

Medi-Caps University, INDORE (M. P.)
B. Sc Forensic Science(Hons.) Credit Point details (2022-25)
3 Year Degree Programme

Semester- I

S.No.	Subject Code	Course Description	Name of Papers	L	T	P	Credit
1	FS3CO01	Core (CO)	Introduction to Forensic Science	2	0	2	3
2	FS3CO17	Core (CO)	Elements of Criminology & police	3	0	2	4
3	FS3CO03	Core (CO)	Human Anatomy	4	0	2	5
4	FS3EL01	Elective Discipline	Forensic Physics	2	0	2	3
5	FS3EG01	Elective Generic	Computer Science	3	0	2	4
6	FS3AE01	Ability	English Communication	2	0	2	3
			Total	16	0	12	22
			Total Contact Hours	28			

Semester- II

S.No.	Subject Code	Course Description	Name of Papers	L	T	P	Credit
1	FS3CO16	Core (CO)	Forensic Psychology	3	0	2	4
2	FS3CO18	Core (CO)	Criminal Law	3	0	2	4
3	FS3EL11	Elective Discipline	Human Physiology	3	0	2	4
4	FS3EG05	Elective Generic	Zoology	3	0	2	4
5	FS3AE03	Ability	Environmental Studies	2	0	0	2
6	FS3SE05	Skill Enhancement	Cyber Security	3	0	2	4
			Total	17	0	10	22
			Total Contact Hours	27			

Semester- III

S.No	Subject Code	Course Description	Name of Papers	L	T	P	Credit
1	FS3CO06	Core (CO)	Technological Methods in Forensic	3	0	2	4
2	FS3CO19	Core (CO)	Forensic Dermatoglyphics	3	0	2	4
3	FS3CO20	Core (CO)	Advancement in Forensic Science	3	0	2	4
4	FS3EL03	Elective Discipline	Criminalists	3	0	2	4

Dr. Bajjant Yadav
HOD, FS
11/7/2024

(Signature)

Dr. Bajjant Yadav

5	FS3EG03	Elective Generic	Entomology	2	0	2	3
6	FS3SE06	Skill Enhancement	Digital Biometric	2	0	2	3
			Total	16	0	12	22
			Total Contact Hours	28			

Semester- IV

S.No.	Subject Code	Course Description	Name of Papers	L	T	P	Credit
1	FS3CO09	Core (CO)	Forensic Chemistry	3	0	2	4
2	FS3CO10	Core (CO)	Questioned Document	3	0	2	4
3	FS3CO21	Core (CO)	Forensic Biology	3	0	2	4
4	FS3EL04	Elective Discipline	Digital & Cyber Forensic scene	3	0	2	4
5	FS3EG04	Elective Generic	Chemistry	4	0	2	5
6	FS3SE03	Skill Enhancement	Scientific Investigation	2	0	2	3
			Total	18	0	12	24
			Total Contact Hours	30			

Semester- V

S.No.	Subject Code	Course Description	Name of Papers	L	T	P	Credit
1	FS3CO22	Core (CO)	Forensic Ballistics	3	0	2	4
2	FS3CO23	Core (CO)	Forensic Toxicology	3	0	2	4
3	FS3EL05*	Elective Discipline	Genetics	3	0	2	4
3	FS3EL06*	Elective Discipline	DNA Typing	3	0	2	4
4	FS3EL07	Elective Discipline	Forensic Serology	3	0	2	4
6	FS3SE07	Skill Enhancement	Digital & Fraud Investigation	3	0	2	4
	FS3N001	Non-Graduat (NG)	Soft Skill-I	2	0	0	2
			Total	20	0	10	22
			Total Contact Hours	30			

Dr. Badajet Yadav
11/7/2024
HOD, FS

Dr. Badajet Yadav

Dr. Badajet Yadav

Semester- VI

S.No.	Subject Code	Course Description	Name of Papers	L	T	P	Credit
1	FS3CO24	Core (CO)	Forensic Anthropology	3	0	2	4
2	FS3CO15	Core (CO)	Forensic medicines	4	0	2	5
3	FS3EL08	Elective Discipline	Advance Instrumentation	4	0	2	5
4	FS3EL09*	Elective Discipline	Forensic Statistics	2	0	2	3
5	FS3EL12*	Elective Discipline	Mobile Forensic	2	0	2	3
6	FS3SE04	Skill Enhancement	Project work	0	0	6	3
	FS3* M902	Non-Gradial (NG)	Soft Skill-2	2	0	0	2
			Total	13	0	14	22
			Total Contact Hours			27	

Total Credit Semester Wise

Semester- I	22
Semester- II	22
Semester- III	22
Semester- IV	24
Semester- V	22
Semester- VI	22
Total	134

COLOUR SCHEME

NATURE OF

- Core (CO)
- Elective Discipline
- Elective Generic (EG)
- Ability Enhancement
- Skill Enhancement

[Signature]
HOD, FS
11/11/2024

Dr. Rajeev Yadav

[Signature]

To
HOD, FS
[Signature]
6/8/2024



मेडी-केप्स विश्वविद्यालय, इंदौर

Medi-Caps University, Indore

Syllabus

SEM-V

Paper-I

Course Code	Courses	Hours Per week			Total	
		L	T	P	Hrs	Credit
FS3CO22	Forensic Ballistics	3	-	2	5	4

Course Objectives:

After studying this paper

1. Students will gain an understanding of the historical origins of firearms and ammunitions.
2. Students will develop an understanding about the working of firearms and Ammunitions
3. Students will study the internal and external ballistics and their importance in forensic science.
4. Students will develop an understanding about the terminal and wound ballistics.
5. Student will read and analyse about physical evidence in offences involved firearms.

Prerequisites: 12th

Co-requisites: Nil

Unit I

History and Background of Firearms

History of Firearms, Classification of Firearms, characteristics of different Firearms and their working mechanism. Basic parts of Firearms: Stock, Action, Barrel. Rifling, the purpose & types of rifling. improvised country-made/imitative firearm, and their constructional features., proof marks. Photography of scene of crime. Recognition, Collection, Packaging, Handling, and forwarding of firearm evidence from "The Scene of Crime". Reconstruction of crime scene in firearm related crimes

Unit II

Ammunition

Types of Ammunition and their components, constructional features and characteristics of different types of cartridges and bullets. Primers & Propellants. Head stamp markings on ammunitions. Types of marks produced during firing process on cartridge – Firing Pin Marks, Breech Face Marks, Chamber Marks, and Extractor and Ejector marks and their examination.

DC MOM Annexure- 3 Revised Syllabus 23/ May/2024

Unit III

Internal and External Ballistics

Definition, Ignition of propellants, Shape and size of propellants, Manner of burning, Energy considerations, and various factors affecting the Internal Ballistics: Lock Time, Ignition Time, Barrel Time, Erosion, Corrosion and Gas Cutting. Vacuum Trajectory, Effect of air resistance on trajectory, base drag, drop, drift, yaw, Shape of Projectile and stability, trajectory computation, Ballistics Coefficient and Limiting Velocity.

Unit IV

Terminal and Wound Ballistics

Definition, Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, and influence of range. Ricochet and wound ballistics, evaluation of injuries caused due to shot-gun, rifle, handguns and country made fire arms, post mortem and anti-mortem firearm injuries.

Unit V

Firearm Evidence

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

Case study: Optional

Project: Optional

List of Practical

1. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
2. Identification of firearm for type, make and model.
3. Identification of ammunition/parts thereof for type, make and calibre.
4. To carry out the comparison of fired bullets and cartridge case.
5. Preliminary Examination Black Powder.
6. To identify gunshot residue by chemical test.
7. To differentiate, with the aid of diagram, contact wounds, close range wounds.
8. To analyse glass fracture pattern formed by bullet.
9. To calculate range of Fire.
10. Restoration of erased marking on firearm.

Agarwal

Byadar

Course outcomes

After completion of the course, the student will be able

1. To explain key concepts of firearms, ammunition, and ballistics.
2. To analyse various types of firearm and ballistic evidence.
3. To implement methods of collection and preservation in firearm-related evidence.
4. To apply techniques for the investigation of firearm-related crime scene
5. To compare findings from ballistic evidences to draw comprehensive conclusions about firearm related evidence

Text books:

1. B.R. Sharma; "Firearms in Criminal Investigation & Trials", Universal Law Publishing Co Pvt Ltd, New Delhi,
2. Brain J. heard; Hand book of Firearms and Ballistics; John Willey, England;
3. Jauhari M; "Identification of Firearms, Ammunition, & Firearms Injuries", BPR&D, New Delhi.
4. TA. Warlow; Firearms, The Law and Forensic Ballistics; Taylor and Francis, London
5. Gary J. Ordog, Management of Gunshot Wounds; Elsevier, New York
6. Karl G. Sellieretal; Wound Ballistics and the Scientific Background; Elsevier, London;
7. J. Howard Mathews; Charles C. Thomas, Firearms Identification, Vols. 1,2 & 3; Springfield, Illinois
8. Hatcher, Jury and Weller; Firearms Investigation, Identification and Evidence; Stackpole Books, Harrisburg, P A

Suggested readings:

1. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester
2. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey
3. A.J. Schwoble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton
4. Nickolls, L.C.; Scientific Investigation of Crime, Bulterwest, London
5. Working Procedure Manual: Forensic Ballistic BPR&D Publication

Web Source:

1. <https://application.wiley-vch.de>
2. www.researchgate.net
3. <http://www.ipu.ac.in>

Open Learning Source:

1. <https://swayam.gov.in/courses/public>
2. <http://nptel.ac.in/course.php>
3. https://www.goodreads.com/book/show/779610.Introduction_to_Forensic_Science_and_Criminalist



मेडी-केप्स विश्वविद्यालय, इंदौर

Medi-Caps University, Indore

Syllabus

Paper II

Course Code	Courses	Hours Per week			Total	
		L	T	P	Hrs	Credit
FS3CO23	Forensic Toxicology	3	-	2	5	4

Course objectives:

After studying this paper, the students will know

1. The significance of toxicological studies in forensic science.
2. The classification of poisons and their modes of actions.
3. The absorption of poisons in body fluids.
4. The forensic identification of illicit liquors.
5. The classification and characteristics of narcotics, drugs and psychotropic substances.

Prerequisites: 12th

Co-requisites: Nil

Unit I

Forensic Toxicology

Introduction and History, Branches of Forensic Toxicology, Significance, Scope, Duties and Responsibilities of Forensic Toxicologist, Analysis Report.

Unit II

Isolation and Clean-up Procedures of Poison from Viscera

Poisons: Definition, Classification of Poisons, Types of Poisoning, Mode of Action, Factors Modifying the Action of Poisons.

Introduction of Pharmacokinetics (Absorption, Distribution, Metabolism And Elimination) And Pharmacodynamics (Receptors And Their Classification).

Unit III

General Study and Analysis

Metallic Poisons: Arsenic, Antimony, Lead, Barium, Copper, Mercury, Zinc, Thallium and their sampling in living and dead cases, Examination In Laboratory By Various Methods. Nitrite, Nitrate, Sulphide, Sulphate, Phosphide, Chlorate Borate, Bromide, Fluoride, Bromate etc.

Barbiturates, Chloral Hydrate and Tranquilizers. Methanol, Ethanol, Acetone, Chloroform and Ether, Estimation of Liquor in Breath, Blood and Urine.

Unit IV

Narcotic Drug and Psychotropic Substances

NDPS: introduction, classification, narcotic drugs & psychotropic substances, sampling, specific drugs types (cannabis, heroin, cocaine, amphetamine, LSD, Phencyclidine, MDMA, peyote)

Drugs of abuse in sports and their methods of analysis.

Alkaloids: definition, classification, isolation and general characterization. Hydromorphone, methadone, mescaline, phencyclidine, atropine, cocaine etc.

Unit V

Animal and Plant Poison

Plant Poison: Opium, strychnosnux vomica, mexican prickly poppy, dhatura, aconite, atropa, kaner, madar, cannabis, abrus, ricinus, bhilawa, plumbago, poisonous fungi (ergot etc.), cyanogenetic glycosides, poisonous mushrooms.

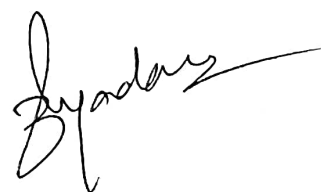
Animal poisons: Snake, canthridine, scorpion.

Case study: Optional

Project: Optional

List of Practical:

1. Separation and Identification of Volatile Liquid by Simple Distillation.
2. Identification of Common Plant i.e. calotropis, cannabis, by physical examination and colour test.
3. Identification of Common Plant i.e. dhatura, nux vomica by physical examination and colour test.
4. Identification of Common Plant i.e. marking nut, opium by physical examination and colour test.
5. Identification of Common Plant i.e. Mexican poppy, kaner by physical examination and colour test.
6. Extraction of pesticides from viscera.
7. Extraction of pesticides from viscera non-biological matrix.
8. Identification of pesticides by colour test/ thin layer chromatography.
9. Extraction drugs/ toxicants from biological matrix.
10. Identification of drugs/ toxicants from biological matrix by colour test, TLC, HPLC.
11. Extraction of Metallic Poisons from Viscera Using Dry Ashing method.
12. Identification of Arsenic metallic Poisons from Viscera Reinsch's test.
13. Identification of Antimony metallic Poisons from Viscera Reinsch's test
14. Identification of Bismuth metallic Poisons from Viscera Reinsch's test
15. Identification of Mercury metallic Poisons from Viscera Reinsch's test



Course outcomes:

After completion of the course, the student will be able

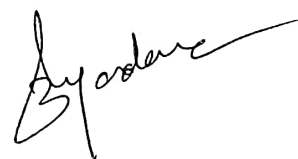
1. To define poisons based on actions, nature, extraction methods
2. To explain how alcohol is metabolized in the liver and its impact on the central nervous system.
3. To Identify different types of poisons, qualitative and quantitative estimation of ethyl alcohol
4. To recognize common poisons and their physiological effects, such as cyanide, arsenic, and methanol.
5. To classify and identify NDPS, Narcotics, stimulants, depressants and hallucinogens

Text Books:

1. Working Procedure Manual- Chemistry, Explosives and Narcotics”, BPR&D,
2. Niesink, RJM; “Toxicology- Principles and Applications”, CRC Press,
3. Chadha, PV; “Handbook of Forensic Medicine & Toxicology”, Jaypee Brothers, New Delhi,
4. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey
5. F.G. Hofmann, A Handbook on Drug and Alcohol Abuse, 2nd Edition, Oxford University Press, New York
6. S.B. Karch, the Pathology of Drug Abuse, CRC Press, Boca Raton
7. Poklis, Forensic toxicology in, Introduction to Forensic Sciences, W.G. Eckert (Ed.), CRC Press, Boca Raton
8. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, Alcohol, Drug and Driving,
9. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher’s, Techniques of Crime Scene Investigation, CRC Press, Boca Raton

Suggested readings:

1. Modi J S: medical jurisprudence and Toxicology, Law Publishers,
2. Taylor A. S.: Medical jurisprudence, Blanchard & Lea,
3. Parikh CK: Forensic Medicine and Toxicology, Medical Publications,
4. Keith Simpsen & Bernard Knight: Forensic Medicine 11th edit., Taylor & Francis,
5. Poison, CJ, DJ Gee, B. Knight: Forensic Medicine, Pergamon Press,
6. Reddy K.S.Narayan : Forensic Medicine 3rd edit, Jaypee Brothers
7. Krishan Vij: Textbook of Forensic Medicine & Toxicology: Principles & Practice, Elsevier Health Sciences
8. Anil Aggrawal: Textbook of Forensic Medicine and Toxicology, Avichal Publishing Company
9. Charles A. Catanese: Color Atlas of Forensic Medicine and Pathology, CRC Press



Web Sources:

1. <https://legislative.gov.in/sites/default/files/A1985-61.pdf>
2. <https://dor.gov.in/sites/default/files/National%20Policy%20on%20NDPS%20published.pdf>
3. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=16>

Open Learning Source:

1. <https://swayam.gov.in/courses/public>
2. <http://nptel.ac.in/course.php>
3. https://www.goodreads.com/book/show/779610.Introduction_to_Forensic_Science_and_Criminalistics





मेडी-केप्स विश्वविद्यालय, इंदौर

Medi-Caps University, Indore

Syllabus

Paper III

Course Code	Courses	Hours Per week			Total	
		L	T	P	Hrs	Credit
FS3EL05	Forensic Genetics	3	-	2	5	4

Course Objective

After studying this paper, the students shall be able to

1. Understand the basic concepts of genetics.
2. Acquaint with quantification methods for DNA.
3. Aware of various extraction methods for DNA.
4. Know the various DNA profiling techniques.
5. Comprehend DNA fingerprinting and its advancement.

Prerequisites: 12th

Co-requisites: Nil

Unit I

Basic Concepts of Genetics

Genetic Material– Discovery, Experiments, Composition and Structure of DNA and RNA, Organization of DNA In Chromosomes, Genetic Code, Chargaff's Rule, Watson-Crick's Double Helical Model of DNA, Types of DNA. Mendelian Principles, Introduction to Human Genome.

Unit II

Basics of DNA and its Qualitative and Quantification Methods

Basic Principles DNA as biological blueprint of life. Extraction of DNA for analysis, Quantization of DNA – yield gel quantization and slot blot quantization. Mitochondrial DNA – sequence analysis.

Unit III

DNA Extraction Methods

Sample sources for DNA, collection and preservation of samples for DNA testing, conventional and recent methods of DNA extraction (organic and inorganic extraction method).

Unit IV

Forensic DNA Profiling and their application

Forensic DNA Profiling: History and development of DNA fingerprinting. Micro and Minisatellites, Methods of DNA profiling: Principle, types (RFLP, STR, VNTR) their advantages and limitations. Southern /Northern Blotting, DNA profiling in Wildlife Crime Investigation.

Unit V

Advancement in DNA Profiling

Polymerase chain reaction (PCR), sequence polymorphisms, individualization of evidence using Gender identification: Y-STR and MT-DNA profiling. Touch DNA. Introduction to NCBI Database & BLAST Tool.

List of Practical:

1. Demonstration of structure of DNA.
2. Preparation of Agarose gel for electrophoresis.
3. Demonstration of an electrophoretic machine and it's working.
4. Separation of DNA by using agarose gel electrophoresis.
5. Demonstration of extraction of DNA by organic method.
6. Demonstration of extraction of DNA by inorganic method.
7. To prepare a report on the role of DNA typing in solving paternity disputes.
8. To perform crossover electrophoresis for biological fluid.
9. To study the structure of mitochondrial DNA and their role in wildlife crime investigations.
10. Demonstration of a PCR machine and it's working.
11. To identify FASTA sequence of wildlife endangered species using NCBI.
12. To identify the origin of species via FASTA sequence using NCBI.
13. To Study markers useful in analysing DNA from multiple contributors in sexual assault cases.

Course outcomes:

After studying this paper, the students will be able to

1. To understand the fundamental concepts of genetics
2. To explain proficiency in DNA extraction techniques for analysis, including both qualitative and quantitative methods
3. To describe basics of forensic DNA profiling and its diverse applications.
4. To Apply DNA profiling and its diverse applications in various criminal and civil cases
5. To compare the advancements in DNA fingerprinting techniques



Text Books:

1. E.J. Gardner, M. I. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York;
2. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London;
3. Richard Saferstein; Forensic Science Hand Book; Prentice Hall, Englewood Cliff, New Jersey;
4. P. L. Williams and R. Warwick; Gray's anatomy; Churchill Livingstone; London;
5. Biology Methods manual; Metropolitan Police Forensic Science Laboratory, London;
6. Herbert R. Mauersberger; Mathews Textile Fibres – their physical, Microscopic and chemical properties; John Wiley, New York;
7. R.P. Pandey, Plant Anatomy; S. Chand, new Delhi; (India)
8. Edwin, H. Mc Caney; Human Genetics: The Molecular Revolution; Jones & Bartlett Pub. London,
9. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of Cell, 2nd ed. Garland Pub. New York

Suggested readings:

1. Lewis. B; Gene IV, Oxford University Press, England
2. Clifford, B.J; The examination and typing of Bloodstains in the Crime Laboratory; US Court Printing Press
3. Morrison, Robert D; Environmental Forensics Principles and Applications, CRC Press, Boca Raton, New York,
4. Ball Simon; Environmental Law – The law and policy relating to protection of environment, Universal Law Pub Co, Delhi, (India)
5. Oates, D W, Brown, C W & Weigel, D L; Blood and tissue identification of selected birds and mammals; JPR study Projects Lincoln NE Nebraska Game and Parks Commission
6. Catts, E.P. & Haskell NH ; Entomology and death : A procedural guide ; Joyce's Print Shop
7. John M. Walker, Ralph Rapley; Molecular Biology and Biotechnology; Royal Society of Chemistry,
8. Christopher M. Triggs, John S. Buckleton, Simon J. Walsh; Forensic DNA Evidence Interpretation; CRC Press,
9. Joshi A. Rashmi; A Textbook of Practical Biochemistry; B. Jain Publishers (India) (2002)

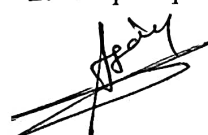
Web Source:

1. <https://application.wiley-vch.de>
2. www.researchgate.net
3. <http://www.ipu.ac.in>



Open Learning Source:

1. <https://swayam.gov.in/courses/public>
2. <http://nptel.ac.in/course.php>.





मेडी-केप्स विश्वविद्यालय, इंदौर

Medi-Caps University, Indore

Syllabus

Paper- IV

Course Code	Courses	Hours Per week			Total	
		L	T	P	Hrs	Credit
FS3EL06	DNA Typing	3	-	2	5	4

Course Objective

After studying this paper, the students shall be able to

1. This paper deals with these basic concepts that form the building block for any further understanding of Genetics.
2. The students are expected to have basic knowledge of chromosome structure, genome organization and cell division.
3. The syllabus includes advanced aspects of chromosome biology, genome organization and genetics of cell cycle regulation.
4. To explain the topics with the help of classical experimental strategies, examples from different model organisms and contemporary genetic approaches and methods.
5. Much of genetic analysis is based on quantitative data; statistical techniques are therefore used extensively.

Prerequisites: 12th

Co-requisites: Nil

Unit I

Biochemical Markers

Introduction, definition of biochemical markers of individuality: classification of markers, biochemical basis of genetic variation. Expression of gene transcription and translation of DNA and gene mapping. Composition and structure of DNA and RNA, organization of DNA in chromosomes, genetic code, Chargaff's rule, Watson-Crick's double helical model of DNA, types of DNA. Introduction to recombinant DNA technology. Forensic application of DNA.

Unit II

Molecular biology of DNA

Introduction to human genome-structure and properties of DNA: nucleotides and polynucleotides, genetic code, Chargaff's rule, Watson-Crick's double helical model of DNA, types of DNA, denaturation and renaturation of DNA, organization of DNA into chromosomes, human chromosomes. Human nuclear genome: genes and related sequences, intragenic noncoding sequences.

Unit III

DNA Typing

Introduction and development of DNA typing. DNA typing techniques- RFLP analysis, PCR amplifications, sequence polymorphism. Analysis of SNP, Y-STR, mitochondrial DNA. DNA bar-coding for species identification, evaluation of results, frequency estimate calculations, interpretations, allele frequency determination, matches probability- database, quality control, certification and accreditation.

UNIT IV

Extraction of DNA

DNA extraction and quantitation- cell and tissue disruption, lysis of membranes and organelles, removal of proteins and cytoplasmic contaminants, contamination, storage of DNA solutions. Methods of DNA extraction: extraction with phenol chloroform, extraction by boiling lysis and chelation, silica -based extraction, differential extraction. Slot-blot assay, fluorescent interrelating dye assay, quantitative PCR assay, Real- time quantitative PCR, Taq- man method.

UNIT V

Applications of DNA

Applications of DNA profiling in forensic investigations: Disputed paternity cases, child swapping, and missing person's identity- civil immigration and wildlife cases. Legal Perspectives- legal standards for admissibility of DNA profiling, procedural and ethical concerns.

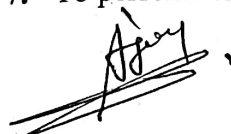
Course outcomes:

After studying this paper, the students will be able to:

1. Students will able to use basics of genetics in forensic science
2. Students will able to apply DNA as physical evidence in criminal cases
3. Students will able to carry out different experiments that are used in forensic genetics and apply statistical calculations for evaluation of results
4. Students will able to understand apply, critically evaluate and understand problems concerning various types of markers and methods for DNA analyses
5. Students will able to identify and understand problems concerning various types of evidence materials for DNA analyses

List of Practical:

1. Isolation of DNA by electrophoresis methods.
2. DNA fingerprinting and its application.
3. To carry out the separation of amino acids by thin layer chromatography.
4. To carry out electrophoresis for separation of protein.
5. To preparation of gel plates for electrophoresis.
6. To prepare a report on the role of DNA typing in solving paternity disputes.
7. To perform cross over electrophoresis from biological fluid.



8. To study the structure of mitochondrial DNA.
9. To study the features of giant DNA.
10. Demonstration of PCR machine and its working.

Text Books:

1. E.J. Gardner, M. I. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York; (1991)
2. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London; (1904)
3. Richard Saferstein; Forensic Science Hand Book; Prentice Hall, Englewood Cliff, New Jersey; (1982)
4. P. L. Williams and R. Warwick; Gray's anatomy; Churchill Livingston; London; (1980)
5. Biology Methods manual; Metropolitan Police Forensic Science Laboratory, London; (1978)
6. Herbert R. Mauersberger; Mathews Textile Fibres – their physical, Microscopic and chemical properties; John Wiley, New York; (1954)
7. R.P. Pandey, Plant Anatomy; S. Chand, new Delhi; (India) (1998)
8. Edwin, H. Mc Caney; Human Genetics: The Molecular Revolution; Jones & Bartlett Pub. London, (1993)
9. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of Cell, 2nd ed. Garland Pub. New York (1989)

Suggested readings:

1. Lewis. B; Gene IV, Oxford University Press, England (1980)
2. Clifford, B.J; The examination and typing of Bloodstains in the Crime Laboratory; US Court Printing Press (1971)
3. Morrison, Robert D; Environmental Forensics Principles and Applications, CRC Press, Boca Raton, New York, (2000)
4. Ball Simon; Environmental Law – The law and policy relating to protection of environment, Universal Law Pub Co, Delhi, (India) (1991)
5. Oates, D W, Brown, C W & Weigel, D L; Blood and tissue identification of selected birds and mammals; JPR study Projects Lincoln NE Nebraska Gome and Perks Commission (1974)
6. Catts, E.P. & Haskell NH ; Entomology and death : A procedural guide ; Joyce's Print Shop (1990)
7. John M. Walker, Ralph Rapley; Molecular Biology and Biotechnology; Royal Society of Chemistry, (2009)
8. Christopher M. Triggs, John S. Buckleton, Simon J. Walsh; Forensic DNA Evidence Interpretation; CRC Press, Nov 29, (2004)
9. Joshi A. Rashmi; A Textbook of Practical Biochemistry; B. Jain Publishers (India) (2002)



मेडी-केप्स विश्वविद्यालय, इंदौर

Medi-Caps University, Indore

Syllabus

Paper-IV

Course Code	Courses	Hours Per week			Total	
		L	T	P	Hrs	Credit
FS3EL07	Forensic Serology	3	-	2	5	4

Course Objectives:

After studying this paper, the students shall be able to

1. Interpret the basic principle of forensic serology and its significance.
2. The use of immunology in the field of forensic science.
3. Role of genetic markers in biological fluid detection.
4. Use of various serological techniques and their importance.
5. The working procedure and importance of instruments used in Forensic Serology.

Prerequisites: 12th

Co-requisites: Nil

Unit I

Introduction to Forensic Serology

Introduction to forensic serology. Scope of forensic serology. Serological evidence (blood, saliva, semen, vaginal fluids, menstrual blood, sweat, and milk); recognition, collection, preservation, and forwarding of serological exhibits at crime scenes.

Unit II

Immunology

Immune system. Immune response. Structure of antigens and antibodies; epitopes, paratopes, haptens, and adjuvants. Antigen-antibody reactions and their strength, types of antigens and antibody reaction; precipitation, agglutination, complement-dependent serological tests neutralization test, opsonization, immunofluorescence, enzyme immunoassay, radioimmunoassay, western blotting, chemiluminescence assay, immune electron microscopic tests.

Unit III

Serogenetic markers

Introduction to blood group system; ABO, Rh, Mn, Lewis, and Bombay blood group systems. Methods of ABO blood typing (Absorption-Inhibition, mixed agglutination, and absorption Elution) from blood stains and other body fluids/stains, Determination of secretor and non-secretor status, Polymorphic enzyme typing- PGM, ESD, EAP, AK, etc., and their forensic significance.

Unit IV

Serological Techniques

Serological techniques-primary binding assays: enzyme immunosorbent assay (ELISA), immunochromatographic assays, secondary binding assays; precipitation-based assays: immunodiffusion, electrophoretic methods. agglutination-based assays: direct agglutination assays, passive agglutination assays, and agglutination inhibition assays.

Unit V

Electrophoresis and Centrifugation

Electrophoresis: Low and high voltage electrophoresis, vertical (capillary) and horizontal (slab gel electrophoresis) electrophoresis, PAGE. Forensic application of electrophoresis. Basic principles of centrifuges, types of centrifuges, and forensic applications of centrifuges.

Course Outcome

After studying this course, the students will be able

1. To understand the knowledge of forensic serology in crime scene investigation
2. To explain different types of blood groups and serological markers.
3. To discuss the concept of immunological techniques in investigation.
4. To identify different serological techniques and assays.
5. To apply electrophoresis and centrifuge techniques in forensic serology.

List of Practical:

1. Collection and packaging of various serological evidence.
2. Preliminary and confirmatory examination of blood.
3. Identification of the ABO blood group from fresh blood.
4. Identification of the ABO blood group from dried blood.
5. To perform a preliminary and confirmatory examination of Saliva.
6. Identification of urine.
7. Identification of semen.
8. To Perform species origin identification using immunodiffusion assay.
9. To observe the agglutination reaction under a microscope.



10. To understand the workings of electrophoresis.
11. To understand the workings of the centrifuge and its application.

References:

1. Laboratory Procedure Manual - Forensic Biology (2005), Directorate of Forensic Science, MHA, New Delhi.
2. Textbook of Forensic medicine and toxicology -V.V.Pillay.
3. E.J. Gardner, M. I. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York;
4. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London;
5. Richard Saferstein; Forensic Science Hand Book; Prentice Hall, Englewood Cliff, New Jersey;
6. P. L. Williams and R. Warwick; Gray's anatomy; Churchill Livingstone; London;
7. Edwin, H. Mc Caney; Human Genetics: The Molecular Revolution; Jones & Bartlett Pub. London,
8. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of Cell, 2nd ed. Garland Pub. New York

Suggested Readings:

1. Laboratory Procedure Manual - Forensic Biology (2005), Directorate of Forensic Science, MHA, New Delhi.
2. Textbook of Forensic medicine and toxicology -V.V.Pillay.
3. Clifford, B.J; The examination and typing of Bloodstains in the Crime Laboratory; US Court Printing Press
4. Morrison, Robert D; Environmental Forensics Principles and Applications, CRC Press, Boca Raton, New York,
5. Ball Simon; Environmental Law - The law and policy relating to the protection of the environment, Universal Law Pub Co, Delhi, (India)
6. John M. Walker, Ralph Rapley; Molecular Biology and Biotechnology; Royal Society of Chemistry,
7. Christopher M. Triggs, John S. Buckleton, Simon J. Walsh; Forensic DNA Evidence Interpretation; CRC Press,
8. Joshi A. Rashmi; A Textbook of Practical Biochemistry; B. Jain Publishers (India)

