W.R. Practical Criminal Investigation in Correctional Facilities. CRC Pres: London; (2001).
12. Lyman M.D. Criminal Investigation- The Art and the Science. Pearson Education: India; (2013)
13. Henry Lee‟s Crime Scene Handbook:Henry C Lee (2001)
14. Stuart H. James Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. (2009)

Credits (Total Credits 2)	SEMESTER – III Minor Practical Paper – III List of Practical	No. of hours per Practical
Course Objectives: Students should be able to, 1. Prepare a case report on a case involving arson. 2. Carry out analysis of explosives substances. 3. Learn the methods of analysis of glass fragments. 4. Understand the methods of analysis of tool and tool marks.		
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.(no.2)	
5	To prepare a case report on a case involving arson.	
6	To carry out analysis of explosive substances.(no.2)	
7	To separate explosive substances using thin layer chromatography.(no.2)	
8	To prepare a case report on bomb scene management.	
9	Chemical analysis of explosive materials.(Gun powder)- Color test,Microscopic examination.(no.2)	
10	Examination of fire arson cases by GC, TLC.(no.2)	
11	Comparison and physical matching of glass fragments.	
12	Study of glass fractures due to impacts / heat.	
13	Study the refractive index of glass samples.	
14	Determination of density of a given sample.	
15	Microscopic examination of paint sample.	
16	Identification of tools using standard data sheets.	
17	Physical matching of broken tools.	
18	Comparison of tool and tool marks under comparison microscope.	
19	Examination of structural properties tools by Comparison Microscope.	
20	Examination of tool marks and identification of tools.	
Course Outcomes- Students will be able to: 1. Understand how to carry out chemical analysis of explosives materials.		

2. Understands how to carry out examinations of fire arson cases by GC,TLC.
3. Apply the methods of analysis of glass fragments.
4. Perform the methods of analysis of tool and tool marks.

Reference Books

1. DFSL manual(2005)
2. Forensic Analysis pre laboratory and laboratory student manual Dr. E. Hywel Evan (2001)
3. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
4. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
5. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
6. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)

VSC: Essential Components in Cyber Security

Credits (Total Credits 2)	SEMESTER – III List of Practical	No. of hours per Practical
Course Objectives: Students will be able to, 1. Understanding Cyber security Fundamentals 2. Practical Application of Security Measures 3. Risk Analysis and Management		
1	Introduction to networking commands.	
2	Introduction to Kali Linux OS.	
3	To study the Basic commands in Kali Linux.	
4	To study the tools in Kali Linux.	
5	To study the Digital footprints.	
6	To study the tools in Digital footprints.	
7	To study the Digital Scanning.	
8	To study the tools in Digital Scanning.	
9	To study the Namp and Nmap commands.	
10	To study the scanning commands.	
11	To study the Network Traffic Monitoring.	
12	To study the Network Traffic Monitoring Tools.	
13	To study the Wireshark.	
14	To study the Website scanning.	
15	To study the SQL Attacks.	
16	To study the SQL Injection.	
17	To study the VAPT Basic.	
18	To study the Malware Analysis.	
19	To study the Malware Isolation.	
20	To study the Introduction to Nessus.	

Course Outcomes- Students will be able to:

1. Perform the Privacy and security settings for social media.
2. Utilize the Firewall, Windows defender and MS office tools.
3. Perform the Secure net banking, Online transactions
4. Describe the use of Internet & Email Securely.

Reference Book

1. Anderson, Ross. *Security Engineering: A Guide to Building Dependable Distributed Systems*. Wiley, 2020.
2. Bace, Rebecca, and William Mullins. *Understanding Intrusion Detection Systems*. Network Security, 2003.
3. Bishop, Matt. *Computer Security: Art and Science*. Addison-Wesley, 2003.
4. Clarke, Richard A., and Robert K. Knake. *The Fifth Domain: Defending Our Country, Our Companies, and Ourselves in the Age of Cyber Threats*. Penguin Press, 2019.
5. Conklin, William, and Gregory J. Davis. *Principles of Cybersecurity*. Jones & Bartlett Learning, 2021.
6. McKenzie, Roger. *Cybersecurity for Executives: A Practical Guide*. IT Governance Publishing, 2020.
7. Ponemon Institute. *Cost of a Data Breach Report 2022*. IBM Security, 2022.
8. Schneier, Bruce. *Schneier on Security*. Wiley, 2015.
9. Stoll, Cliff. *The Cuckoo's Egg: Tracking a Spy Through the Maze of Computer Espionage*. Doubleday, 1989.
10. Vasserman, Eugene. *The Protection of Information in Computer Systems*. IEEE, 2020.
11. Zadvinskis, Ivars. *Tactical Cyber Security for All: A Guide to Managing and Resolving Cyber Attacks*. Routledge, 2021.
12. Zetter, Kim. *Countdown to Zero Day: Stuxnet and the Launch of the World's First Digital Weapon*. Crown Publishing Group, 2014.

SEC: Handwriting Identification & Recognition

Credits (Total Credits 2)	SEMESTER – III List of Practical	No. of hours per Practical
Course Objectives: Students should be able to, 1. Learn handwriting characteristics and their analysis. 2. Carry out analysis of handwriting examinations. 3. Learn about forgery. 4. Understand the process of analysis of forged documents.		
1	To perform examination of handwriting with the given samples.	
2	To perform examination of handwriting on various surfaces.	
3	To examine handwriting influenced by age.	
4	To examine handwriting samples of a twin.	
5	To examine forged signatures.	
6	To examine simulated handwriting.	
7	To examine the handwriting numerals.	
8	To examine disguise in handwriting.	
9	To perform analysis of handwriting strokes documents.	
10	To perform analysis of currency and other security documents.	
11	Identification of General Characteristics of Handwriting	
12	Study of Natural variations in Handwriting	
13	Examination of forged documents.	
14	Examination of alteration, erasures, overwriting, additions and obliteration.	
15	Decipherment of secret writings using VSC	
Course Outcomes- Students will be able to: 1. Perform handwriting characteristics and their analysis. 2. Perform analysis of handwriting examinations. 3. Elaborate about forgery. 4. Perform the process of analysis of forged documents.		
Reference Books 1. DFSL manual (2005)		

2. Forensic Analysis pre laboratory and laboratory student manual Dr. E. Hywel Evan (2001)
3. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
4. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
5. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
6. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)

SEMESTER – IV Major Paper – V **Advanced Forensic Science-II**		
Course Objectives: Students should be able to, 1. Understand the physical evidence and their handling process. 2. Know about investigative techniques. 3. Gain knowledge about handling evidence and crime. 4. Understand about the blood spatter analysis and CSR.		
Credits (Total Credits 2)	**SEMESTER – IV Major Paper – V**	**No. of hours per unit (30)**
Unit – I	**Physical Evidences – I**	**(08)**
	1.1 Soil evidence – importance, location, collection and comparison of soil samples. 1.2 Cloth evidence- importance, collection, analysis of adhering material. Matching of pieces. 1.3 Fiber evidence- artificial and man-made fiber. Collection of fiber evidence. Identification and comparison of fiber 1.4 Forensic Gemology	
Unit – II	**Impression evidences – I**	**(07)**
	2.1 Lip print analysis (Development, collection, packaging, preservation, analysis) 2.2 Gait pattern analysis (Development, collection, packaging, preservation, analysis) 2.3 Ear print (Development, collection, packaging, preservation, analysis) 2.4 Palm print (Development, collection, packaging, preservation, analysis)	
Unit – III	**Impression evidences – II**	**(07)**
	3.1 Tire marks (Development, collection, packaging, preservation, analysis) 3.2 Skid mark analysis 3.3 Fingerprint (Development, collection, packaging, preservation,	

	analysis) 3.4 Footprints and Shoe prints (Development, collection, packaging, preservation, analysis)	
Unit – IV	**Bloodstain Pattern and Crime Scene Reconstruction**	**(08)**
	4.1 Bloodstain Pattern: Historical perspective, Physical and biological properties of human blood. 4.2 Classification: Spatter and non-spatter, droplet directionality and angle of impact, determination of point of convergence and point of origin, altered bloodstain patterns. 4.3 Crime Scene reconstruction (CSR): nature and importance of CSR, basic principles and stages. Role of protocol in reconstruction. 4.4 Reconstruction of motor accident, firing, post blast cases, fire. Collection of data (videography photography, measurements, analysis of data) Writing of CSR reports, courtroom testimony.	

Course Outcomes: After completion of the units students will be able to:

1. Comprehend the significance of physical evidence to investigate crime.
2. Analyse the various types of cases.
3. To Evaluate and interpret crucial information from various types of trace evidence.
4. To analyze the scientific principles of crime scene investigation including proper evidence handling.

Reference Books:

11. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
12. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
13. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
14. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)
15. Sharma, B.R. Forensic Science in Criminal Investigation and Trails. Universal Law Publishing: (2003).
16. Meguire, M., Morgan, R. and Reiner, R.The Oxford Handbook of Criminology 2nd ed. Oxford University Press: New York; (2002)

17. Bell, W.R. Practical Criminal Investigation in Correctional Facilities. CRC Pres: London; (2001).
18. Lyman M.D. Criminal Investigation- The Art and the Science. Pearson Education: India; (2013)
19. Henry Lee"s Crime Scene Handbook:Henry C Lee (2001)
20. Stuart H. James Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed.(2012)

SEMESTER – IV Major Paper – VI		
Course Objectives: Students should be able to, 1. Know the Basic Computer networking information. 2. Know the tools used in Mobile Crime Investigation. 3. Know the Extraction of data from mobile device, analysis tools. 4. Know the Registration of FIR of Cyber Crimes.		
Credits (Total Credits 2)	**SEMESTER – IV Major Paper – VI**	**No. of hours per unit (30)**
Unit – I	**Computer Networks**	**(08)**
	1.1 Computer Networks, 1.2 Client Server architecture, 1.3 Network technologies, Network 1.4 Topologies, Network Devices, Network Commands.	
Unit – II	**Mobile Crime Investigations**	**(07)**
	2.1 Seizure note for Mobile Handset, care taken for while confiscating Mobile Handset. 2.2 Toolkit for Investigation of mobile Handset, Software Required for 2.3 Investigation.Mobile Number Portability, 2.4 Mobile Number Tracing, Tracing Stolen/Lost Handset.	

Unit – III	**Cyber Forensic Tools and Utilities**	**(07)**
	3.1 Introduction, 3.2 Examining a Breadth of Products Cyber Forensic, 3.3 Tools Good, Better,Best: What‟s the Right Incident Response,Tool for Your Organization, 3.4 Tool Review Forensic Toolkit, Encase, Mobil edit, F-RAT, FTK, Cyber check suites, etc. Specifications for Forensic toolTested.	
Unit – IV	**Legal Provisions For Digital Evidences**	**(08)**
	4.1 Registration of FIR(ITAA 2008), 4.2 Panchnama(Seizure Memo),Seizure Proceedings, Legal Procedure after seizure of evidence. Expert Opinion from Forensic Examiner, Gathering information from ISP/MSP/other service Providers, 4.3 Analyzing and Handling external data. Guideline to Prepare Chargesheet, Guideline for IO on what to include in Charge sheet, 4.4 Tips to preserve seized digital media,Deposition of Evidence in court.	

Course Outcomes: After completion of the units students will be able to:

1. Understand & Study the Computer Network & its Applications.
2. Learn & understand the detailed Process of Mobile phone investigation.
3. Study the Toolkit & Software use.
4. Learn the Legal Procedures related Digital evidence.

Reference Books:

1. Incident Response and Computer Forensic by Kelvin Mandia, TMH publication. (2012) (Unit-I,II,III,IV)
2. Digital Forensics : Digital Evidence in Criminal Investigation byAngus McKenzie Marshall.(2008)(Unit-II)
3. Cyber Forensic A field Manual for Collecting Examining and Preserving Evidence of Computer. Crimes by Albert J Menedez.Auerba (2010) .(Unit-III)
4. Richard Saferstein: Forensic science from the crime scene to the crime lab.(2015)(Unit-IV)

Major Practical Paper - V

Credits (Total Credits 2)	SEMESTER – IV Major Practical Paper– V List of Practical	No. of hours per Practical
Course Objectives: Students should be able to, 1. Learn the different examination and report writing process of forensic evidence. 2. Understand the crime scene management and crime scene documentation.		
1	To identify and compare toolmarks.	
2	Examination fiber by using a microscope.	
3	To compare soil samples by density gradient method.	
4	To compare paint samples by physical matching method	
5	Analysis of paint samples by using chemical method.	
6	To compare glass samples by refractive index method.	
7	To analyze the lip print.	
8	To study gait pattern analysis.	
9	To examine the skid mark and perform an analysis process of it.	
10	To analyze the bloodstain pattern.	
11	Microscopic Examination of Soil	
12	To perform cast and analyze footwear impression	
13	Differentiate soil samples based on their chemical composition.	
14	Analyze tire tread impressions to identify the make and model of a vehicle.	
15	Develop and analyze latent fingerprints on different surfaces using various techniques.	
Course Outcomes- Students will be able to: 1. Utilize the crime scene investigation process. 2. Operate the different photographic techniques. 3. Perform retrieves the deleted data from various pen drives, flash drives etc. 4. Acquire thorough knowledge regarding collection of digital evidence and their analysis.		

Reference Books

1. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
2. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
3. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
4. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)
5. Sharma, B.R. Forensic Science in Criminal Investigation and Trails. Universal Law Publishing: (2003).
6. Meguire, M., Morgan, R. and Reiner, R.The Oxford Handbook of Criminology 2nded. Oxford University Press: New York; (2002)
7. Bell, W.R. Practical Criminal Investigation in Correctional Facilities. CRC Pres: London; (2001).
8. Lyman M.D. Criminal Investigation- The Art and the Science. Pearson Education: India; (2013)
9. Henry Lee‟s Crime Scene Handbook:Henry C Lee (2001)
10. Stuart H. James Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. (2012)
11. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation, Second Edition 2nd Edition by Lee Reiber. (2018)
12. Practical Mobile Forensics: Forensically investigate and analyze iOS, Android, and Windows 10 devices, 4th Edition Paperback -April 9, 2020 by Rohi Tamma (Author), Oleg Skulkin (Author), Heather Mahalik (Author), Satish Bommisetty (Author).
13. Handbook of Digital Forensics and Investigation 1st Edition by Eoghan Casey, ElsevierAcademic Press 2010.

Major Practical Paper - VI

Credits (Total Credits 2)	SEMESTER – IV Major Practical Paper – VI List of Practical	No. of hours per Practical
Course Objectives: Students should be able to, 3. Learn the different examination and report writing process of forensic evidence. 4. Understand the crime scene management and crime scene documentation.		
1	To set up and troubleshoot a VPN connection between two computers.	
2	To analyze network traffic using Wireshark to identify network Protocols.	
3	To configure user authentication using ACLs on a network router.	
4	To analyze call logs and text messages from a mobile phone image using forensic analysis tools.	
5	To practice secure storage and evidence integrity verification using Digital evidence management software.	
6	To conduct file carving on forensic images using digital forensic Analysis techniques.	
7	To practice live forensics techniques to extract data from running System without altering the state of the system.	
8	To analyze volatile memory using Volatility to extract evidence from a Running system.	
9	To demonstrate the use of FTK Imager to create forensic images of Storage devices.	
10	To use Autopsy to perform file carving and recover deleted files from a Disk image.	
11	Disk imaging and analysis (FTK imager)	
12	Extracting browser auto-fill data (Browser Auto-fill Viewer) Analysis of auto-fill data from web browsers	
13	Investigating application usage (App Compact Cache Parser) Recently run application analysis	
14	Analyzing Windows Jumplist (JumpListsView) View and analyze recent user activity	
15	Browser cookie analysis (ChromeCookiesView)	
16	Analyzing windows shellbags (ShellBagsView) to see which folders were accessed	
17	Website activity reconstruction (WebHistorian) Reconstruct website browser history	

Course Outcomes- Students will be able to:

1. Utilize the crime scene investigation process.
2. Operate the different photographic techniques.
3. Perform retrieves the deleted data from various pen drives, flash drives etc.
4. Acquire thorough knowledge regarding collection of digital evidence and their analysis.

Reference Books

1. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003).
2. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995).
3. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001)
4. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)
5. Sharma, B.R. Forensic Science in Criminal Investigation and Trails. Universal Law Publishing: (2003).
6. Meguire, M., Morgan, R. and Reiner, R.The Oxford Handbook of Criminology 2nded. Oxford University Press: New York; (2002)
7. Bell, W.R. Practical Criminal Investigation in Correctional Facilities. CRC Pres: London; (2001).
8. Lyman M.D. Criminal Investigation- The Art and the Science. Pearson Education: India; (2013)
9. Henry Lee‟s Crime Scene Handbook:Henry C Lee (2001)
10. Stuart H. James Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. (2012)
11. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation, Second Edition 2nd Edition by Lee Reiber. (2018)
12. Practical Mobile Forensics: Forensically investigate and analyze iOS, Android, and Windows 10 devices, 4th Edition Paperback -April 9, 2020 by Rohi Tamma (Author), Oleg Skulkin (Author), Heather Mahalik (Author), Satish Bommisetty (Author).
13. Handbook of Digital Forensics and Investigation 1st Edition by Eoghan Casey, ElsevierAcademic Press 2010.

SEMESTER – IV Minor Paper – IV Advanced Forensic Biology II & Forensic Psychology II		
Course Objective: Student should be able to : 1. Understand the advanced knowledge of genetics and study of various Extraction and purification methods for DNA and protein analysis. 2. Learn the analysis of biological fluid and analysis of macromolecules by using blotting techniques. 3. Study will understand the Application of Forensic Psychology in Civil and Criminal Legal Proceedings. 4. Gain knowledge about Investigative Psychology and Correctional Psychology.		
Credits (Total Credits 2)	**SEMESTER – IV Minor Paper – II**	**No. of hours per unit (30)**
Unit I	**Forensic Genetics, DNA and Protein Extraction techniques:**	**(8)**
	1.1 Forensic Genetics: Definition and Scope of Genetics Importance of Genetics in Forensics • **Cell division:** Cell cycle, mitosis and meiosis, • **Chromosomes**: Structural and definitive properties of chromosomes, nomenclature of chromosomes, types of chromosomes, Packaging of Heredity Material, Concept of euchromatin and heterochromatin, chromatin modification, • **Human genome:** genes and related sequences, non- coding sequences (interspersed and tandem repeats), human DNA polymorphism. **1.2 Sources of DNA evidence** **1.3 DNA Extraction techniques** • **DNA Extraction:** Basic Principles, Method of DNA extraction (Physical, chemical and biological). • **DNA Quantification:** Quantitative PCR (Polymerase Chain Reaction) assay, Slot Blot Assay, DNA data- basing Electrophoretic Methods: Agarose gel, SDS-PAGE, Native PAGE, Southern /Northern Blotting. • **Forensic mitochondrial analysis**: Comparison of mitochondrial and nuclear DNA maternal inheritance, and its genome organization. **1.4 Protein purification and Metabolism:** • **Protein Extraction and Purification**: Introduction to Methods of cell disruption (blenders, grinding with abrasives, presses,	

	enzymatic method, sonication); Understanding Salt Participation: salting in, salting out, • **Advanced Protein Purification:** Organic Solvent Precipitation and its Applications in Forensic Science	
Unit II	**Forensic Biology and Serology:**	**(7)**
	2.1 Analysis of Biological Fluid and Other evidence: Introduction to Forensic Biology and Serology; Types of Biological Fluids & Evidence and its Analysis: Saliva, Semen, Vaginal Fluid, Urine, Sweat, Blood, Vomit; Other Evidence: Hair, Nails and tissue samples. **2.2 Enzymology:** Enzymes: Introduction, IUB classification, active site, energy of activation, transition state hypothesis, lock and key hypothesis, induced fit hypothesis. **2.3 Human Skeleton and Locomotion: Human Skeleton:** Introduction to the Human Skeleton**;** Bone Classification and Anatomy**:** Axial Skeleton, Appendicular Skeleton; Types of joints (Fibrous Joints, Synovial Joints, Cartilaginous Joints); **Locomotion:** Types of Locomotion : Bipedalism, Quadrupedalism;	
Unit III	**Aggression and Behavioural abnormalities:**	**(7)**
	3.1 Aggression: Definition, Nature, Types of aggression. **3.2 Violence-** Definition, Nature of Violence-Self-directed, Interpersonal, family and community interpersonal, and Collective. Types of Violence-Physical, Sexual, Emotional, Psychological, Spiritual and Cultural. **3.3 Memory:** Definition. Types of Memory, Memory Process, Methods of memory improvement **3.4 Behavioural abnormalities** – Harassment and types of harassment, Bullying and types of bullying. Psychology of Personality: Concept and nature; Basic issues related to study of personality. Eastern and Western perspective, Trait and type approaches: Allport, Cattell, Eysenck, and Big-five model.	
Unit IV	**Investigative psychology & Criminal Profiling:** **4.1 Investigative psychology**: Criminal psychological profiling Nature, definition, Psychological tests used Criminal psychological profiling, psychological autopsy, Forensic hypnosis, Narco-analysis, Polygraph, Brain fingerprinting, layered voice analysis, Stalking the Psychology of violence. **4.2 Eyewitness:** Police Interrogations, Lineups and Effect of Media Coverage on Perception of Defendants. Eyewitness Testimony, Errors /Problems in Eyewitness Testimony, Solutions for Increasing	**(8)**

	Eyewitness Accuracy. **4.3 Perspective of Criminal Behaviour and Legal Proceedings**: Psychobiological Approaches, Psychological Approaches- Emotional Deprivation, Psychological Motives of Crime, Frustration, Attitudes, Peer Influence. **4.4 Civil Proceedings**-Domestic law and Rights of Adults, Assessment of Civil Competency, Personal Injury Evaluation, Evaluation of Trauma Caused by Sexual Harassment or Rape**.** **4.5 Criminal Proceedings**-Competency to stand trial, Criminal responsibility and insanity defence, Risk assessment, Evaluation of Eyewitness testimony, Psychotherapeutic and Counselling services.	

Course Outcomes: After completion of the units students will be able to:

1. Know the advanced knowledge about the chromosome and its packaging.
2. Understand the modern concept of gene, human DNA polymorphism, different types of DNA extraction methods, protein extraction and purification, Electrophoresis techniques and their types, Forensic application.
3. Understand the analysis of the biological fluid sample and Human Skeleton and their types.
4. Understand the Aggression and violation and Forensic application
5. Understand the thoughtful versus Thoughtless and Forensic application.
6. Understand the application of Forensic Psychology in Civil and Criminal Legal Proceeding.

Reference Books:

1. Cell biology, genetics, molecular biology, evolution and ecology: V.S Verma, V.K Agrawal, S.Chand and company,2005
2. Principles of Genetics, Snustad and Simmons,12 December, 2006
3. Genetics a conceptual approach 4th edition.: Benjamin A Pierce., W. H Freeman and company, NewYork 19 December, 2016
4. Bioinstrumentation by L.Veerakumari 1 January 2011
5. Bioinstrumentation by Bhawana Pandey M.H.Fulekar 1 January 2019
6. Forensic DNA analysis : A Laboratory Manual McClintock, J.Thomas 19 February 2008
7. Principles of Biochemistry Lehninger 16 March 2021
8. Principles and Techniques and molecular biology, Wilson and Walkers 8etd 1 January 2018.
9. Cell biology, genetics, molecular biology, evolution and ecology: V.S Verma, V.K Agrawal, S.Chand and company,2005
10. Fundamentals of Enzymology, by Nicholas C.Price 3rd edition,1 January 2009.
11. Forensic DNA analysis : A Laboratory Manual McClintock, J.Thomas 19 February 2008 (Unit II)
12. Protein Purification, Philip L.R.Booner 2nd edition,2019
13. Principles of Biochemistry Lehninger 16 March 2021
14. Biological Anthropology of the Human Skeleton, M.Anne katzenberg and Anne L.Grauer October 2018
15. Bachhav, Aun M. (2012). Criminal Psychology. Chandralok Prakashan, Kanpur – 208021
16. Bharati, A. (2012). 12. Studies on Criminological Psychology. G.S. Rawat for Ceber Tech Publications. New Delhi- 110 002 Cohen, R.J., Swerdlik, M.E. (2005).

Credits (Total Credits 2)	SEMESTER – IV Minor Practical Paper IV List of Practical	No. of hours per Practical
Course Objective: Students should be able to… 1. Study the analysis & handling of Centrifugation Instrumentation. 2. Study the Isolation technique of DNA. 3. Learn about the psychological test and their interpretation.		
1.	To study the centrifugation of milk.	
2.	To demonstrate the gel electrophoresis.	
3.	To study the Isolation of chromosomal DNA.	
4.	Study of DNA Extraction and Quantification.	
5.	To perform electrophoresis for separation of various polymorphism enzymes.	
6.	DNA extraction by Phenol-Chloroform method.	
7.	DNA extraction by Silica –column-based method.	
8.	Detection of Amylase activity- a) Starch-Iodine Assay.	
9.	Estimation of vitamin C from a biological source.	
10.	Separation of compounds using TLC, calculation of Rf values.	
11.	Microscopic Comparison of Hair- i] Human Hair ii] Animal Hair	
12.	Presumptive test for Blood a] Phenolphthalein Assay b] Benzidine c] Leuco Malachite Green d] Luminol test	
13.	Confirmatory Tests for Blood –Crystallization Assays.	
14.	Standard progressive matrices- J. Raven, J.C. Raven and J. H. Court	
15.	Locus of Control	
16.	Koh‟s block design test	
17.	Aggression test – C.G. Pati	
18.	Personality assessment using any projective test	
19.	Cattell‟s 16 P.F.	
20.	Lie Detection Test (Polygraph Testing).	
21.	Achievement motivation- Deo Mohan	

Course Outcomes: After completion of the units students will be able to:

1. Know the advanced knowledge about the chromosome and its packaging.
2. Understand the modern concept of gene, human DNA polymorphism, different types of DNA extraction methods, protein extraction and purification, Electrophoresis techniques and their types, Forensic application.
3. Understand the analysis of the biological fluid sample and Human Skeleton and their types.
4. Understand the Aggression and violation and Forensic application
5. Understand the thoughtful versus Thoughtless and Forensic application.
6. Understand the application of Forensic Psychology in Civil and Criminal Legal Proceeding

Reference Books :

1. Forensic Serology and Blood examination, by A.K.Dwivedi, Dr.Archana Tripathi,2012
2. Li, Richard. Forensic Biology. CRC Press eBooks, 2008
3. Bioinstrumentation by Bhawana Pandey M.H.Fulekar 1 January 2019
4. DNA analysis: A Laboratory Manual McClintock, J.Thomas 19 February 2008
5. Principles of Biochemistry Lehninger, 16 March 2021
6. Forensic Analysis pre laboratory and laboratory student manual Dr. E. Hywel Evans
7. „Social Psychology", Robert A. Baron, Nyla R. Branscombe, Donn Byrne, Gopa Bhardwaj, Edition 12th ,2010 Pearson Publication.
8. Social theory and social structure" Robert K. Merton., (1981), Amerind Publications & Co., New Delhi.
9. Harold Franck and Darren Frank, Forensic Engineering Fundamentals, (5th edition)
10. Standard progressive matrices- J. Raven, J.C. Raven and J. H. Court Scale. Dr. Yashvir Singh and Dr. Manesh Bhargav

SEC: Questioned Document Recognition & Examination

Credits (Total Credits 2)	SEMESTER – I List of Practical	No. of hours per Practical
Course Objectives: Students should be able to, 1. Prepare a case report on a case involving questioned documents. 2. Carry out analysis of different types of documents. 3. Learn the analysis of charred documents. 4. understand the analysis of printed documents.		
1	Examination of watermarks in documents.	
2	Comparison of documents.	
3	Handling and preserving of documents	
4	Handling and preserving of charred documents	
5	Examination of Age of Document.	
6	To study types of documents.	
7	Identification of source of photocopier machine by examination of photocopied documents.	
8	Identification of different types of printing technology on documents.	
9	Identification and detection of type written matter on documents.	
10	Examination of fire arson cases by GC, TLC.(no.2)	
Course Outcomes- Students will be able to: 1. Prepare a case report on a case involving questioned documents. 2. Perform analysis of different types of documents. 3. Apply methods of analysis of charred documents. perform analysis of printed document **Reference Books** 1. DFSL manual 2. Forensic Analysis pre laboratory and laboratory student manual Dr. E. Hywel Evan 3. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques. CRC Press: USA; (2003). 4. Saferstein, R. Criminalistics -An Introduction to Forensic Science. Prentice Hall: USA; (1995). 5. Nanda, B.B. and Tiwari, R.K. Forensic Science in India- A Vision for the Twenty First Century. Select Publisher: New Delhi; (2001) 6. Barry, A.J. Fisher- Techniques of Crime Scene Investigation, 7th ed. R.C. Press, New York (2003)ts.		

VSC:- Cyber Security Threat Landscape

SEMESTER- IV		
Course Objectives- Students should be able to: 1. Study Do‟s and Don‟t‟s about social media sharing 2. Learn the registering complaint about cyber crime 3. Understand the Antivirus Importance and Installation and Cyber Security 4. Learn the security patch management in computer system and Mobile Phone.		
Credits (Total Credits 2)	**SEMESTER- IV VSC PAPER II List of Practical**	**No. of hours per Practical**
1	Setting privacy settings on social media platforms.	
2	Do‟s and Don‟ts for posting content on Social media platforms.	
3	Registering complaints on a Social media platform.	
4	Prepare password policy for computer and mobile devices.	
5	List out security controls for computers and implement technical security controls in the personal computer.	
6	List out security controls for mobile phones and implement technical security controls in the personal mobile phone.	
7	Log into computer system as an administrator and check the security policies in the system.	
8	Platforms for reporting cyber crimes.	
9	Checklist for reporting cyber crimes online.	
10	Wi-Fi security management in computer and mobile.	
11	Setting, configuring and managing three password policy in the computer (BIOS, Administrator and Standard User).	
12	Setting and configuring two factor authentication in the Mobile phone.	
13	Security patch management and updates in Computer and Mobiles.	
14	Managing Application permissions in Mobile phones.	
15	Installation and configuration of computer Anti-virus.	
16	Installation and configuration of Computer Host Firewall.	
17	Use a network analysis tool (e.g., Wireshark) to capture and analyze network traffic for suspicious activity.	

18	To identify secure websites by checking for HTTPS and secure connections.	
19	Run antivirus scans to detect and address potential threats on a computer.	
20	Adjust browser settings for better security, such as disabling third-party cookies.	
21	Research and summarize common cyber threats (e.g., malware, phishing, ransomware).	
22	To Implement multi-factor authentication (MFA) or on social media accounts.	

Course Outcomes- Students will be able to:

1. Describe the Do‟s and Don‟t‟s about social media sharing
2. Describe the registering complaint about cyber crime
3. Perform the Antivirus Installation.
4. Perform the security patch management in computer system and Mobile Phone.

Reference Books

1. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press.

2. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication.

3. Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning.

4. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.

5. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)

6. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)

Credits (Total Credits 2)	CULTURAL HERITAGE	No. of unit per hrs (30)
Unit I	**Introduction to cultural heritage** Definitions, significance, and types of cultural heritage.	7
Unit II	**Documentation and Preservation of Cultural heritage** Importance and need of Cultural heritage preservation, tools and techniques, Process of documentation, Techniques of preservation	8
Unit III	**Cultural heritage and Forensic Science** Definition and significance of cultural heritage in Forensic Science Role of cultural context in forensic investigations Importance of Cultural heritage preservation by using forensic techniques	8
Unit IV	**Application of Forensic science in Cultural heritage** Application of Forensic Analysis Techniques , Cultural Heritage Crimes, Case Study based on the analysis techniques	7

Course outcomes:

Students will be able to…

1. recognize and identify cultural heritage
2. analyze crime scenes and forensic evidence within their cultural context
3. demonstrate an understanding of cultural diversity and its implications for forensic science
4. integrate knowledge from forensic disciplines

Reference Book: References Books:

1. "Understanding Cultural Heritage" by Marie-Theres Albert and Dietrich Boschung (2017) - This comprehensive book delves into the concept of cultural heritage, examining its various dimensions and discussing approaches to its preservation and management.
2. "Forensic Science: An Introduction to Scientific and Investigative Techniques" by Stuart H. James and Jon J. Nordby (2014) - Providing a thorough overview of forensic science, this book covers the principles, techniques, and applications of forensic investigation.
3. "Cultural Heritage: A Very Short Introduction" by Philip Lindley (2010) - This book provides a concise overview of cultural heritage, exploring its significance, preservation, and the challenges it faces.
4. "Forensic Science: A Very Short Introduction" by Jim Fraser (2010) - Offering an

accessible introduction to the field of forensic science, this book covers various techniques and methods used in forensic investigations.