SHRI VAISHNAV VIDHYAPEETH VISHVAVIDHYALAYA, INDORE

B.Sc. / B.Sc.-M.Sc. (Forensic Science)CBCS

Semester-VI (B.Sc. / B.Sc.-M.Sc.)

Name of Program B.Sc. / B.Sc.-M.Sc. (Forensic Science)

Subject Code	Category	Subject 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 *				
BSCFS-601	DC	Forensic Anthropology	60	20	20	30	20	3	1	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.**

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

1. Importance of forensic anthropology in identification of persons.
2. Significance of somatoscopy and somatometry. .
3. Different techniques of facial reconstruction and their forensic importance.

Unit 1:

Significance of Forensic Anthropology :

Forensic Anthropology: Definition scope and Problems, Human skeleton, comparative skeletal anatomy of human and non-human.

Identification of bones and determination of site:

- Age determination from skeletal remains: General considerations, classification of bones, suture closure in skull and ossification in other bones.
- Sex determination from skeletal remains: skull, Pelvis, and other bones.
- Estimation of stature from skeletal remains with special reference to long bones.

Unit 2:

Somatoscopy:

Observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.

Unit 3:

Somatometry:

Measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

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Unit 4:
Facial Reconstruction-I:
Portrait Parle/ Bertillon system. Photofit/identi kit.
Facial superimposition techniques: Cranio facial super imposition techniques, photographic super imposition, videosuperimposition, Roentgenographic superimposition.

Unit 5:
Facial Reconstruction-II
Use of somatoscopic and craniometric methods in reconstruction.
Importance of tissue depth in facial reconstruction.
Genetic and congenital anomalies – causes, types, identification and their forensic significance.

Practicals:

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

Suggested Readings:

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
3. S.Rhine, Bone Voyage: A Journey in Forensic Anthropology, University of Mexico Press, Mexico (1998).

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			THEORY			PRACTICAL		L	T	P	Credits
			End Sem University Exam	Two Term Exam	Teachers Assessment *	End Sem University Exam	Teachers Assessment *				
BSCFS-602	DC	Forensic Medicine	60	20	20	30	20	3	1	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.**

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

Unit 1:
Introduction to Forensic Medicine:
Fundamental aspects and scope of forensic medicine.
Approaching the crime scene of death.
Obtaining first hand information from the caller.
Rendering medical assistance to the victim, if alive. Protecting life.
Inquest: Inquest by police, magistrate
Medical certification and medico-legal reports including dying declaration.

Unit 2:
Death:
Definition, Types: Somatic, Cellular and Brain-Death. Mode of death: Asphyxia, Syncope, Coma Sudden natural and unnatural deaths. Suspended animation.

Unit 3:
Forensic Taphonomy (Postmortem Changes)
Immediate Changes: Insensibility and loss of voluntary power, Cessation of respiration.
Early Changes: cooling of body, lividity, rigor mortis, cadaveric spasm, cold stiffening and heat stiffening.
Late Changes(Decomposition and decay): Putrefaction, mummification, adipocere and maceration
Postmortem artifacts.

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Unit 4:
Medico-legal autopsies:
Definitions of medico-legal and clinical/pathological autopsies.
Objectives, procedures, formalities of medico-legal autopsies.
Preservation of articles of importance, during autopsy.
Preservation of body fluids & viscera in suspected poisoning.

Unit 5:
Mechanical injuries or wounds:
Definition, classification of mechanical injuries; description of blunt force, sharp force and firearm injuries.
Medico-legal aspects of injuries, differences between antemortem and post-mortem injuries, estimation of age of different types of injuries, defense injuries, hesitation cuts; fabricated injuries; simple and grievous hurt, suicidal/accidental/homicidal injuries; causes of death by mechanical injuries. Identification of injuries by torture.

Practicals:

1. To design a questionnaire for the first responder to the death scene.
2. To design a checklist for the forensic scientists at the death scene.
3. To design a canvass form giving description of an unidentified victim.
4. Practical aspects of collection, preservation and dispatch of viscera for chemical analysis
5. To give the demonstration of postmortem and ante-mortem wound.
6. Examination of certification of injuries.

Suggested Readings:

1. K. Smyth, The Cause of Death, Van Nostrand and Company, New York (1982).
2. M. Bernstein, Forensic odontology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton (1999).
4. H.B. Baldwin and C.P. May in, Encyclopedia in Forensic Science, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. V.J. Geberth, Practical Homicide Investigation, CRC Press, Boca Raton (2006).
6. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
8. Forensic Taphonomy, edited by Wouldiam D. Haglernd, Marculla H. Sorg; CRC Press, LLC, 1997. 14. Glaister (Ed)-Rentoul& Smith (1973) :
9. Forensic Medicine & Toxicology, Churchill Livingston, Edinburgh.
10. Modi, J.K. (1988): Medical Jurisprudence & Toxicology

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			End Sem University Exam	Two Term Exam	Teachers Assessment *	End Sem University Exam	Teachers Assessment *				
BSCFS –6031	DC	DNA Typing	60	20	20	30	20	3	1	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.**

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

1. The basic principle of DNA analysis.
2. The importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.
3. The forensic significance of DNA typing, i.e parentage testing etc.
4. The report writing procedure
5. The legal perspective of DNA typing.

Unit 1:

History of DNA fingerprinting. Basic Principles DNA as biological blueprint of life. Extraction of DNA for analysis. Quantitation of DNA – yield gel quantitation and slot blot quantitation.

Unit 2:

Forensic DNA Typing Collection of specimens:
Polymerase chain reaction: Historical perspective, sequence polymorphisms, individualization of evidence.
Short tandem repeats (STR): Role of fluorescent dyes, nature of STR loci.
Restriction fragment length polymorphism (RFLP): Genetic markers used in RFLP, typing procedure and interpretation of results.
Mitochondrial DNA – Sequence analysis.
Touch DNA

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Unit 3:
Forensic Significance of DNA Profiling:-
Parentage Testing Principles of heredity. Genetics of paternity. DNA testing in disputed paternity. Mandelian laws of parentage testing. Mathematical basis of parentage identification. Missing body cases. Veterinary & wild life and Agriculture cases

Unit 4:
Report Writing:
Role of DNA typing in identifying unrecognizable bodies. Evaluation of result. Frequency calculations, Interpretation, Allele frequency determination, Hardy-Weinberg law. Match probability: Reference populations and databases, Quality control, Certification and Accreditation.

Unit 5:
Legal perspective: Legal standard for admissibility of DNA profiling – procedural & ethical concerns, status of development of DNA profiling in India & abroad.
New & future technologies: DNA chips, SNPS, DNA cloning,
Limitations of DNA profiling.

Practicals:
1. To carry out the separation of amino acids by thin layer chromatography.
2. To carry out extraction of DNA from body fluids.
3. To preparation of gel plates for electrophoresis.
4. To carry out electrophoresis for separation of enzymes.
5. To prepare a report on the role of DNA typing in solving paternity disputes.

Suggested Readings :

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).
3. H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
5. Daniel L. Hartl& Elizabeth W. Jones; Genetics- Principle & Analysis, 4th Ed., Jones &Bartlet Pub. 1998.
6. Jaiprakash G. Shewale, Ray H. Liu Forensic DNA Analysis: Current Practices and Emerging Technologies, CRC Press, 2013
7. John M Butler: Forensic DNA Typing. Elsevier Academic Press.
8. Lee M.C. and Gaenesten, R.E: DNA and other Polymorphism in Forensic Science. Year book Medical Published.

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			THEORY			PRACTICAL		L	T	P	Credits
			End Sem University Exam	Two Term Exam	Teachers Assessment *	End Sem University Exam	Teachers Assessment *				
SCFS–6032	DC	Wild Life Forensics	60	20	20	30	20	3	1	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.**

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

1. The difference between protected and endangered species.
2. Types of wild crimes
3. Crimes related to reptiles
4. Trade in wild animals
5. Different Wildlife artifacts

Unit 1:
Wildlife Forensic: Protected and endangered species of animals and plants; Sanctuaries and their importance; Relevant provision of wild life and environmental act;

Unit 2:
Types of wildlife crimes, Poaching and hunting, different methods of killing and poaching of wildlife animals; Enforcement of wildlife protection policy,

Unit 3:
International trade in reptile skins, Challenges to species identification of reptile skin products, species and products represented in the reptile skin trade, reptile scale morphology basics and current limitations, Identifying features of major reptile groups. Wildlife (Protection) Act-1972

Unit 4:
Trade in wild animals, elephant-, Indian rhino, wild cat, poisonous snakes for venom and skin, crocodiles, salamanders, deer, birds (feathers Macau parakeets, whales, sharks, spectacle bear, Himalayan antelopes.

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Unit 5:

Wild animals as pharmacopeias, Wildlife artifacts (Bones, skin, fur , hair, nails, blood, feather, etc.), Recovering evidence at poaching scenes, Locating the burial site: Anomalies on the surface

Practicals:

1. Identification of species from pug marks
2. Sex determination from Pug- marks.
3. Casting of pug marks
4. Collection and seizure of wildlife evidences
5. Examination of Species from feathers and fur
6. Case study of wildlife crimes

Suggested Readings:

1. Forensic science in wild life investigation, Linarce, Adrian CRC Press, Taylor & Francis
2. The wild life (protection) act, Baalu, T.R.1972, Nataraj Publication
3. Wild life (Protection act, 1972), Universal Publication

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Subject Code	Category	Subject 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 *				
BSCFS-6041	DC	Chemistry-III	60	20	20	30	20	3	1	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**

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

1. The nomenclature and properties of Carboxylic Acid.
2. The preparation of derivatives of carboxylic acid.
3. The chemistry of cement.
4. The chromatography
5. The characteristics of water.

Unit 1:

Carboxylic Acids:

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituent on acid strength.Preparation of carboxylic acids, reactions of carboxylic acids.Hell-Volhard-Zelinskyreaction.Synthesis of acid chlorides, esters and amides.Reduction of carboxylic acids.Mechanism of decarboxylation.Dicarboxylic acids: Methods of formation and chemical reactions of unsaturated monocarboxylic acid and dicarboxylic acid.

Unit 2:

Carboxylic acid derivatives Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides.Relative stability of acyl derivatives. Physical properties, inter conversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions.Mechanism of esterification and hydrolysis (acidic and basic).

Unit 3:

Introduction of Cement and Its Classification, Portland Cement, Manufacturing Chemical Composition, Setting and Hardening of Cement, I.S.I. Specifications, Physical Properties, Physical & Chemical Tests of Cement. Fiber, Paint: Classification, Methods of Preparation, Properties and Uses.

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Unit 4:
Chromatographic Techniques:
Definition, Description of Chromatographic Separation Method, Classifications and Principle, Terminology used in Chromatography, Chromatography Applications.

Bioinorganic Chemistry - I
Essential and trace elements in biological processes, metalloporphyrins with special reference to hemoglobin and myoglobin, Biological role of alkali and alkaline earth metalions with special reference to Ca2+,Nitrogen fixation.

Unit 5:
Water Analysis:
Hardness and its units, types of Hardness-Temporary,Permanent and Total Hardness, Industrial Water Characteristics, Water Analysis, Acidity andAlkalinity, DissolvedOxygen (DO), BiologicalOxygen Demand (BOD), Chemical Oxygen Demand (COD), Chlorides, Pre-Chlorine.

Practicals:

1. Thin layer chromatography - Determination of Rf values and identification of organic compounds.
2. Separation of green leaf pigments (spinach leaves may be used).
3. Separation of a mixture of dyes using cyclohexane and ethylacetate (8:5:1.5).
4. Separation of a mixture of phenylalanine and glycine, alanine and aspartic acid, leucine and glumatic acid. Spray reagent ninhydrin.
5. Separation of a mixture of DL-alanine, glycine and L-lucine using nbutanol: acetic acid: water (4:1:5). Spray reagent ninhydrin.
6. Separation of monosaccharides- a mixture of D-galactose and Dfructose using nbutanol: acetone: water (4:1:5). Spray reagent-aniline hydrogen pthalate.
7. Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives and preparation of suitable derivatives and preparation of suitable derivatives.
8. Effluent Analysis - Identification of cautions and anions in different water samples.
9. Water analysis - To determine the amount of dissolved oxygenin water samples in ppm units.

Suggested Readings:

1. Advanced Inorganic Chemistry, Volume-I, Nineteenth Edition, SatyaPrakash, G. D. Tuli, S. K. Basu, R. D. Madan, S. Chand Publication, ISBN- 81-219-0263-0.
2. Concept and model
3. Concise Inorganic Chemistry, Fifth Edition, of Inorganic Chemistry, Third Edition, Douglas Mc. Doniels, Wiley India.J. D. Lee, Wiley India
4. General Chemistry, Sixth Edition, Raymand Chang, McGraw Hill
5. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
6. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

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			End Sem University Exam	Two Term Exam	Teachers Assessment *	End Sem University Exam	Teachers Assessment *				
BSCFS-6042	DC	Forensic Physics	60	20	20	30	20	3	1	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.**

Learning 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

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.

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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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BSCFS–605	DC	Project Work	0	0	0	60	40	0	0	8	4

Project Work

Every student will carry out "**Project Work"** the supervision of Supervisor/(s) (Internal/External). The topic shall be approved by a Committee constituted by the Head of the concerned Institute. Every student will be required to present two seminar talks, first at the beginning of the project work (Phase-I) to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester.