

**Program Structure and Syllabus
for
M.Sc. Forensic Science
DNA Fingerprinting**

2021-22 Onwards



ADIKAVI NANNAYA UNIVERSITY

RAJAMAHENDRAVARAM

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
BOARD OF STUDIES MEETING – FORENSIC SCIENCE

Date: 28-10-2021

AGENDA:

1. Eligibility and Entrance Examinations
2. Syllabus finalization
3. Syllabus for practicals
4. Number of teaching hours / Periods theory / Practical
5. Model Question Papers
6. Credits / Evaluation
7. Scheme of Valuation
8. List of Examiners for paper setting
9. List of Practical Examiners

Members:

- | | | |
|---|---|-----------------|
| 1. Dr. D. Kalyani, Asst. Prof.,
Dept. of Zoology, AKNU, RJY, | - | Chairman |
| 2. Mr.E.Mohan, Principal,
Aditya Degree College, Surampalem | - | Convener |
| 3. Dr. N. Kala Bhaskar, Asst. Prof.
University of Madras, Chennai | - | Member |
| 4. Dr. Komal Saini, Professor,
Panjabi University | - | Member |
| 5. Dr. P. Uma Maheshwara Rao, Prof. & Head,
Forensic Medicine & Toxicology,
Rangaraya Medical College, Kakinada | - | Member |
| 6. Dr. Satyan, Scientist (Retd),
CFSL Hyderabad | - | Member |

RESOLUTIONS:

The common Board consisting of the above members have met on blended mode in the O/o Dean, Academic Affairs, Adikavi Nannaya University, Rajamahendravaram on 28/10/2021 and considered the enclosed agenda. After thorough deliberations and discussions, the Board members have resolved the following.

1. A B.Sc. graduate with “Chemistry or Forensic Science” as one of the subjects is eligible to apply for admission into M.Sc. Forensic Science-Questioned Documents and Fingerprints.
2. A B.Sc. graduate with “Chemistry or Forensic Science” as one of the subjects is eligible to apply for admission into M.Sc. Forensic Science - Chemistry and Toxicology.
3. A B.Sc. graduate with “Biology or Forensic Science” as one of the subjects is eligible to apply for admission into M. Sc. Forensic Science - DNA Finger Printing.
4. A B.Sc. graduate with “Computer Science or Forensic Science” as one of the subjects is eligible to apply for admission into M.Sc. Cyber Security.
5. A B.Sc. graduate with “Computer Science or Forensic Science” as one of the subjects is eligible to apply for admission into M.Sc. Digital Forensics and Information Security.
6. The members formulated the syllabus for M.Sc Forensic Science, a 2 year program on par with other Universities in the Country to be implemented from academic year 2021-22.
7. The syllabus for practicals of the above courses was formulated on par with UGC model curriculum.
8. There shall be 4 to 5 hours per week for each theory paper & 3 hrs for each practical.
9. I & II Semesters are common for M.Sc Forensic Science - Questioned Documents & Fingerprints, M.Sc Forensic Science - Chemistry and Toxicology, M.Sc Forensic Science - DNA Finger Printing
10. III Semester is having specialization i.e, Questioned Documents & Fingerprints in M.Sc Forensic Science - Questioned Documents & Fingerprints, Chemistry and Toxicology in M.Sc Forensic Science - Chemistry and Toxicology, DNA Finger Printing in M.Sc Forensic Science - DNA Finger Printing.
11. IV Semester will be project cum Internship for all M.Sc. Programs M.Sc Forensic Science - Questioned Documents & Fingerprints, M.Sc Forensic Science - Chemistry and Toxicology, M.Sc Forensic Science - DNA Finger Printing, M.Sc. Cyber Security, M.Sc. Digital Forensics and Information Security.
12. Marks and credits are allotted to theory & practical papers in each semester. There will be 100 marks for each theory, and 200 marks for 2 practicals each 100 marks and total marks for each semester 600 x 4 semester 2400 marks.

13. Examination pattern will be as follows.

a) Each theory paper will be evaluated for 100 marks out of which 75% of marks, for Semester End Examination (SEE) while the remaining 25% marks for Continuous Internal Assessment (CIA)

Continuous Internal Assessment		
S. No	Scheme of Evaluation	Marks
1	Mid-Semester Examination	10M
2	Assignment/Seminar Presentation	5M
3	Attendance	5M
4	Swachhata Activity	5M
Total		25M
Details of Attendance Marks		
S.No	Attendance	Marks Allotted
1	95% above	5
2	85-94%	4
3	75-84%	3
4	65-74%	2
5	55-64%	1
6	< 54%	0
Total		25M

- b) The Semester End Examination question paper comprises of two sections –Section A & B, Section A consists of 4 questions one question from each unit of syllabus with internal choice ‘a’ or ‘b’. Section-B consists of 8 short questions two from each unit of the syllabus, with internal choice out of which only 5 are to be attempted
- c) Similarly, each practical will be evaluated for a total of 100 marks, out of which 75% of marks for Semester End Examination (75 Marks) and 25% (25 Marks) for Continuous Internal Assessment.
14. A comprehensive viva-voce will be conducted for students at the end of IV Semester for 100 marks carrying 4 credits.
15. IV Semester Students should do their project cum internship at Forensic Science Laboratories, Police Stations, Cyber cells, Fingerprint Bureau, National Crime Records Bureau, National Forensic Sciences University, Rashtriya Raksha University, Directorate of Forensic Science Services, Centre for Development of Advanced Computing (C-DAC), National Institute of Nutrition, Centre for DNA Fingerprinting and Diagnostics – CDFD, Council of Scientific And Industrial Research–Centre for Cellular and Molecular Biology (CSIR–CCMB), Indian Institute of Chemical Technology (CSIR-IICT), Central Detective Training Institute, etc. and thesis must be submitted to the college and University.

M.Sc. Forensic Science
SEMESTER END EXAMINATION
Theory Model Question Paper pattern

Time: 3 hrs

Max. Marks: 75

Section-A

Answer all questions. Each question carries 15 marks.

4x15=60

Q1. Unit-1

a or b

Q2. Unit-2

a or b

Q3. Unit-3

a or b

Q4. Unit-4

a or b

Section-B

5x3=15

Q5. It contains 8 short questions with at least two from each unit, carrying 3 marks.

5 questions are to be answered.

M.Sc. DNA Fingerprinting Scheme of Examination

Code	Title of the Paper	L @	P #	Total (Hrs)/ Week	Duration of Exam (hrs)	External Marks	Internal Marks	Total Marks	Credits
I Semester									
MSFS101	Forensic Science & Criminal Justice System	4	3	7	3	75	25	100	4
MSFS102	Forensic Science & Divisions	4	3	7	3	75	25	100	4
MSFS103	Crime Scene Management	4	3	7	3	75	25	100	4
MSFS104	Instrumentation	4	3	7	3	75	25	100	4
Lab Course									
MSFS105	Crime Scene Processing Lab				3	75	25	100	4
MSFS106	Instrumentation Lab				3	75	25	100	4
II Semester									
MSFS201	Forensic Medicine and Anthropology	4	3	7	3	75	25	100	4
MSFS202	Forensic Physics and Ballistics	4	3	7	3	75	25	100	4
MSFS203	Cyber Forensics	4	3	7	3	75	25	100	4
MSFS204	Psychology	4	3	7	3	75	25	100	4
Lab Course									
MSFS205	Forensic, Medicine & Anthropology Lab				3	75	25	100	4
MSFS206	Forensic Physics & Cyber Lab				3	75	25	100	4
III Semester									
MSFS351	Molecular Biology	4	3	7	3	75	25	100	4
MSFS352	Forensic Biology	4	3	7	3	75	25	100	4
MSFS353	Genetics and Bioinformatics	4	3	7	3	75	25	100	4
MSFS354	DNA profiling	4	3	7	3	75	25	100	4
Lab Course									
MSFS355	Forensic Biology Lab				3	75	25	100	4
MSFS356	DNA Profiling Lab				3	75	25	100	4
IV Semester									
MSFS451	Comprehensive viva-voce							100	4
MSFS452	Project					500	100	600	24
Total								2500	100

@ Lectures
Practicals

M.Sc. Forensic Science
I Semester, Paper I
MSFS101- Forensic Science & Criminal Justice System

Aim and Objectives of Course: To Introduce fundamentals of Forensic Science, Concepts of Criminology, Laws pertaining to Criminal Justice System and Court Testimony.

Learning Outcomes

1. Fundamentals of Forensic Science and its development.
2. Significance of Criminology in Forensic Science.
3. Understanding Criminal Justice System.
4. Various agencies involved in CJS
5. Procedures and Significance of Court testimony.

Unit I- Forensic Science

Forensic Science – Introduction. History – Pioneers in Forensic Science. Principles of Forensic Science. Organization of Forensic Science Laboratories (Central & State) and other allied institutions -DFSS, CDTI, FPB, NCRB, BPR&D, CDFD, CCMB, IICT, NIN, LaCONES, CBI, NIA, CID, IB, SFIO, RAW NCB, CERT-In etc. Duties of Forensic Scientists. Forensic Education in India – 1959 to 2020.

Unit II – Criminology

Introduction of Criminology, Social Change and Crime, Control and Prevention of Crime in context with Organization, Industrialization, Family set up, Criminal Behavior and Psychology. Schools of Criminology, Theories of Criminology (Differential Association theory, Self-concept and containment theory, Labelling theory, Barrier theory, etc.), Punitive Aspects (Theories of punishment), Probation & Parole, Correctional Institutions. Penology and its concepts. Victimology and its concepts.

Unit III- Criminal Justice System

Criminal Justice system in India – Introduction – Administration of civil and criminal courts – Hierarchy, Powers, Types. LokAyukta. Hierarchy of Police personnel in India - Functions and duties of police. Investigation of crimes and prosecution. Cognizable and Non- cognizable offences. Human Rights Commission – Guidelines for Forensic Investigation. Introduction to constitution of India – Fundamental Rights. Right to Information Act. Indian penal Code – Sections 171B, 171E, 291, 292, 293, 299, 300, 302, 304B, 308, 309, 362, 375, 376, 390, 391, 415, 420, 463, 465 - Criminal Procedure Code Introduction – Sections 291, 292, 293, 300 – Indian Evidence Act - Introduction – Sections 45, 46, 47, 57, 58, 60, 73, 135, 136, 137 and 159.

Unit IV

Report writing and evidence evaluation, Components of reports, report formats in respect of crime scene and laboratory findings.

Court testimony, admissibility of expert testimony, pre-court preparations and court appearance, examination – in chief, cross examination and re-examination, Discussion of complicated cases.

Reference Books:

1. Forensic Science in Criminal Investigation & Trails by B.R. Sharma – Universal Law Publishing.
2. An Introduction to Scientific and Investigative Techniques by James, S. H. and Nordby, J. J. CRC Press, 2003 & 2005
3. Forensic Science: Fundamentals and Investigations by Anthony J. Bertino - Cengage Learning, 2008
4. Introduction to Criminalistics: The foundation of Forensic Science by Barry A. J. Fisher, William J. Tilstone, Catherine Woytowicz - Elsevier
5. Criminal Major Acts 27th Edition 2018 by Padala Rama Reddi – Asia Law House Hyderabad.
6. Text Book of Criminology by Vimala Veeraraghavan – Selective & Scientific Books
7. Criminology, Penology & Victimology by Prof. N.V. Paranjape – Central Law Publication
8. Encyclopedia of Forensic Sciences Vol 1,2,3 by Jay A Siegel, Pekka J Saukko, Geoffrey C Knufer – Elsevier

M.Sc. Forensic Science
I Semester, Paper II
MSFS102- Forensic Science & Divisions

Aim and Objectives of Course: To acquire fundamental knowledge of various branches in Forensic Science and scope of Wildlife Forensic Science.

Learning Outcomes

1. To learn analysis of various evidence relevant to biology & chemistry.
2. To learn examination procedures of Questioned documents and Fingerprints
3. Applications of Forensic Science in Wildlife protection.

Unit - I :Biology

Introduction and Functions of Forensic biology.Importance, Preliminary and Confirmatory tests for Blood, Semen, Saliva, Urine, etc.Blood grouping systems.Examination of Hair and Fibre.Diatoms – Importance and Examination.Basics of DNA Fingerprinting.Introduction to Forensic Botany – Wood, leaves, seeds. Study of Pollen grains& Starch grains. Morphological and anatomical characteristics of Cannabis, Coca plants, Psilocybe mushrooms, Tobacco etc.

Unit – II : Chemical

Introduction and Functions of Forensic Chemistry.Chemistry of Fire. Explosives – Classification, Preliminary and Confirmatory tests for Explosive substance. Preliminary and Confirmatory tests for NDPS – Benzodiazepines, Phenethylamines, Hydroxyl derivatives, Methoxy derivatives, Tertiary amines, Tryptamines, etc. Examination of Petroleum products – Petrol, Diesel and Kerosene.Analysis of Alcoholic Beverages. Analysis of trace evidence – paint, dyes, etc.

Unit – III : Physical

Questioned Documents – History, Standard Documents – types.Introduction and Principles of Handwriting & Signatures.Alterations – Additions, Erasures, Overwritings, Obliterations. Secret writings, Printers and Printed document examination. Forgeries-types and detection. Instruments used in QDE– VSC, ESDA, etc.

Fingerprints – History, Types of Fingerprints, Fingerprint patterns, Development techniques– Chemical and Physical. Fingerprint identification and comparison. AFIS.

Unit – IV : Wildlife

Introduction and importance of Wildlife Forensics. Wildlife Protection act. Schedules I to VI of WPA.Wildlife crimes – Smuggling, poaching, hunting etc. Crime scene search, Criminal Investigation – Determination of time of death and sex determination from bones – Identification of teeth, claws, Ivory, Horns, antlers, furs, skin, bitemarks, pug marks – Identification of blood, excreta and bones by biochemical and immunological methods. Wildlife Protected and endangered species of animals and plants, Sanctuaries and their importance, Wild animals as pharmacopeias, Wildlife species commonly traded illegally.

Reference Books:

1. Forensic Science in Criminal Investigation & Trails by B.R. Sharma – Universal Law Publishing.
2. Criminalistics- An Introduction to Forensic Science 12th Edition by Richard Saferstein – Pearson
3. Forensic Biology by Richard Li – CRC Press
4. Essentials of Forensic Biology; Animals, Plants & Microorganisms in Legal Investigations by Gunn Allen – J. Wiley (2006)
5. Forensic Investigation of Explosives by Beveridge – Taylor & Francis (2000)
6. Basics of Forensic Chemistry by Javed I. Khan, Thomas J.Kennedy, Donell R.Christian, Jr – Humana Press
7. Forensic Analysis of Fire Debris and Explosives by Kenyon Evans-Nguyen and Katherine Hutches – Springer
8. Handwriting Identification Facts and Fundamentals – Huber &Headricks by Heidi H Harralson and Larry S Miller – CRC Press
9. The Fingerprint Sourcebook – NIJ
10. Wildlife Forensics Methods and Applications by Jane E. Huffman and John R. Wallace
11. Foundations of Forensic Document Analysis Theory and Practice by Michael Allen – Wiley Blackwell.
12. Encyclopedia of Forensic Sciences Vol 1,2,3 by Jay A Siegel, Pekka J Saukko, Geoffrey C Knufer– Elsevier
13. Wildlife Protection Act 1972 and its Amendments
14. Forensic Science in Wildlife Investigations – Linacre A

M.Sc. Forensic Science
I Semester, Paper III
MSFS103- Crime Scene Processing

Aim and Objectives of Course: Importance of Crime Scene Processing and Evidence for Investigation.

Learning Outcomes

1. Principles, Methods, Procedures of Crime Scene Processing.
2. Applications of Various Evidence Collection kits in Crime Scene.
3. Collection methods of Physical Evidence.

Unit I- Basic Principles of Crime Scene Management

Definition of Crime and Crime Scene, Types of SoC, Planning, Organization and Coordination, Preservation of the Scene and evidence, Safety measures for evidence collection, Steps to be followed at SoC – Walk through, Protection, Search methods, Identification and Recognition of Physical Evidence, Labelling, Documentation – Photography, Videography and Sketching. Digital Imaging of Crime Scene, 3D scanning technique.

Unit II- Evidence Collection Kits

Importance of evidence collection kit and types of kits - General Crime Scene Kit, Fingerprints Kits - Forensic Light Source Kit, Foot & Tireprints casting Kit, Blood Detection Kit, Semen Detection Kit, Explosives Kit, GSR Kit, Narcotics Kit, Sexual Assault Forensic Evidence Collection (SAFE) Kit, Arson Investigation Kit, Digital Evidence Collection Kit.

Unit III- Collection of Physical Evidence

Physical Evidence – Definition, types, HLP of Various evidence such as Biological – Blood, Semen, Saliva, Urine, Faecal Matter, Vomit, Vaginal fluid, Nasal & Buccal Swabs, Nails, Hair etc. Chemical – GSR residue, Explosive substance, Arson residues, Drug substance, Beverages, Petroleum samples, Toxins and Toxicants etc. Physical – Soil, Fiber, Glass fractures, Tool marks, Foot & Tire prints, Fingerprints, Weapons – firearms, knife, rod, hammers, etc. Digital – Storage devices – Floppy Disks, Hardisks, Pendrives, Memory Cards etc., Electronic gadgets – Laptop, Mobiles, Tabs, IoT Devices, etc. Preservation and Storage of evidence.

Unit IV- Crime Scene Reconstruction

Nature and importance of CSR – Basic principles and stages involved – Types and classification of reconstruction – Pattern evidence and shooting scene reconstruction – Manual and computer-assisted reconstruction of Bloodstain Pattern Analysis – Role of logic in CSR – Writing a reconstruction report – Correlation of crime scene analysis with behavioural analysis – Cases of special importance pertaining to forensic examination. National & International scenario of Crime Scene Management.

Reference Books:

1. A Forensic Guide for Crime Investigation – Standard Operating Procedures by LNJN National Institute of Criminology and Forensic Science
2. Criminalistics- An Introduction to Forensic Science 12th Edition by Richard Saferstein – Pearson
3. Forensic Science in Criminal Investigation & Trails by B.R. Sharma – Universal Law Publishing.
4. Techniques of Crime Scene Investigation by Barry A. J. Fisher & David R. Fisher – CRC Press
5. Introduction to Crime Scene Photography by Edward M. Robinson -Academic Press
6. Practical Crime Scene Processing and Investigation by Ross M. Gardner & Donna R. Krouskup – CRC Press
7. Crime Scene Management A Forensic Approach by Dr. M.S. Rao & Dr. B.P. Mathil – Selective & Scientific Books
8. Forensic Science, Its Related Issues, Techniques & Court Evidence by V.N. Sehgal - Selective & Scientific Books
9. Encyclopedia of Forensic Sciences Vol 1,2,3 by Jay A Siegel, Pekka J Saukko, Geoffrey C Knufer - Elsevier

M.Sc. Forensic Science
I Semester, Paper IV
MSFS104- Instrumentation

Aim and Objectives of Course: To inculcate knowledge on various analytical instruments used in Forensic Science.

Learning Outcomes

1. Principles, Mechanism, Procedures of Various Microscopes, Spectroscopic techniques, Separation techniques and Biochemical techniques.

Unit-I Microscopy

Introduction, principle and applications of Microscope, Compound Microscope, Stereomicroscope, Comparison Microscope, Polarized Light Microscopy, Fluorescence Microscopy, Transmission Electron Microscope, Scanning Electron Microscope – Energy Dispersive X-Ray, Atomic Force Microscope, etc.

Unit-II Spectroscopic techniques

Introduction to spectroscopy, Interaction of EMR with matter - absorption, emission, reflection, fluorescence, phosphorescence.

UV Vis Spectrophotometry, AAS, AES, IR Spectroscopy, X-Ray Diffraction, XRF, EDXRF, Raman Spectroscopy, NMR, Mass Spectroscopy, ICP-MS, NAA.

Unit-III Separation Techniques

Introduction & principles of chromatographic Techniques – TLC, HPTLC, Column Chromatography, High Performance Liquid Chromatography, Gas Chromatography, Ion Exchange Chromatography, LC-MS, GC MS, Electrophoretic techniques, etc

Unit-IV Biochemical Techniques

Centrifugation, Immuno-Chemical Techniques, Immuno electrophoresis, Radio Immuno Assay (RIA), Enzyme linked Immuno Sorbent Assay (ELISA), Fluorescence Immuno Assay, Flow Cytometry, PCR, etc.

Reference Books:

1. Encyclopedia of Forensic Sciences Vol 1,2,3 by Jay A Siegel, Pekka J Saukko, Geoffrey C Knufer - Elsevier
2. Practical Forensic Microscopy – A Laboratory Manual by Barbara P. Wheeler Lori J. Wilson – Wiley Blackwell
3. Principles of Instrumental Analysis by Skoog D.A., Holler J.F. and Neiman T.A. – Thomson 1997
4. Instrumental Methods of Analysis 7th Edition by Willard H.H. Merritt L.L. Jr. Dean J.A. and Settle F.A. – Wadsworth 1998
5. Instrumental Methods of Chemical Analysis by Chatwal, G.R. and Anand, S
6. Instrumental Methods of Chemical Analysis by Sharma B.K.
7. Immunology 5th Edition, by Goldsby R.A. Kindt, T.J. Osborne, B.A and Kuby, J – Freeman 2003
8. Harper's Biochemistry 25th Edition by Murray R.K. Granner D.K. Mayes P.A. and Rodsell, V.W.

I SEMESTER PRACTICALS

MSFS 105 – Crime Scene Processing Lab

1. Investigation-Scene of Crime.
2. Crime Scene Search methods and Numbering of Physical Evidence.
3. Crime Scene Sketching (Rough & Fine) by Baseline, Rectangular, Triangulation, polar techniques.
4. Crime Scene Photography – Close, Mid & Wide Range.
5. Handling, Lifting and Packing of physical evidence.
6. Sealing, Labelling and Preservation of physical evidences.
7. Crime Scene Reconstruction - Blood Pattern Analysis
8. Demonstration of Evidence Collection Kits – Crime scene kit, Fingerprints kit, Foot/Tire Print Casting kit, Forensic Light kit, etc.
9. Polygraphy / Lie Detection / Psychology evaluation.

MSFS 106 – Instrumentation Lab

1. Compound Microscope - Examination of RBC & Human Hair and Animal hair.
2. Stereomicroscope examinations of Pollen grains
3. Comparison Microscope – Toolmarks examination, Hairs, Bullets, Cartridges, etc.
4. TLC Ink, Pesticides and Black powder, etc.
5. Examination of Pesticides in UV Vis Spectrophotometer
6. Demonstration of Gas Chromatography & High-Performance Liquid Chromatography

Note:

- i. Crime Scene visit along with police
- ii. Visit to Forensic Science Laboratories
- iii. Visit to IICT, LaCONES, NIN, etc.
- iv. Visit to Court during trials

M.Sc. Forensic Science
II Semester, Paper I
MSFS201- Forensic Medicine and Anthropology

Aim and Objectives of Course: To impart knowledge on cause and time since death, sexual offences and role of anthropology, odontology and entomology in Investigation.

Learning Outcomes

1. To understand basics of Human Anatomy and Anthropology.
2. To learn postmortem examination procedure and its significance.
3. To learn various sexual offences and their forensic significance.

Unit – I : Forensic Medicine

Introduction to Forensic Medicine – Definition, History, and Development. Pathology, Medical Jurisprudence, Medical evidences- documentations, investigation of scene of death - Medical Law and Ethics. Introduction, History & Development of Forensic Anthropology & Archaeology, & F. Taphonomy. Role of Anthropologist at the Scene of Crime, Anthropologist, Equipment opted for search and recovery.

Unit – II : Human Anatomy

Introduction to Human anatomy and Physiology- Axial Skeleton- Skull, Sutures of skull, Cranial bones, Facial bones, Sternum, thoracic bones, vertebral column, Appendicular Skeleton Bones of Upper limbs, Lower limbs, Pelvic Girdle etc.

Determination of sex- from skull, mandible, and pelvis, Femur, scapula etc., Determination of Age- Suture closures, and growth of teeth & appearance of ossification centres. Determination of Stature, Difference between human and animal bones commonly confused with human bones. Facial Reconstruction & Superimposition.

Unit – III : Medico-legal Autopsy

Medico-legal Autopsy- Death and its Causes- External and internal examination of deceased body, Exhumation process and its importance. Determination of time since death and cause of death- Injuries - classification- Medico-legal aspects of injuries- Post-mortem changes- collection of post-mortem samples and preservation.

Introduction and Importance of Forensic Entomology- types & developmental stages.

Unit – IV : Odontology

Development of teeth- Dentition, Architecture of teeth, growth of teeth- Milk, Permanent. Forensic Odontology- Basic principles, Applications in criminal investigations- Bite mark Analysis, Age estimation etc. Dentition Library, Forensic Odontology limitations. Sexual offences- rape- unnatural sexual offences- sexual perversions- Abortion- Infanticide foeticides- impotence and sterility- virginity, Pregnancy and Delivery linked crimes- medico-legal crimes- thermal deaths- electrocution- starvation- anaesthetic & operative deaths- Mechanical Asphyxia- accidental- Drowning deaths- Poisoning deaths – Lightning

Reference Books:

1. Modi's Textbook of Medical Jurisprudence and toxicology – Edited By BV Subramanyam
2. Parikh's Textbook of Medical Jurisprudence , Forensic Medicine and Toxicology .
3. Principle of Forensic Medicine and Toxicology by Rajesh Bardale.
4. Review of Forensic Medicine and Toxicology by Gautam Biswas.
5. Fundamental Toxicology by John H. Duffus, Howard G. J. Worth.
6. Dr. Umadethan Principles and Practice of Forensic Medicine .
7. K.S.N Reddy , O.P Murty The Essentials of Forensic Medicine and Toxicology.
8. Angi M. Christensen , Nicholas v. Passalacqua , Eric j . Bartelink Forensic Anthropology current methods and practice.
9. Jason H. Byrd & James L. Castner Forensic Entomology .

M.Sc. Forensic Science
II Semester, Paper II
MSFS202- Forensic Physics and Ballistics

Aim and Objectives of Course: To impart knowledge on firearms, ammunition, ballistics and forensic engineering.

Learning Outcomes

1. Importance of firearms in shooting cases and their investigation.
2. Classification, parts and functions of firearms and ammunition.
3. To learn concepts relevant to forensic engineering.

Unit – I : Firearms & Ammunition

History & importance of Firearms – characteristics & classification. Functional assembly & working Principle of firearms: Standard- Rifled, Small arms, Shot guns and Non-standard- Improved, Country made, Imitative firearms. Differences between Company & Country made Firearms.

Ammunition -Introduction, Definition, Classifications–Metals used in Cartridge cases, types of bullets, Composition of different primers & propellants. Safety guidelines for handling firearms and ammunition.

Unit – II : Types of Ballistics

Introduction & Types of ballistics – Internal, External, Terminal & Firearm injuries

Internal Ballistics: –Definition, Ignition of the propellant, Manner of burning, Piobett's law, Shape and Size of the Propellant, pressure space curve, shot start pressure. All burnt point, Velocity, Space curve, Le Due's formula, muzzle velocity, Factors affecting muzzle velocity, Theory of recoil.

External Ballistics: Definition-trajectory drop in the flight of the projectiles force of gravity, air resistance-base drag, Yaw, Shape of Bullet (Spherical ball, Cylindrical-conical, flat nose, round nose, etc.), effective range, extreme range.

Terminal ballistics: Definition, behavior of various type of bullets on hitting the target, remaining velocity, stopping power, Tumbling of the bullet, Cavitation, Ricochet and its effects.

Firearm injuries: Ballistic aspect of firearm injuries, nature, Effect of target, Velocity, constructional features and range on the wounding, identification of firearm injuries, Evaluation of firearm injuries.

Unit – III : Identification Of Firearms & GSR

Identification of firearms & ammunition: Class characteristics & Individual characteristics. Different types of marks – firing pin marks, breech face marks, chamber marks, extractor marks, ejector marks. Bullet-number, direction of lands and grooves, striation marks, Indian Arms Act (IAA) – Report writing and court testimony.

Analysis of GSR – Composition of GSR, Location & Collection methods – Dry & Wet, Chemical & Instrumental techniques involved in analysis, Shooter Identification technique. Introduction to BDAS & IBIS. Test Firing

Unit – IV : Forensic Engineering & Toolmarks

Forensic Engineering: Vehicle accident investigation – Road Safety norms. Forensics of Building Failure, Bridge failure and civil engineering material failure - Cement and its composition – Reinforced Cement Concrete – Bitumen and road tar.. Examination of soil, Glass , paint, and electrical appliance.

Introduction to Toolmarks, Types, Class and individual characteristics. Embossment on metals surfaces and their erasure / obliteration – Restoration techniques - Chemical etching.

Reference Books:

1. J. Howard Mathews ; Charles C . Thomas Identification , Vols 1,2 , &3; Springfield, Illinois;
2. Hater , Jury And Weller , Firearms Investigation , Identification and Evidence ; Stackpole Books , Harrisburg , P A.
3. Vincent Di Maio , Gunshot Wounds; Cre Press , Washington , DC.
4. Brain j. Heard ; Hand Book Of Firearms and Ballistics ; John Willey , England.
5. TA , Warlow ; Firearms, The Law And Forensic Ballistics ; Taylor And Francis , London.
6. Karl G. Sellieret.al ; Wound Ballistics And The Scientific Background ; Elsevier , London .
7. Garg J.ordog , Management Of Gunshot Wounds , Elsevier , New York.
8. L.vHogg ; The cartridges Guide – a small arms ammunition identification manual ; The stackpole co., Harrisburg P A

M.Sc. Forensic Science
II Semester, Paper III
MSFS203- Cyber Forensics

Aim and Objectives of Course: To create awareness on cyber-crimes and applications of forensic tools in investigation. To impart knowledge in fundamentals of computers, networks, cybersecurity and basics of python.

Learning Outcomes

1. Types of Cyber-crime and Cyber Attacks.
2. Fundamentals of Computer components and Networking & Security.
3. Applications of Computer Forensic tools in Investigation.

Unit – I: Cyber Crimes

Principles and Concepts of Cyber Crimes – Crime, Tort, Misdemeanor, Cyber Space, Cyber Crimes - unauthorized access and hacking, virus, worms & Trojan attacks, E-mail related crimes, Internet relay, chat relating crimes, sale of illegal articles, online gambling, phishing, Intellectual property crimes, web defacement, DOS attack, cyber stalking etc, Cyber Criminology, Information Security – Data Privacy, Penetration testing, Incidence Response, Conventional Crimes versus Cyber Crimes. Cyber Jurisdiction. Introduction to IT Act 2000, Indian IT Act 2008 and amendments

Unit – II : Computer Hardware &Networking

Computer Hardware Basics – Basics of Motherboard, Processors, System memory, RAM & ROM, System Storage Devices – types of harddisks – FAT, NTFS, RAID etc. Optical Drives, removable storage devices, tape drive, backup systems. Computer ports. Monitors and their types. Printers and their types. Functions of OS. Basics of Files and Directories, Computer principles and a backbox model of PC.

Fundamentals of Networking – Network Infrastructure, Principles of Network security. OSI, TCP/IP, IP, Addressing, CIDR, DHCP, IPv6, ARP, ICMP, VPN, VLAN, DNS, RIP, Wireless, IEEE 802.11, Bluetooth, SIP, VoIP, CTI, ATM: Addressing Signalling and Routing – Header Structure – ATM Adaption layer – Management control. Internetworking with ATM: LAN – IP over ATM – Multiprotocol over ATM – Frame Relay over ATM. Routers, Switches, Hubs.

Unit – III :Object Oriented Programming using Python

The basic elements of python, Branching Programs, Control Structures, Strings and Input, Iterations.

Functions, Scoping and Abstraction, Specifications, Recursion, Global variables, Modules, Files, System Functions and Parameters.

Classes and Object-Oriented Programming, Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding.

Unit – IV : Computer Forensic Tools and Technology

Introduction & their applications of various tools such as Packet tracer, Nmap, Zenmap, Snort IDS, Kali Linux – Tools and Commands, Hexworkshop, Exterro FTK, Oxygen Forensic Detective etc. Cellebrite UFED, Pro Discover, Encase ,Belkasoft Evidence Extractor, Port SwiggerBurpsuite, Autopsy.

Introduction to Forensic Audio and Video Analysis.

Reference Books:

1. Cyber Security (with CD): Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, SunitBelapure.
2. Cyber Laws & Information Technology by Dr. Jyoti Rattan.
3. The Information Technology Act, 2000 [2021 Edn]- Bare Act with short notesby UNIVERSAL'S BARE ACTS
4. Cyber Crimes & laws by Taxman and Technology decoded by N.S.Nappani.
5. Computer Fundamentals, by ANITA GOEL, PEARSON.
6. Operating Systems: Three Easy Pieces by Remzi H Arpaci-Dusseau, Andrea C Arpaci-Dusseau
7. Operating System Conceptsby peter Abraham Silberschatz, Galvin, Gagne
8. Computer Networks by Andrew S. Tanenbaum, PEARSON.
9. Computer Networking: A Top-Down Approach, by Ross Keith W. And Kurose James F.
10. Linux Command Line and Shell Scripting Bibleby Richard Blum and Christine Bresnahan
11. Python Object-Oriented Programming - Fourth Edition by Steven F. Lott, Dusty Phillips, Packt Publication.

M.Sc. Forensic Science
II Semester, Paper IV
MSFS204- Psychology

Aim and Objectives of Course: Fundamentals of Psychology and its forensic applications.

Learning Outcomes

1. Development of psychology in various stages of human life.
2. Understanding Applications of psychology in interrogative procedures.
3. Significance of mental disorders in Forensic Psychiatry.

Unit I: Introduction to Psychology

Historical origin of psychology as a science & Development of Psychology in India – Emotion, Motivation and Personality. Psychology of Lifespan development – Definition, beginning of life, development in infancy, early childhood, middle childhood, young adulthood, middle adulthood and late adulthood.

Unit II: Physiological Psychology

Introduction, Organization of nervous system – Peripheral, Spinal cord and Brain, hormones and behaviour – Major endocrine glands and their functions, Hormones of stress, growth, sexual behaviour and reproduction. Physiological basis of Perception, Emotions, Learning and Amygdala.

Unit III: Types of Psychology

Social Psychology – Definition, History, Research methods. Counselling Psychology – Definition, Nature, Rules, Goals and Functions. Health and Clinical Psychology – Hypnosis, The Mind and Body relationship, Ethical Issues. Psychological Assessment – Nature, Components, significance.

Unit IV: Interrogative techniques and Forensic Psychiatry

Polygraph (Lie detection) – Objectives, Stages of Examination, Admissibility. History, Principle, Procedure & Importance - Brain Fingerprinting/ Brain Mapping, Narco analysis, Brain Electrical Oscillation Signature Profiling (BEOS). NHRC Guidelines, Admissibility in Court. Forensic Psychiatry – Delirium, Delusion, Hallucination, Illusion, Impulse, Psychopath.

Reference Books:

1. Developmental Psychology: A lifespan approach by Hurlock EB. (1980) – Tata McGraw – Hill
2. Human Development by Papalia. D.E. & Olds S.W. (1992) - Tata McGraw – Hill
3. Child Development by Beck L – Pearson
4. Introduction to Physiological Psychology, 3rd Edition by Levinthal C.F. (1996) – Prentice Hall
5. Biopsychology, 6th Edition by Pinel J.P.J (2006) – Pearson Education
6. Physiological Psychology (1950) by Morgan T.C and Stella . E
7. Physiological Psychology (1978) by Schwartz M. - Prentice Hall
8. The Biology of the Behaviour and Mind by Bridgeman (1994) - Prentice Hall
9. Psychological Testing and Assessment – An Introduction to Tests and Measurement 9th Edition by Ronald Jay Cohen & Mark E. Swerdlik – McGraw Hill Education
10. Handbook of Forensic Psychology by Prof, (Dr.) VimalaVeeraraghavan - Selective & Scientific Books
11. Introduction to Forensic and Criminal Psychology 6th Edition by Dennis Howitt – Pearson
12. Encyclopedia of Forensic Sciences Vol 1,2,3 by Jay A Siegel, Pekka J Saukko, Geoffrey C Knufer - Elsevier

II SEMESTER PRACTICALS

MSFS205 – Forensic, Medicine & Anthropology Lab

1. Preliminary & Confirmatory tests for Blood, Semen, Saliva, Urine etc.
2. Examination of Hair – Human & Animal
3. Microscopic Examination & Chemical analysis of Fibres – Cotton, Silk, Jute, Coir, Wool & Synthetic fibres.
4. Examination of Diatoms
5. Preliminary and Confirmatory test for Explosive anions – Nitrates, Nitrites, Thiosulphates, Thiocyanates, Chlorides, Chlorates, Perchlorates, Phosphates, Sulphates and Sulphites.
6. Examination of various documents under VSC.
7. Development of Fingerprints by Powder methods and lifting of FP
8. Development of Fingerprints by Iodine Fuming method
9. Collection of Plain & Rolled Fingerprints.
10. Collection and Preservation of Visceral Samples
11. Human Anatomy – Axial & Appendicular Skeleton.
12. Determination of Sex from skeletal remains
 - Pelvic Gridle, Skull
13. Estimation of stature by using long bones long bones.

MSFS206 – Forensic Physics & Cyber Lab

1. Preliminary tests for GSR.
2. Density gradient analysis of soil samples.
3. Restoration of erased identification marks
4. Determination of refractive index of glass.
5. Glass Fracture Analysis.
6. Casting of foot prints & tire prints.
7. Using Packet Tracer, perform the following:
 - Basic Router/Switch Configurations, IPv4, IPv6 Routing Protocol Configurations, WAN Configurations, DHCP Configuration, Port Security Configuration, Access List Configurations, SNMP, VLAN Configurations
8. To identify different ports and other features using Nmap, Zenmap.
9. To perform terminal operations and various in-built tools in Kali Linux.
10. To extract and analyze data from HDD's and SSD's using different forensic tools and compare their hash values to determine the performance of the tools.
11. To crack passwords and decrypt data from encrypted and password protected mobile devices using different forensic tools.
12. How to configure Burp Suite and perform the following operations
 - Spider, Intruder, Repeater, Sequencer, Decoder, Scanner

Note: I. Autopsy Visit

II. Visit to Bell of Arms

M.Sc. Forensic Science
III Semester, paper I
MSFS351- MOLECULAR BIOLOGY

Aim and objectives of course: To introduce cytology and organelles, Bio molecules, microbiology, Microbes and Forensic importance.

Learning Outcomes:

1. Fundamentals of cytology, Organelles and structure of chromosomes, DNA, RNA.
2. Introduction to Bio molecules and its types
3. Introduction to microbiology.
4. Importance of microbes and its Forensic significances.

UNIT-I: Cytology & Organelles

Definition, History, Prokaryotic and eukaryotic cells, virus, viroids. Mycoplasma. Electron microscopic structure of eukaryotic cell. Plasma Membrane-Different models of plasma membrane. Ultrastructure of prokaryotic and eukaryotic cell, Structural differences of plant and animal cell, Structure and functions of endoplasmic reticulum. Structure and functions of Golgi apparatus. Structure and functions of lysosomes. Structure and functions of Ribosomes. Structure and functions of Mitochondria. Nucleus. Chromatin-Structure and Significance, Chromosomes-Structure, Types, Functions. Cell division-Mitosis and Meiosis, Structure of eukaryotic gene, structure of DNA & RNA.

UNIT-II: Biomolecules

Carbohydrates, proteins, amino acids, lipids, vitamins and porphyrins. Enzymes – classification and mode of action, enzyme assay, enzyme units, enzyme inhibition, enzyme kinetics, factors regulating enzyme action. Glycolysis, Krebs Cycle, Oxidative Phosphorylation and fermentation.

UNIT-III: Microbiology

Microbes – Types, distribution and biology. Isolation and cultivation of bacteria and virus. Staining techniques. Bacterial growth curve, Microbial diseases in plants – by bacteria, fungi and virus, plant microbe – interactions.

UNIT-IV: Microbes of Forensic Importance:

Bacillus anthracis, Yersinia pestis, Francisella tularensis, Brucella spp., Burkholderia pseudomallei, Clostridium botulinum, Listeria monocytogenes and their morphological & biochemical studies. DNA of microbes in soil for crime detection. Fungi of forensic importance: Opportunistic mycoses, Chytridiomycota, Zygomycota, Aspergillus fumigatus, Microsporidium, Pneumocystis jirovecii, Aspergillus flavus & Candida sp, epidemiology, Antifungal agents. Food borne - Shigella, Salmonella. Etc. Forensic Aspects of Biological Toxins. Microbial Forensic Analysis of Trace and Unculturable Specimens. Etc.

Reference books:

1. Introduction to practical Molecular Biology , P.D Dabre , John Wiley & sons Ltd ., New York , 1998.
2. Molecular Biology of the Gene , 7th Edition (2013) , James D. Watson , Tania A. Banker , Stephen p. Bell , Alexander Gann , Michel Levine , Richard Losick , Benjamin cummings ISBN:978-0321905376.
3. Molecular cell Biology 7th Edition (2012) –Havey Lodish, Arnold Berk , Chris A. Kaiser , Monty Krieger , Anthony Bretsher Hidden ploegh, Angelika Amon , Matthew p. Scott , W.H Freeman, ISBN :978-1429234139.
4. Genes VIII –Benjamin Lewin, Oxford University press ,ISBN:0-19-879276-X.
5. Molecular Biology and Biotechnology A comprehensive desk reference R.A Meyers (ED.) VCH publishers , Inc .Newyork .1999.
6. Gene Cloning and DNA Analysis ;An introduction 7th Edition (2016) –T .A. BROWN , wiley –Blackwell , ISBN:978-1119072560.
7. Lehninger principles of Biochemistry 6th Edition –Nelson and cox ,Macmillan publishers ,ISBN-978-1464109621.
8. Kuby Immunology 6th Edition Kindt ,Goldsby and Osborn , W.H Freeman & co.ISBN:978-0716767640.
9. Introduction to Bioinformatics , 3rd Edition –Arthur Lesk,Oxford University press , ISBN:978-0199208043.
10. An introduction to Genetic Analysis ,6TH Edition –Anthony J, F, GRIFFITHS et.al ., W.H .Freeman and co.ISBN:978-716726043.
11. Bioinformatics –A practical guide to the analysis of genes and proteins , 3rd Edition –Andreas D.Baxevanis and B.F Francis outlette , Willey –Liss ,ISBN-978-0471478782.
12. Bioinformatics for Benginners ; Genes , Genomes , Molecular Evolution ,Databases and Analytical Tools , 1st Edition (2014) –spratim choudhury ,Academic press, ISBN:978-0124104716.

M.Sc. Forensic Science
III Semester, paper II
MSFS352- FORENSIC BIOLOGY

Aims & Objectives of Course –

To study immunology, basic principle of immunology, forensic significance of microbes, and introduction to enzymology.

Learning Outcomes –

1. To study immunology, and different techniques of immunology used in Forensic Science.
2. To study microbiology, different microbes, analysis of different microbial toxins.
3. To study enzymology, types and mechanism of enzymes, role of enzymes, importance of enzymes in forensic science.

UNIT-1: Organs of Immune system:

Cells of immune system. Organs of immune system. Basic properties of antigens. B and T cell epitopes, haptens and adjuvants. Factors influencing immunogenicity. Structure of antibody. Classes and functions of antibodies. Monoclonal antibodies. Structure and functions of major histocompatibility complexes. Exogenous and Endogenous pathways of antigen presentation and processing. Classification and brief description of various types of hypersensitivities. General introduction to vaccines. Types of vaccines.

UNIT-II: Immunology

Antigen-Epitope, essential factors for antigenicity, haptens and adjuvant, Immunoglobulin - structure, classes of immunoglobulin, antigen- antibody reactions and their techniques in serological analysis, Application of various polymorphic enzymes and proteins in criminal investigation, Antigen Processing and presentation, Production of Monoclonal and polyclonal antibodies, hybridoma technology, Autoimmunity and hypersensitivity, HLA typing and its forensic importance, Vaccines, Lectins and their forensic significance.

UNIT-III: Introduction of Enzymology

Enzyme as biocatalysts, properties, classification, denaturation; enzyme substrate, interactions, Energetics of enzyme catalysed reactions, transition state; Mechanism of enzyme action, Regulation of enzyme activity; Iso-enzymes, co-factors and co-enzyme. Enzyme kinetics: Michaelis-Menten equation and its derivatives; Ribozymes and Catalytic antibodies; Multienzyme systems: Occurrence, polygenic nature of multi-enzyme systems, Enzymes of forensic significance (with one example): Oxido-reductases: Glucose oxidase, Peroxidases, Catalase, Transferases, Hydrolases, Proteases: Animal proteases, Trypsin, Chymotrypsin, Pepsin, Chymosin, Plant proteases: Papain, Keratinases, alpha amylases.

UNIT-IV Forensic Serology

Blood grouping –History , Biochemistry , Biosynthesis , of ABO antigen. Genetics of ABO, RH, MN and other blood group system . Secretors and non-secretors , rare alleles . Bombay blood group . Blood identification – presumptive and confirmatory assays. Methods of ABO blood grouping from dried blood stains and other body fluids (absorption elution method, absorption inhibition method and mix agglutination method), species identification from blood –Double immunodiffusion Assays, Crossed –Over Electrophoresis.

Reference books:

1. Kuby Immunology (8th Edition) By Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen
2. Paniker, C. K. J., & Ananthanarayan, R. (1978). *Ananthanarayan and Paniker's textbook of microbiology*. Himayatnagar, Hyderabad: Orient Longman.
3. Microbial forensics By Roger Breeze, Bruce Budowle, Steven E. Schutzer. Elsevier Academic Press
4. Forensic Biology – Richard Li
5. Fundamental immunology William E. Paul
6. Understanding enzymes 3rd ed. (1991): Trevor Palmer, Prentice Hall
7. The elements of Immunology: Fahim Halim Khan
8. “Enzymology and Enzyme Technology” by Bhatt S M
9. “Enzymes: Biochemistry, Biotechnology, Clinical Chemistry” by Palmer T and P L Bonner

M.Sc. Forensic Science
III Semester, paper III
MSFS353- GENETICS AND BIOINFORMATICS

Aim and objectives of course: To introduce students about basics of genetics and Bioinformatics to solve Forensic cases . It provides detailed knowledge of bioinformatics and techniques of various of forensic significances.

Learning Outcomes:

1. The students will be able to understand genetics use in solving of paternity test and other issue.
2. Students will be able to understand the blood protein polymorphism and their profiling methods.
3. Students will learn about bioinformatics tools for forensic analysis of various biological materials.
4. Students will learn about Biological agents used in warfare and collection , preservation and identification

UNIT-I: Human Genetics

Human genetic variations. Mendelian Inheritance. Hardy-Weinberg Equilibrium. Mutation-their types and causes. Relevance of population genetics. Allele frequency, genotype frequency. Polymorphism and heterozygosity. Measures of genetic variations.

Unit – II: Forensic Protein Profiling

Erythrocyte Isoenzymes (PGM, GLO-I, ESD, EAP, AK, ADA etc). hemoglobin polymorphism. HLA typing. Role of sero-genetic markers in individualization, paternity disputes, and their limitations.

UNIT-III: Biological agents in warfare

Collection and preservation of microbial forensic samples sampling for microbial forensic investigations, Categories of biological weapons, study of potential bacteria, fungi, viruses, and their toxins, mode of action, identification, sampling, transport, preventive measures during handling, laboratory setup, epidemiologic investigation for public health, investigation of suspicious disease outbreak, Biosafety and biosecurity, Bio surveillance, documentation, and case studies

Unit – IV: Bioinformatics

Introduction to bioinformatics and its application in Forensics Science. Integrated information retrieval. Major databases in bioinformatics. Sequence alignment, Phylogenetic analysis and related tools. Gene identification and prediction. Bioinformatics analysis of DNA Microarray, Bioinformatics tools of Forensic applications, Protein structure prediction and visualization tools. Tools used in proteomics, In-silico simulation for molecular biology experiments. Basic theory of probability and statistics. Bayesian analysis. Likelihood ratio. Statistical evaluation of DNA profiles using Bioinformatics tools.

Reference books:

1. Richard Li .Forensic Biology : Identification and DNA Analysis of Biological Evidence, CRC press.
2. Alan Gunn : Essential Forensic Biology , 2nd Edition , John Wiley and sons. 2009.
3. Chowdhari , S., Forensic Biology B.P.R & D ,Govt. Of India.
4. Prakash , M physiology of blood , Anmol publications , 1998.
5. Gupta , S.K.” Essentials of Immunology” ,Arya publications , 2008.
6. Goodwin , William : “An Introduction to forensic Genetics “, John Wiley & sons Ltd.2007
7. Kapur , V.”Basic Human Genetics Jaypee Brothers ,1991.
8. Kothari Manu L. “Essential of Human Gentics”, University press (India) Pvt. Ltd 2009.

M.Sc. Forensic Science
III Semester, paper IV
MSFS354- DNA PROFILING

Aim and objectives: The objective of this course is to discuss the basics of DNA, methods and techniques involved in DNA profiling. The student would be able to understand the forensic DNA profiling and its application in criminal and civil cases investigation.

Learning Outcomes:

- 1) Students will be able to understand the basic structure of human genome and DNA molecules.
- 2) To understand various DNA typing methods such as RFLP, STR and SNPs with their limitations and advantages.
- 3) To understand different methods of extraction of DNA by conventional and recent methods.
- 4) Students will be capable of performing DNA profiling of any biological samples during investigation.

UNIT –I: Introduction of Human Genome: Human DNA Profiling Bill, Human chromosomes and karyotype, human nuclear genome. Mutation-types and cause, genes and alleles, human genetics and heredity. Mendel's Laws of Inheritance, Hardy Weinberg Principle, Calculation of allele frequencies. Basic structure, types and properties of DNA and RNA, mt DNA, DNA modifying enzymes, restriction enzymes. modifying enzymes, restriction enzymes.

Forensic DNA Profiling: History and development of DNA fingerprinting. Concept of length and sequence variation- VNTRs, STRs, mini STR, SNPs. STR - markers-nomenclature of STR markers.

Methods of DNA profiling: Principle, techniques of RFLP, STR profiling their advantage and limitations. Gender identification: Y-STR and mt-DNA profiling.

DNA Amplification (PCR)- Principle, method, DNA primers, factors affecting PCR, advantage of PCR based techniques over RFLP.

UNIT-II: DNA, RNA and Protein Metabolism

Organization of genome in prokaryotes and eukaryotes, Fluorescence in situ hybridization (FISH) for genome analysis and Chromosome micro dissection, Key historical experiments of DNA metabolism, Enzymes and accessory proteins involved in DNA replication, Mechanism of DNA replication in prokaryotes and eukaryotes, Gene transcription and post transcriptional modification in prokaryotes and eukaryotes, Translation in prokaryotes and eukaryotes, post translational modification, Synthesis of secretory and membrane proteins, import into nucleus, mitochondria, chloroplast and peroxisomes. Receptor mediated endocytosis, Operon concept- Lac and Trp operon, Advanced Methodologies in Forensic DNA Analysis, Fundamentals of RFLP and PCR based DNA typing, Result of STR marker analysis and its interpretation, Single Nucleotide Polymorphism (SNP) and its applications in forensic investigation, Y-STR analysis and its significance in establishing paternal relationships.

UNIT-III: DNA sample preparation: Sample sources for DNA, collection and preservation of samples for DNA testing, conventional and recent methods of DNA extraction (for samples blood, tissue, hair, tooth and bones), separation methods, DNA quality check, DNA Quantitation methods, DNA sequencing. DNA data base- CODIS, STRbase. NGS (New Generation Sequencing Rapid DMNA)

Nucleic acid hybridization: Preparation of nucleic acid probes for DNA profiling, Single locus and multi locus probes, and cDNA probes; Methods of labeling of DNA probes; detection methods.

Forensic Issues: Degraded DNA, contamination, mixed samples and low copy number. Result interpretation, Quality assurance in DFP testing. Legal standards for admissibility of DNA profiling.

UNIT –IV: Methods in Forensic DNA Analysis

Fundamentals of RFLP and PCR based DNA typing, STR genotyping, Result of marker analysis and its interpretation, Single Nucleotide Polymorphism (SNP) and its applications in forensic investigation, LCN typing, Mitochondrial DNA analysis in Forensic investigation, Y-STR analysis and its significance in establishing paternal relationships, Non-human DNA analysis. Laws of Probability, Bayes theorem, Likelihood ratio, Paternity index. Closeness of fit with HWE, combined frequency of occurrence, probability of match and discrimination, discrimination power, power of exclusion, errors in interpretation.

Reference books:

1. Daniel L. Hartl & Elizabeth W. Jones ; Genetics – Principle & Analysis , 4th Ed., Jones & Bartlet pub .1998.
2. Jaiprakash G. Shewale, Ray H. Liu Forensic DNA Analysis : Current practices and Emerging Technologies , CRC press 2013 .
3. John M Butler : Forensic DNA Typing . Elsevier Academic Press.
4. Keith Immen and Norah Rudus , 1997 . An introduction to forensic DNA analysis CRC press , New York.
5. Lee M.C. and Gaenesten , R.E: DNA and other polymorphism in Forensic Science . Year book Medical published.

SEMESTER – III PRACTICALS

MSFS355 – Forensic Biology lab

1. Determination of pKa and pI values of amino acids.
2. Paper Chromatography of amino acids and sugars.
3. Separation of pigments by adsorption chromatography.
4. Molecular weight determination of enzymes / proteins by Gel filtration, SDS-PAGE.
5. Subcellular fractionation by differential centrifugation.
6. Demonstration of GM counter
7. Qualitative tests of carbohydrates
8. Qualitative tests of proteins.
9. Estimation of DNA by DPA method.
10. Estimation of RNA by orcinol method
11. Preliminary & Confirmatory tests for Blood, Semen, Saliva, Urine etc.
12. Determination blood group
13. Examination of Hair - Human & Animal
14. Microscopic Examination & Chemical analysis of Fibres - Cotton, Silk, Jute, Coir, Wool & Synthetic fibres.
15. Examination of Diatoms
16. Examination of Pollen grains and starch grains
17. Morphological and Anatomical Examination of Tobacco, Cannabis, Dhatura, Nerium, Croton, and Castor plants.

MSFS356 – DNA Profiling

1. OMIM database and human genetic disorders
2. Retrieve DNA sequence from database (NCBI) National Center for Biotechnology Information
3. Retrieve protein sequence from database (NCBI) National Center for Biotechnology Information
4. Retrieve protein structure from database (PDB) Protein Data Bank
5. KEGG database for pathways
6. Local alignment of DNA, protein
7. Global alignment of DNA, protein
8. Multiple sequence alignments
9. In silico restriction mapping
10. Isolation of DNA from Blood and saliva
11. Estimation of DNA and RNA by UV absorption method and determination of purity of nucleic acids.
12. Agarose gel for RNA, DNA, blot the gel
13. Polymerase chain reaction (PCR)
14. DNA profiling for paternity and maternity disputes.

M.Sc. Forensic Science
IV Semester
MSFS451 – Comprehensive Viva-voce

M.Sc. Forensic Science
IV Semester, Paper II
MSFS452 – PROJECT

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

M.Sc. Forensic Science

I-SEMESTER END EXAMINATION

Theory Model Question Paper Pattern: Paper I

MSFS101- Forensic Science & Criminal Justice

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Explain history and development of Forensic science on worldwide concepts.
(OR)
b) Explain in brief about DFSS, FPB, NCRB, and BPR&D.
2. a) Write about the school of criminology in detail.
(OR)
b) Explain about Differential Association theory and Self-control theory.
3. a) Explain about the hierarchy of Indian Police with their functions.
(OR)
b) Describe the Hierarchy of court and their role and duties.
4. a) Write what is meant by court testimony and why it's necessary.
(OR)
b) Explain about report writing and evidence evaluation.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Write a note on: i) CID ii) NIA iii) RAW
 - b. Write duties of Forensic Scientist.
 - c. Explain about social change and crime relationships.
 - d. Write about Probation and Parole.
 - e. What are the powers of Lokayukta?
 - f. Write about IPC and Sec 171B, 291, and 299 with suitable examples
 - g. What is meant by the admissibility of expert testimony?
 - h. Explain examination- in chief, cross-examination, and re-examination.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
M.Sc. Forensic Science
I-SEMESTER END EXAMINATION
Theory Model Question Paper Pattern: Paper II
MSFS102- Forensic Science & Divisions

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Explain Preliminary and Confirmatory tests for Blood, Semen, Saliva, Urine.
(OR)
b) what is Forensic Botany, Wood, leaves, seeds, Pollen grains& Starch grains.
2. a) Definition of Explosives and explain about Classification, Preliminary and Confirmatory tests for Explosive substances.
(OR)
b) Explain about Preliminary and Confirmatory tests for NDPS – Benzodiazepines.
3. a) Definition of Questioned Documents Explain about Alterations – Additions, Erasures, Overwriting, Obliterations. Secret writings.
(OR)
b) Definition of Fingerprints, Explain about Fingerprint patterns, Development techniques– Chemical and Physical.
4. a) Explain Wildlife Forensics, Wildlife Protection act. Schedules I to VI of WPA.
(OR)
b) Explain about Identification of teeth, claws, Ivory, Horns, antlers, furs, skin, bite.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Examination of Hair and Fibre.
 - b. Write Morphological and anatomical characteristics of Cannabis, Coca plants.
 - c. Explain Functions of Forensic Chemistry and Chemistry of Fire.
 - d. Examination of Petroleum products like Petrol, Diesel, and Kerosene.
 - e. What is VSC, ESDA.
 - f. Explain about AFIS.
 - g. Write about the Wildlife Protection act. Schedules I to VI.
 - h. Explain about Determination of the time of death and sex determination from bones.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

M.Sc. Forensic Science

I-SEMESTER END EXAMINATION

Theory Model Question Paper Pattern: Paper III

MSFS103- Crime Scene Management

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Define crime and crime scene, its importance and types of crime scene with suitable example.
(OR)
b) Explain about digital imaging of crime scene.
2. a) Explain about Fingerprint kit, Explosives kit, and GSR kit.
(OR)
b) Explain about Narcotics Kit, Sexual Assault Forensic Evidence Collection Kit
3. a) Describe in detail procedure of collection and packaging of faecal matter, Saliva, Semen, Vomit and GSR residue.
(OR)
b) How to collect and store Digital devices.
4. a) Explain about nature and importance of Crime scene reconstruction.
(OR)
b) Explain about role of Bloodstain Pattern Analysis.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Write a note on: i) Videography ii) Sketching iii) Photography
 - b. Write note on 3D scanning technique.
 - c. Explain Digital Evidence Collection Kit and Blood Detection Kit.
 - d. Write Arson Investigation Kit.
 - e. What are Petroleum samples and Toxins samples that mostly found in crime scene
 - f. Write Basic principles and stages involved crime scene reconstruction.
 - g. Write classification of reconstruction
 - h. Explain shooting scene reconstruction.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM
M.Sc. Forensic Science
I-SEMESTER END EXAMINATION
Theory Model Question Paper Pattern: Paper IV
MSFS104- Instrumentation

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Explain about Introduction, principle and applications of Compound Microscope, Stereomicroscope, Comparison Microscope.
(OR)
b) Explain Transmission Electron Microscope, Scanning Electron Microscope.

2. a) Introduction to spectroscopy, Interaction of EMR with matter - absorption, emission, reflection, fluorescence, phosphorescence.
(OR)
b) Explain UV Spectrophotometer, AAS, AES, and IR Spectroscopy.

3. a) Write about Introduction & principles of chromatographic Techniques like TLC, HPTLC, Column Chromatography.
(OR)
b) Explain High-Performance Liquid Chromatography, Gas Chromatography, Ion Exchange Chromatography.

4. a) Explain about Immuno-Chemical Techniques, Immuno electrophoresis, Radio Immuno Assay (RIA).
(OR)
b) Explain about Enzyme linked Immunosorbent Assay (ELISA), Fluorescence Immuno Assay.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Write about Energy Dispersive X-Ray.
 - b. Explain Atomic Force Microscope.
 - c. Explain about X-Ray Diffraction, XRF.
 - d. What is Raman Spectroscopy and Mass Spectroscopy?
 - e. Write about liquid chromatography-mass spectrometry.
 - f. Explain about gas chromatography –mass spectrometry.
 - g. Explain Flow Cytometry.
 - h. What is PCR.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

M.Sc. Forensic Science

II-SEMESTER END EXAMINATION

Theory Model Question Paper Pattern: Paper I

MSFS201- Forensic Medicine and Anthropology

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Write detail about documentation and investigation of scene of death.
(OR)
b) Define Forensic Anthropology and what are the differences between Anthropology and Archaeology.
2. a) Explain Axial and Appendicular skeleton.
(OR)
b) Explain Anatomy of pelvis and illustrate how you will identify sex with pelvis.
3. a) Explain in detail about post-mortem changes.
(OR)
b) Describe different types of Mechanical injuries.
4. a) Define rape. Describe in detail about various types of rape. Add a brief note on Incest and its types.
(OR)
b) Explain in detail about teeth eruption process.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Define forensic pathology.
 - b. Describe the types of abortions.
 - c. Write a difference between Male & Female Pelvis.
 - d. Differentiate between incised and stab wounds.
 - e. Write about sutures of skull.
 - f. Differentiate between temporary and permanent dentition.
 - g. Write a note on mechanical asphyxia.
 - h. Give a brief account on exhumation.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

M.Sc. Forensic Science

II-SEMESTER END EXAMINATION

Theory Model Question Paper Pattern: Paper-II

MSFS202- Forensic Physics and Ballistics

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Write in detail the classification of fire arms.
(OR)
b) Explain Improvised, Country-made, Imitative firearms. Differences between Company & Country made Firearms
2. a) Define internal ballistics, Ignition of the propellant, Manner of burning, Piobett's law.
(OR)
b) Define Terminal ballistics, behaviour of various type of bullets on hitting the target.
3. a) Different types of marks – firing pin marks, breech face marks, chamber marks.
(OR)
b) Analysis of Composition of GSR, Location & Collection methods – Dry & Wet.
4. a) Examination of soil, Glass, paint, and electrical appliance.
(OR)
b) Restoration techniques - Chemical etching.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Explain Composition of different primers & propellants.
 - b. Write about Safety guidelines for handling firearms and ammunition.
 - c. How to identify firearm injuries.
 - d. Explain about GSR
 - e. Explain Introduction to BDAS & IBIS.
 - f. Write about Test Firing
 - g. Explain about Cement and its composition.
 - h. What is Reinforced Cement Concrete, Bitumen and road tar

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

M.Sc. Forensic Science

II-SEMESTER END EXAMINATION

Theory Model Question Paper Pattern: Paper-III

MSFS203- Cyber Forensics

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) Describe Factors contributing to incident severity and prioritization.
(OR)
b) Describe types of cyber-attack and Explicate email & Browser attack.
2. a) Explain Cryptography and its techniques.
(OR)
b) Describe Factors contributing to incident severity and prioritization.
3. a) Explain incident summary report.
(OR)
b) Explain verification and quality control.
4. a) Explain Cryptography and its techniques.
(OR)
b) Explain threat and its classification.

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. Describe types of malwares.
 - b. Write a note on Data masking.
 - c. Explain security issues associated with Identities
 - d. Write a note on cross site scripting & eavesdropping.
 - e. Define ransomware and its types.
 - f. Define virus and its types.
 - g. Write a note on stakeholders.
 - h. Explain digital forensics workstation.

ADIKAVI NANNAYA UNIVERSITY: RAJAMAHENDRAVARAM

M.Sc. Forensic Science

II-SEMESTER END EXAMINATION

Theory Model Question Paper Pattern: Paper-IV

MSFS204- Psychology

Time: 3 hrs

Max. Marks: 75

Answer all questions. Each question carries 15 marks.

4X15=60

Section-A

1. a) What are the various developmental stages observed in the childhood?
(OR)
b) Write in detail about the development of Psychology in India?
2. a) Briefly describe about the Physiological Psychology?
(OR)
b) Explain about the physiological basis of perception, learning and Amygdala?
3. a) What is social and clinical psychology? And its differences?
(OR)
b) What is psychological Assessment? Explain its nature and significance?
4. a) Explain the principle and procedure of Brain fingerprinting?
(OR)
b) What is BEOS? Explain in detail?

Section-B

5X3=15

5. Answer any FIVE of the following
 - a. What is Forensic Psychiatry?
 - b. What are the main objectives of Polygraph?
 - c. Explain Hypnosis and its relationship with body?
 - d. Define Counselling Psychology?
 - e. Explain the organization of nervous system?
 - f. Explain about Hormones and its effect on the sexual behaviour and reproduction?
 - g. Define Psychology?
 - h. What is Forensic Psychiatry?