Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Forensic Science

Choice Based Credit System (CBCS)
B.Sc. / B.Sc.-M.Sc. (Forensic Science) - III SEMESTER

BSFSN 301 INSTRUMENTAL METHODS IN FORENSIC SCIENCE

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSFSN 301	DC	Instrumental Methods in Forensic Science	60	20	20	30	20	4	0	2	5

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: After studying this Paper the Students will Know-

1. The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
2. The utility of Colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.
3. The significance of microscopy in visualizing trace evidence and comparing it with control samples.
4. The usefulness of photography and videography for recording the crime scenes.

Course Outcomes: After studying this Paper-

1. The student will be able to explain the importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
2. They will be able to determine the utility of Colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.
3. They will be able to understand the significance of microscopy in visualizing trace evidence and comparing it with control samples.
4. They will be able to understand the usefulness of photography and videography for recording the crime scenes**.**

Unit 1: **Instrumentation:** Sample preparation for chromatographic and Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography

Unit 2 :

Spectroscopic methods: Fundamental principles and forensic applications of Colorimetry, Ultraviolet visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy.

Unit 3

Electrophoresis – fundamental principles, types, instrumentation and forensic applications. Neutron activation analysis – fundamental principles and forensic applications

Unit 4:

Microscopy: Fundamental principles , Different types of microscopes. Electron microscope. Comparison Microscope. Stereomicroscope, Forensic applications of microscopy.

Unit 5:

Forensic photography Basic principles and applications of photography in forensic science. Infrared and ultraviolet photography. Digital photography. Videography, Crime scene and laboratory photography.

Practical's

1. To determine the concentration of a colored compound by Colorimetry analysis.
2. To carry out thin layer chromatography of ink samples.
3. To carry out separation of organic compounds by paper chromatography.
4. To identify drug samples using UV-Visible spectroscopy.
5. To take photographs using different filters.
6. To take photographs of crime scene exhibits at different angles.
7. To record videography of a crime scene.

Suggested Readings

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

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Choice Based Credit System (CBCS)
B.Sc. / B.Sc.-M.Sc. (Forensic Science) - III SEMESTER

BSFSN302 FORENSIC DERMATOGLYPHICS

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSFSN302	DC	Forensic Dermatoglyphics	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: After studying this Paper the Students will Know-

1. The historical development of fingerprint
2. The basic patterns and types of fingerprints
3. The different developing methods of fingerprint.
4. The classification, identification and comparison of fingerprint.

Course Outcomes: After studying this Paper-

1. They student will be able acquainted with fingerprints and trace their origin.
2. They will be able to understand the pattern of fingerprints and their inner and outer terminus.
3. They will be able to develop the latent fingerprints using various techniques.
4. They will be able to understand the significance of Fingerprints, footprints, lip prints in personal identification.

Unit 1: Basics of Fingerprinting

Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting.

Unit 2: Fingerprint characteristics/minutiae.

Types of fingerprints, Fingerprint patterns, characteristics/minutiae of Fingerprint, Plain and rolled fingerprints. Classification and cataloguing of fingerprint record. Automated fingerprint Identification System. Significance of poroscopy and edgeoscopy.

Unit 3: Development of Fingerprints

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

Unit 4: Preservation of developed fingerprints.

Application of light sources in fingerprint detection. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Fingerprinting the deceased. Developing fingerprints on gloves.

Unit 5: Other Impressions

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

Practicals:

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of foot prints.
10. To investigate Fuming methods of fingerprint detection.

Suggested Readings:

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

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Choice Based Credit System (CBCS)
B.Sc. / B.Sc.-M.Sc. (Forensic Science) - III SEMESTER

BSFSN303 FORENSIC PHYSICS

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSFSN303		Forensic Physics	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: After studying this paper the students will know –`

1. The type of glass and their forensic importance
2. The composition and forensic analysis of soil
3. The utility of paint in criminal investigation.`
4. The elemental analysis of Paint and cement.

Course Outcomes: After studying this paper–

1. The students will be able to explain the forensic importance of glass evidence.
2. They will be able to understand the composition and forensic analysis of soil
3. They will be able to determine the utility of paint in criminal investigation.
4. They will be able to understand the elemental analysis of Paint and cement

Unit 1: Glass

Types of glass and their composition, Forensic examination of glass fractures under different conditions, determination of direction of impact, 3R-rules: cone- fracture, rib marks, hackle marks, backward fragmentation, colour and fluorescence, density comparison, physical matching and measurements, refractive index by refractometer, refractive index by Becke line technique, elemental analysis, interpretation of glass evidence, Standard Operating Procedures for examination, Discussion on important case studies of glass evidence.

Unit: 2 Soil

Formation and types of soil, composition and colour of soil, particle size distribution and turbidity test, microscopic examination, density gradient analysis, ignition loss, differential thermal analysis, elemental analysis, interpretation of soil evidence, Standard Operating Procedures for examination, Discussion on important case studies of soil evidence.

Unit: 3: Paint

Types of paint and their composition, macroscopic & microscopic studies, pigment distribution and colorimetry, micro-chemical analysis- solubility test, TLC, pyrolysis chromatographic techniques, IR absorption spectroscopy of paint samples & X-ray diffraction, elemental analysis,

interpretation of paint evidence, Standard Operating Procedures for examination, Discussion on important case studies of paint evidence.

Unit:4: Fibre

Classification of textile fibres - production, structure, and properties, the structure of textiles - an introduction to the basics, ropes and cordage, examination of damage to textiles, recovery & collection of fibre evidence & Standard Operating Procedures for examination protocols, visible & infrared microscopical examination of fibres, instrumental methods used in fibre and dye examination, interpretation of fibre evidence, new fibres types, discussion on important case studies of fibre evidence.

Unit:5: Cement

Types of cement and their composition, sampling of cement evidence material, determination of adulterants in cement, bromoform test, fineness test, loss on ignition test of cement; Physical and instrumental methods of cement analysis: determination of compressive strength, setting times, initial and final setting time, standard consistency, chemical methods of cement analysis, x-ray powder diffraction- identification of adulterated cement and adulterants. Cement mortar and Cement concrete: Sampling and methods of analysis.

Practicals:

1. To compare soil samples by density gradient method.
2. To compare paint samples by physical matching method.
3. To compare paint samples by thin layer chromatography method.
4. 6. To compare glass samples by refractive index method.
5. To identify and compare tool marks.
6. To compare cloth samples by physical matching.

Suggested Readings:

1. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence, CRC Press, Boca Raton (2001).
2. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).
3. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

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Choice Based Credit System (CBCS)
B.Sc. / B.Sc.-M.Sc. (Forensic Science) - III SEMESTER

BSFSN304 COMPUTER SCIENCE

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSFSN304	DC	Computer Science	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives: After studying this Paper the Students will Know-

1. The basics of computer hardware and their functions,
2. The basics of networking.
3. The network security.
4. The importance of computer language in forensics.
5. The importance of digital evidence in cyber forensic investigation.

Course Outcomes: After studying this paper–

1. The students will be able to understand about the Basic of Computers and Networking & File System.
2. They will be able to understand the Operating System and 'C' Programming..
3. They will be able to understand the cyber crime.

Unit-1 Basic of Computers

Fundamentals of computers, hardware and accessories. Types of Memory – Primary Memory-: RAM, SRAM, DRAM, ROM, EPROM, Secondary Memory-: Magnetic, Floppy, Hard Disk RAM, ROM; Optical Memory-: CDROM, WORM; Concept of Virtual Memory, Concept of Cache, Memory hierarchy.

Unit-2 Networking & File System

Connecting Devices-: Routers, Hubs, Bridges, Basics of Networking – Types of topologies, LAN, MAN, WAN etc.File system management FAT, NTFS etc. Logic Gates: AND, OR, NOT, NOR, NAND, EX-OR, EX-NOR Operations and their Truth Tables.

Unit-3 Basic Internet

Introduction to Internet , World Wide Web, E-mails, Chat, Search Engines, types of portals, Networking Protocols-TCP/IP Protocol, FTP, SMTP, HTTP, SSC, POP etc. Network Security – Threats, Vulnerabilities, Access control, DOS attack, Virus, Trojans, cloud based application.

Unit-4 Operating System and 'C' Programming

Introduction to operating System, process management, concurrency, scheduling, synchronization, Introduction to C programming -: Introduction, Data Types and Variables, Simple Program Structure, Simple Input and Output, Simple and Compound Conditions (Branching), Looping (For, While, Do..While).

Unit-5 Cyber Crime

What is Cyber Crime; Cyber Forensic and Digital Evidence, Conventional crime VS cybercrime, Nature of digital evidence, Precautions while dealing with digital evidence. types of cybercrimes, Digital Evidence, Digital Vs. Physical Evidence.

Practicals-:

1. Working of Networking Devices
2. Windows – Installation
3. Windows - Basic commands
4. Windows - Network Configuration
5. Finding results of different logic gates & their combinations
6. Tracing and analyzing E – mail senders IP Address of received e–mail
7. C Programming for Basic program
8. C programming for Variable
9. C programming for Loop
10. C programming for Mathematical Operations

Suggested Readings:

1. Computer Organization and Architecture Designing for Performance, Eight Edition, William Stallings, Pearson Publication.
2. Computer System Architecture, M. MorrisMano, PHI Publications
3. Operating System Concepts, Silberschatz, Galvin, Gagne, John Wiley and Sons Publications.
4. Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein.
5. Introduction to C :Kanetkar.
6. Digital Evidence and Computer Crime, 2nd ed. :Eoghan Casey Computer Forensics: Principles and Practices : Linda Volonino, Reynaldo.

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Choice Based Credit System (CBCS)
B.Sc. / B.Sc.-M.Sc. (Forensic Science) - III SEMESTER

BSFSN 3051 HANDWRITING IDENTIFICATION & RECOGNITION

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSFSN3051		Handwriting Identification & Recognition	60	20	20	00	00	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

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

1. The importance of examining questioned documents in crime cases.
2. The tools required for examination of questioned documents.
3. The significance of comparing hand writing samples.
4. The importance of detecting frauds and forgeries by analyzing questioned documents.

Course Outcomes

1. Student will know different instruments used in Document Examination
2. Student will be able to compare handwritings.
3. Student will understand different forgeries associated with any Document.

Unit 1: Handwriting

Definition of handwriting, Characteristics of handwriting- Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Application of handwriting in personal Identification. Factors influencing handwriting-physical, mechanical, genetic and physiological factors.

Unit 2- Neuromuscular Basis of Handwriting:

Human Nervous System, Broadmann's area, Brain Function for Hand Motor Control, Neuroanatomical Bases of Hand Motor Control, Frontal-Subcortical Neural Circuits and Motor Function, The Cerebellum and Brain Stem. Handwriting as a Motor Program, Hierarchical Models of Handwriting Motor Control.

Unit 3: Identification of Handwriting

Basis of handwriting identification. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and individual characteristics.

Unit 4: Comparison of Handwriting

Basis of handwriting comparison , Collection of handwriting samples. Exempler, Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting. Standards for comparison of handwriting. Forgery detection. Counterfeiting. Tools used in handwriting examination.

Unit 5: Handwriting Examination and Recognition

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

Suggested Readings

1. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
3. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).

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Choice Based Credit System (CBCS)
B.Sc. / B.Sc.-M.Sc. (Forensic Science) - III SEMESTER

BSFSN3052 FORENSIC SCIENCE & SOCIETY

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSFSN3052		Forensic Science & Society	60	20	20	00	00	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

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

1. Role of Engineers in Forensic Science.
2. Methods of digging the burial site and preservation of remains
3. History and Integration of Forensic Anthropology.

Course Outcomes: After studying this paper–

1. The students will be able to understand about the Forensic Engineering and Forensic Archaeology.
2. They will be able to understand the Forensic Anthropology.
3. They will be able to get knowledge about Forensic Linguistic and Nuclear Forensic

Unit 1: Forensic Engineering

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

Unit 2: Forensic Archaeology

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

Unit 3: Forensic Anthropology

The History and Integration of Forensic Anthropology, The Concept of Race , Identification of bones, Ancestry Estimation , Sex Estimation, Facial Reconstruction, DNA.

Unit 4: Forensic Linguistic

History, Definition and disciplines of Forensic linguistics, types of Forensic text, History of Computational Linguistics, Investigative Linguistics – phonetic analysis, ransom demand and other threat communication, forensic stylistics.

Unit 5: Nuclear Forensic

Definition, nuclear and other radioactive material, illicit trafficking of nuclear and other radioactive material, nuclear attribution, collection of radioactive evidence, nuclear forensics laboratory, elemental analysis tools and techniques.

Suggested Readings:

1. J.F. Brown and K.S. Obenski, Forensic Engineering – Reconstruction of Accidents C.C. Thomas, Springfield (1990).
2. E.W. Killam, The Detection of Human Remains, C.C. Thomas, Springfield (1990).
3. R.K. Noon, Introduction to Forensic Engineering, CRC Press, Boca Raton (1992).
4. O. Ribaux and P. Margot in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Ed.), Academic Press, London (2000)
5. 3. O' Hara &Osterberg : An Introduction to Criminalistics.
6. 4. Lee, Honry : Advances in Forensic Science.
7. 6. Mordby, J Deed Reckoning – The Art of For Forensic Science Detection, CRC Press LLC, Boca Raton FL, CRC Press (2000
8. J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press