Program Structure and Syllabus
for
M.Sc. Forensic Science
Chemistry and Toxicology

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 / Practicals
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 which75% 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. Forensic Science Chemistry and Toxicology
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									
MSFS341	Forensic Chemistry	4	3	7	3	75	25	100	4
MSFS342	Pharmacology & Pharmaceutical Drug Analysis	4	3	7	3	75	25	100	4
MSFS343	Concepts of Toxicology	4	3	7	3	75	25	100	4
MSFS344	Forensic Toxicology & Pharmacology	4	3	7	3	75	25	100	4
Lab Course									
MSFS345	Forensic Chemistry Lab				3	75	25	100	4
MSFS346	Toxicology Lab				3	75	25	100	4
IV Semester									
MSFS441	Comprehensive viva-voce							100	4
MSFS442	Project					500	100	600	24
Total								**2500**	**100**

@ Lectures
# Practical

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-Inetc. 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 InvestigativeTechniques 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: Thefoundation 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 VimalaVeeraraghavan – 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, DonellR.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 – Walkthrough, 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 VisSpectrophotometry, 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), FluoroscenceImmuno 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& workingPrinciple of firearms: Standard- Rifled, Small arms, Shot guns and Non-standard- Improvised, 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; Springfiels, 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 , Elesvier , 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

MSFS341-Forensic Chemistry

Aim and Objectives of Course: To impart thorough knowledge on offence related to chemicals, study on chemical evidence, and analysis of chemical substance.

Learning Outcomes

1. Study on various chemical agents like – fertilizers. pesticides, metals, natural products and chemicals.
2. Understanding drug abuse, various drugs of abuse and their analysis
3. Importance of Petroleum products and its forensic examination.
4. Role of Forensic Science in Fire/Arson investigation and analysis of arson evidence
5. Understanding various types of explosives, their usage, chemical compositions, detonation power, blast effects and post blast / pre blast residue analysis.

Unit – 1: Forensic Chemistry

Introduction to Forensic Chemistry. Qualitative and quantitative forensic analysis of inorganic and organic material - Chemical fertilizers (N,P,K), Insecticides (Endosulfan, Malathion, Carbaryl) - Metallurgical analysis (Fe, Cu, Zn, Au, Ag) – Natural products (tobacco, tea, sugars, rubber) – Industrial chemicals - Sulphuric, Nitric and Hydrochloric acids, Sodium, Potassium hydroxide, Ammonium nitrate, Potassium chlorate, Organic solvents like Methanol, Ethanol, Acetone, Chloroform and Ether-Organic chemicals like Acetanilide, PAminophenol, Nitrobenzene etc. with reference to forensic work

Food Chemistry: Physical examination of lipids, Chemical examination of lipids (Acid value, Saponification value, Ester value, Acetyl value, Iodine value), Analysis of butter, Analysis of dairy products: Milk and its products, care studies.

Unit – 2: Narcotics Drugs & Psychotropic Substance

Introduction to Drugs, Controlled Substance Act, Forensic examination of drugs/Narcotics (Cannabis), Phenethylamines (Amphetamine, Methamphetamine), Hydroxyl derivative (Ephedrine) Ketone Derivative (Cathinone), Methoxy Derivative (Mescaline) Tertiary Amines (Cocaine and Opiates) Tryptamines (Psilocin and Psilocybin) Anabolic Steroids, Miscellaneous Controlled Substances (Barbiturates, Benzodiazepines, GHB, Ketamine and LSD) Sample Preparation, Extraction Techniques- Chemical-color test, Microcrystal techniques and other instrumental techniques involved in analysis.

Unit – 3: Petroleum Chemistry

Paraffins, Iso-olefins, Olefin Hydrocarbons, Naphthenes, Cycloparaffins or Aromatic Hydrocarbons, Sulphur Compounds, Nitrogen Compounds, Oxygen Compounds, Hydrocarbons; H/C Ratio of Hydrocarbons;

Physical Properties of Petroleum Products : Density, Color, Fluorescence, Cloud Point, Pour Point, Aniline Point, smoke point, boiling point, Optical Properties, Flash Point, Refractive Index and Determination of Cetane and Octane number, Analytical Techniques: Quantitative and Qualitative Steps in Analysis of Petroleum

Fire Chemistry: Scientific Investigation of Fire, NFPA 921 and NFPA 1033, The chemistry and physics of combustion, Dynamics of Fire, Development of fire patterns, Separation and analytical techniques of ignitable liquid residues, Field tests, Interpretation of Data Obtained from Fire Debris, Quality Assurance in Fire debris Analysis, Report Writing and Court Testimony.

Unit – 4: Explosives Chemistry

Introduction and assessment of explosives , Oxygen balance, Explosive Power Index, Heat and Temperature of Explosion, Pressure of explosion, Mechanism of Ignition and hot spot formation. Thermal decomposition , physical and chemical aspects of combustion, Deflagration and Detonation, Kinetics of Explosive Reactions, Analysis of low and high explosives by different instrumental techniques, Quality control, Proficiency Testing, Interpretation and Significance of Results

Reference Books

1. Klaassen, C. D.,:Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th ed, McGraw-Hill, 1995.
2. Moffat, A.C.: Osselton, D. M. Widdop, B.: Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material, 3rd ed., Pharmaceutical Press2004.
3. Bogusz, M. J., Hand Book of Analytical Separations, Vol. 2: Forensic Science, 1st ed., Elsevier Science, 2000.
4. Siegel, J.A., Saukko, P. J., Knupfer, G.,: Encyclopedia of Forensic Sciences (Vol3), Academic Press, 2000.
5. Rang, P.H., Dale, M.M., Ritter, M.J.: Pharmacology, 4th ed., Harcourt/Churchill Livingstone, 2000.
6. Paranjape, H.M., Bothara, G.K., Jain, M.M.: Fundamentals of Pharmacology, 1st ed., Nirali Prakashan, 1990.
7. Budhiraja, R.D.: Elementary Pharmacology and Toxicology, Popular Prakashan, 2nd ed., 1999.
8. Wiseman, H and Henry J.: Management Of Poisoning, A Handbook for Healthcare workers, 1st ed., A.I.T.B.S, 2002
9. Hardman, J. G. and Limbird, L. E.,: Goodman and Gilman's The Pharmacological basis of Therapeutics, 9th edn., McGraw-Hill, 1996
10. Laaboratory procedure Manual, Forensic Toxicology: DFS, 2005
11. Sunshine, I ; Methods for Analytical Toxicology, CRC Presss USA (1975)

12. Cravey, R.H; Baselt, R.C.: Introduction to Forensic Toxicology , Biochemical Publications, Davis, C.A. (1981)

13. Stolmen, A.; Progress in Chemical Toxicology: Academic Press, New York (1963)

14. Modi, Jaisingh, P.; Textbook of Medical Jurisprudence& Toxicology, M.M. Tripathi Publication (2001)

15. Eckert; An Introduction to Forensic Science, CRC Press

16. Pillay, V. V.; Handbook of Forensic Medicine and Toxicology, Paras Pub., 2001

17. Curry, A. S: Poison Detection in Human Organ

18. James, S. H. and Nordby, J. J.: Forensic Science: An Introduction to Scientific and Investigative Techniques, 2003.

19. Saferstein, R: Criminalistics - An Introduction to Forensic Science, Prentice Hall, 1995.

20. Sarkar, S: Fuels and Combustion, Orient Longman, 1990

21. Verma, R. M: Analytical Chemistry – Theory and Practice, CBS Pub., 1994

22. Svehla, G. Ed.: Vogel's Qualitative Inorganic Analysis, Longman, 1998.

23. Bassett: Vogel's Text Book of Quantitative Inorganic Analysis, Longman, 1978

24. Vogel, A. I: Text Book of Practical Organic Chemistry including Qualitative Organic Analysis, ELBS, 1971.

25. Skoog, D. A., West, D. M. and Holler, F. J: Analytical Chemistry: An Introduction, Saunders College, 1994.

26. Siegel, J. A, Saukko, P. J. and Knupfer, G. C: Encyclopedia of Forensic Sciences, Academic Press, 2000.

27. Townsends, A. (Ed): Encyclopedia of Analytical Science, Academic Press, 2005.

28. Beveridge, A: Forensic Investigation of Explosives, Taylor & Francis, 2000.

29. Yallop, H. J: Explosion Investigation, Forensic Science Society & Scottish Academic Press, 1980.

30. Narayanan, T. V: Modern Techniques of Bomb Detection and Disposal, R. A. Security System, 1995.

31. Yinon, J. and Zitrin, S: The Analysis of Explosives, Oxford: Pergamon, 1981

32. An Introduction to Physics and chemistry of Petroleum

33. Kinghorn: Introduction to Petrochemicals Sukumar Maiti

34. D.W.Waples : Geochemistry in Petroleum Exploration

35. A.L.Waddams : Petroleum Geochemistry and Geology Chemicals from Petroleum

36. Day& Underwood :Analytical Chemistry

37. H. J. Arnikar Essentials of Nuclear Chemistry, 4th Edition Wiley Eastern (1987).

38. H. J. M. Bowen. Buttler and Tanner Chemical Applications of Radioisotopes, (1969).

39. G Friedlander, T. W. Kennedy, E. S. Macias and J. M. Miller, Introduction of Nuclear and Radiochemistry, 3rd Edition, John Wiley (1981).

40. P.D.Vowels and D.W: Experiments in Environmental chemistry.

M.Sc. Forensic Science

III Semester, Paper II

MSFS342-Pharmacology and Pharmaceutical Drug Analysis

Aim and Objectives of Course: To impart thorough knowledge on Pharmacology and Pharmaceutical Drug Analysis

Learning Outcomes

1. Study on types, dosage and effects of various pharmaceutical drugs.
2. Pharmacokinetics of Drugs
3. Analysis of Drugs and their combinations.

Unit – 1: Basic Principles of Pharmacology

Introduction to Pharmacology, Pharmacopoeias IP, USP, EP, Drug & Drug Receptor mechanisms, Pharmacodynamics, Factor affecting the effects of Drug, Post mortem redistribution

Unit – 2: Pharmacokinetics

L-ADME, Bioavailability and Bioaccumulation, Dose response relationship, Drug Interactions like Agonism, Antagonism, Addition, Synergism, Potentiation, Adverse drug reactions and pharmacogenetics, Drug concentration and pharmacological response, Drug dependence and drug abuse, Half-life of drugs.

Unit – 3: Pharmacology and Pharmaceutical Analysis

Aliphatic alcohols, General and local Anesthetics, CNS Stimulants, Sedative, Hypnotics and Pharmacotherapy of sleep disorders, Drugs effective in convulsive disorders, Drugs of Abuse, Tranquillizers, Schedule and Nonscheduled Drugs, Designer Drugs

Unit – 4: Pharmacology and Pharmaceutical Analysis

Antipsychotic Agents, Antidepressant drugs, Antiseizure Drugs, Doping - Drugs abuse, Doping control policy, Hallucinogens, Chemotherapeutic Drugs, Antibacterial, Antifungal agents, Antiviral agents, Antiprotozoal Drugs, Disinfectants, Antiseptics and Sterilants, WADA, etc.

Reference Books

1. Klaassen, C. D.,:Casarett and Doull's Toxicology: The Basic Science of Poisons, 5th ed, McGraw-Hill, 1995.
2. Moffat, A.C. : Osselton, D. M. Widdop, B. : Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material, 3rd ed., Pharmaceutical Press2004.
3. Bogusz, M. J.,: Hand Book of Analytical Separations, Vol. 2: Forensic Science, 1st ed., Elsevier Science ,2000.
4. Siegel, J.A., Saukko, P. J., Knupfer, G.,: Encyclopedia of Forensic Sciences (Vol3), Academic Press, 2000.
5. Rang, P.H., Dale, M.M., Ritter, M.J.: Pharmacology, 4th ed., Harcourt/Churchill Livingstone, 2000.
6. Paranjape, H.M., Bothara, G.K., Jain, M.M.: Fundamentals of Pharmacology, 1st ed., Nirali Prakashan, 1990.
7. Budhiraja, R.D.: Elementary Pharmacology and Toxicology, Popular Prakashan, 2nd ed., 1999.
8. Wiseman, H and Henry J.: Management Of Poisoning, A Handbook for Healthcare workers, 1st ed., A.I.T.B.S, 2002
9. Hardman, J. G. and Limbird, L. E.,: Goodman and Gilman's The Pharmacological basis of Therapeutics, 9th ed., McGraw-Hill, 1996
10. Laaboratory procedure Manual, Forensic Toxicology: DFS, 2005
11. Sunshine, I ; Methods for Analytical Toxicology, CRC Press USA (1975)
12. Cravey, R.H; Baselt, R.C.: Introduction to Forensic Toxicology , Biochemical Publications, Davis, C.A. (1981)
13. Stolmen, A.; Progress in Chemical Toxicology: Academic Press, New York (1963)
14. Modi, Jaisingh, P.; Textbook of Medical Jurisprudence& Toxicology, M.M. Tripathi Publication (2001)
15. Eckert; An Introduction to Forensic Science, CRC Press
16. Pillay, V. V.; Handbook of Forensic Medicine and Toxicology, Paras Pub., 2001
17. Curry, A. S: Poison Detection in Human Organ
18. James, S. H. and Nordby, J. J.: Forensic Science: An Introduction to Scientific and Investigative Techniques, 2003.
19. Saferstein, R: Criminalistics - An Introduction to Forensic Science, Prentice Hall, 1995.
20. Sarkar, S: Fuels and Combustion, Orient Longman, 1990
21. Verma, R. M: Analytical Chemistry – Theory and Practice, CBS Pub., 1994
22. Svehla, G. Ed.: Vogel's Qualitative Inorganic Analysis, Longman, 1998.
23. Bassett: Vogel's Text Book of Quantitative Inorganic Analysis, Longman, 1978
24. Vogel, A. I: Text Book of Practical Organic Chemistry including Qualitative Organic Analysis, ELBS, 1971.

M.Sc. Forensic Science

III Semester, Paper III

MSFS343 – Concepts of Toxicology

Aim and Objectives of Course: To impart thorough knowledge on Scientific Applications of Toxicology.

Learning Outcomes

4. Study on various application of toxicology.
5. Disposition and translocation chemicals hazardous to nature and habitat
6. Effects of various toxic substance on ecology.
7. Importance of Analytical Toxicology and Quality Management.

Unit – 1: Applications of Toxicology

History, scope and applications, Types of Toxicology, Principle of Toxicology, Mechanism of Toxicology, Risk Assessment and Safety evaluation of chemicals Clinical Toxicology

Environmental Toxicology/ Ecotoxicology, Forensic Toxicology/ Postmortem Toxicology, Industrial/Occupational Toxicology, Food Toxicology, Behavioral toxicology, Mechanistic Toxicology, Regulatory Toxicology.

Unit – 2: Disposition and Translocation of Toxicants

Exposure of Toxicants, Translocation of Toxicants, Bioaccumulation of Xenobiotics, Biotransformation of Xenobiotics, Antidotal therapy

Unit – 3: Toxic Agents

Toxic effects of Pesticides, Toxic effects of Metals, Toxic effects of Solvent, Toxic effects of Plants, Toxic effects of Insects & Animal poisons

Unit – 4: Analytical Toxicology

Introduction, Provision of analytical toxicology services, Samples and sampling techniques, Choice of analytical method, Method implementation, development and validation, Quality control and quality assurance, Applications of analytical toxicology

Reference Books

1. Curry: Analytical Methods in Human Toxicology, Part II, 1986.
2. Casarett & Doll Toxicology: The Basic Science of poisons.
3. Clark, E.G.C.: Isolation and identification of Drugs, 1966
4. Curry, A.S.: Poison Detection in Human Organs, 1976
5. Curry, A.S.: Advances in Forensic Chemical Toxicology, 1972
6. Holfmann, F.G.: Handbook of Drug and Alcohol Abuse.
7. Turner: Drugs & Poisons.
8. Samford : Poisons Their Isolation Identification
9. Stoleman: Progress in Chemical Toxicology.
10. Sunshine, I: Guidelines for Analytical Toxicology Programme, Vol-I, CRC press, 1950.
11. Sunshine, I: Handbook of Analytical Toxicology, press, 1969.
12. Mule, S. J. et al. : Immunoassays for Drugs subjects to ab, CRC Press, 1974
13. Connors, K.: A text book of Pharmaceuticals analysis, Interscince, New York, 1975

M.Sc. Forensic Science

III Semester, Paper IV

MSFS344 - Forensic Toxicology and Pharmacology

Aim and Objectives of Course: To impart thorough knowledge on Scientific Applications of Toxicology and Pharmacology in Forensic Investigations

Learning Outcomes

8. Study on various types of poisons, their action mechanisms and diagnosis.
9. Collection and Preservation procedure of viscera and poisonous substance
10. Toxicokinetics and Pharmacokinetics of various drugs, toxins and toxicants.

Unit – 1:

Introduction and concepts of forensic toxicological examination and its significance. Law relating to poisons. Introduction to Poisons, form of poisons, classification and methods of administration of poison. Mode of action of poison, Diagnosis and management of poisoning cases. Factors affecting the effect of poison and medico-legal aspects in poisoning cases

Unit – 2:

Collection and preservation of biological evidences (viscera and /or body fluids) and circumstantial evidences in fatal and survival cases. Submission of samples to the laboratory, postmortem examination, specific analysis plan / approach to toxicological examinations of poisoning samples. Classification of matrices. Isolation and Extraction of poison/ drug by various classical and modern methods using instrumental techniques.

Unit – 3:

Method of analysis of Inorganic poisons (metallic, non-metallic and anions), Neutral poison, Basic drugs / poisons, Acidic drugs / poisons, volatile poisons.

Forensic pharmacology: Forensic pharmacological studies, absorption, distribution, pharmacokinetics and metabolism, pathways of drug metabolism, drug toxicity, excretion of drugs and poisons. Detection of poison on the basis of their metabolic studies.

Unit – 4:

Insects and animal poisons and their examination. Plant poisons: Classification and analysis by chemical and instrumental techniques. Mechanical poisons and their examination. Analytical aspect of toxicological evidence. Toxicological analysis of decomposed materials. Interpretation of toxicological findings and preparation of reports.

Reference Books

1. Modi JS: Medical Jurisprudence and Toxicology
2. Taylor: Medical Jurisprudence
3. Parikh CK: Medical Jurisprudence and Toxicology
4. Keith Simpsen & Bernard Knight: Forensic Medicine
5. Poison, CJ, DJ Gee, B. Knight: Forensic Medicine
6. Reddy: Forensic Medicine
7. Laboratory Procedure Manual- Forensic Toxicology, DFS, MHA, New Delhi
8. Pharmacology and Therapeutics-Bhandarkar& Satoskar
9. Medical Pharmacology- Tripathy
10. Essentials of Toxicology- Ellenhorn

SEMESTER – III PRACTICALS

MSFS345 – Forensic Chemistry Lab

1. Microcrystalline tests for drugs
2. Separation of alkaloids, glycosides, tryptamines by TLC
3. Separation of Psychotropic substance by TLC
4. Separation of Cannabis/Opium by TLC
5. Analysis of high explosives by color test and TLC.
6. Analysis of fire residues by GC
7. Analysis of adulterated and non-adulterated oil by chemical/Color Test and TLC method
8. Separation of amino acids by thin layer chromatography
9. Analysis of NDPS drugs and explosives by instrumental techniques.
10. Qualitative and quantitative analysis of Pharmaceuticals by various chemical and instrumental techniques.

MSFS346 – Forensic Toxicology Lab

1. Extraction, isolation, purification and identification of volatile, acidic, basic and neutral drugs by various analytical techniques.
2. Extraction and detection of metallic poisons from biological and non-biological matrices.
3. Identification of plant poisons by chemical and microscopic methods.
4. Extraction and detection of poisons and drugs from visceral samples by various chemical and instrumental techniques.
5. Detection of metallic poisons from viscera samples and food samples.
6. Identification of vegetable poisons of Forensic interest.

M.Sc. Forensic Science

IV Semester

MSFS441 – Comprehensive Viva-voce

M.Sc. Forensic Science

IV Semester, Paper II

MSFS442 – 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?