FORENSIC SCIENCE

DEPARTMENT OF CHEMISTRY
UNIVERSITY COLLEGE OF SCIENCE
OSMANIA UNIVERSITY
HYDERABAD

LESSON PLANS
FOR THE ACADEMIC YEAR
2023-2024

M.Sc. FORENSIC SCIENCE
Semester III

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: I/FS 301: FORENSIC CHEMISTRY

Unit I: Forensic Chemistry - Introduction **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Manisha Keshavan**

Lecture No.	Topics to be covered
1	Forensic Chemistry- Introduction
2	Types of cases / exhibits- Preliminary screening- presumptive tests (colour and spot tests)
3	Examinations procedures involving standard methods and instrumental techniques
4	Qualitative and quantitative forensic analysis of inorganic and organic material
5	Chemical fertilizers (N,P,K)
6	Insecticides (Endosulfan, Malathion, Carbaryl)
7	Metallurgical analysis (Fe, Cu, Zn, Au, Ag)
8	Natural products (tobacco, tea, sugars, rubber)
9	Industrial chemicals
10	Sulphuric, Nitric and Hydrochloric acids
11	Sodium, Potassium hydroxide, Ammonium nitrate
12	Potassium chlorate
13	Organic solvents like Methanol, Ethanol
14	Acetone, Chloroform and Ether-Organic chemicals like Acetanilide, P Aminophenol
15	Nitrobenzene etc. with reference to forensic work

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: I/FS 301: FORENSIC CHEMISTRY

Unit II: Standard analysis of Petroleum products, Arson residues and Trace evidences

No. of Hours Allotted: 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction to the petroleum and petroleum processing methods
2	Extraction methods of petroleum products
3	various petroleum products and their commercial uses
4	Standard method of analysis of petroleum products
5	Analysis if petroleum products for adulteration and arson residues
6	Introduction and Chemistry of fire
7	Investigation and evaluation of fires
8	Collection. Preservation and packing of arson residues
9	Analysis of arson residues by conventional methods
10	Analysis of arson residues by instrumental methods
11	Introduction to analysis of trace evidence
12	Analysis of Dyes and Trap related evidence materials
13	Analysis of Paints,
14	Analysis of Oils fats and Greases
15	Analysis of Industrial dusts

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: I/FS 301: FORENSIC CHEMISTRY

Unit III: Examination of NDPS & Alcoholic beverages **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Aishwarya Sebastian**

Lecture No.	Topics to be covered
1	Analysis of beverages: Composition and analysis of alcoholic and non-alcoholic beverages
2	Country made liquor, illicit liquor and medicinal preparations containing alcohol
3	Common adulterants and toxic substances in alcoholic beverages
4	Analysis of Narcotic Drugs and Psychotropic Substances
5	Introduction - classification of NDPS/ drugs of abuse
6	Drug abuse - Drugs of abuse in sports
7	Designers drugs
8	Forensic examination of NDPS
9	Clandestine laboratories– Drug profiling
10	The study of NDPS should be exemplified by Opiates, Cannabis
11	Cocaine, Amphetamines
12	Benzodiazepines, Disubstituted and Quinazolones
13	Barbiturates
14	LSD, Psylocybin, Mescaline and MDMA
15	Drugs and Cosmetic Act, Excise Act, NDPS Act

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: I/FS 301: FORENSIC CHEMISTRY

Unit IV: Examination of Explosives **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Aishwarya Sebastian**

Lecture No.	Topics to be covered
1	Explosives and Explosion residues– composition
2	Classification, and characteristics of explosives
3	Pyrotechnics, IEDs
4	Explosion process and effects
5	Approach to scene of explosion
6	Post-blast explosion residue collection
7	Reconstruction of sequence of events
8	Evaluation and assessment of scene of explosion
9	Systematic analysis of explosives and explosion residues in the laboratory using chemical tests
10	Instrumental techniques (exemplified by country bomb compositions, Picric acid, Gun powder, Ammonium nitrate, NG, NC, TNT, PETN, TETRYL, RDX and HMX)
11	Synthesis of above organic explosives-1
12	Synthesis of above organic explosives-2
13	Profiling and tagging of explosives
14	Interpretation of results
15	Explosives Act and Explosive Substances Act

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: II/FS 302: FORENSIC TOXICOLOGY

Unit I: Introduction to Forensic Toxicology **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction and history of toxicology and forensic toxicology
2	Scope and areas of toxicology. Scope and importance of forensic toxicology
3	Role and duties of forensic toxicologist
4	Introduction and classification of poisons
5	Introduction and classification of poisoning
6	Sample collection methods in case of survival cases
7	Sample collection methods in case of death
8	Methods for the preservation of toxicological samples
9	Toxicological investigation of poisoned death
10	Interpretation of toxicological data
11	Courtroom testimony in toxicological cases
12	Report writing in toxicological cases
13	Case study of homicidal poisoning
14	Case study of suicidal poisoning
15	Case study of accidental poisoning

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: II/FS 302: FORENSIC TOXICOLOGY

Unit II: Introduction to Pharmacology **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction to principles of toxicology
2	Types of absorption methods and factors that affect the absorption of drugs
3	Factors that affect the distribution of toxicants
4	Storage and redistribution of toxicants
5	Phase I reactions of drug metabolism
6	Phase II reactions of drug metabolism
7	Routes drug excretion and factors that affect the drug clearance
8	Introduction and One compartment and two compartmental model of toxicokinetics
9	Introduction to toxicodynamics and Spectrum of undesired effects by drugs and poisons
10	Introduction and types of interaction of chemicals
11	Introduction, types and causes of Tolerance by drugs and poisons
12	Introduction, types and factors that affect the dose response relationship
13	Developmental and reproductive toxicology
14	Introduction, types and causes of Mutagenicity
15	Introduction and methods of Toxicity testing

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: II/FS 302: FORENSIC TOXICOLOGY

Unit III: Forensic Toxicology Analysis **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction and importance of toxicological analysis
2	Importance and methods of sample preparation in toxicological analysis
3	Isolation of poisons from various matrices by Liquid–liquid, solid phase, supercritical fluid extraction methods,
4	Induction, importance and methods of clean up procedures
5	Identification and quantification of metal poisons
6	Identification and quantification of anions
7	Identification and quantification of volatile poisons
8	Identification and quantification of volatile gases
9	Identification and quantification of acidic drugs
10	Identification and quantification of corrosive and mechanical poisons
11	Identification and quantification of plant and animal poisons
12	Identification and quantification of pesticides
13	Introduction and importance of field testing in toxicological work
14	Introduction and importance of Therapeutic drug monitoring
15	Emergency hospital toxicology

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: II/FS 302: FORENSIC TOXICOLOGY

Unit IV: Management of acute poisoning **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction to management of poisoning
2	Importance and methods of maintenance of vital functions in emergency toxicological cases
3	Methods used to enhance the elimination of poisons
4	Methods used for the removal of unabsorbed poisons
5	Methods used for the removal of absorbed poisons
6	Introduction and classification of antidotes
7	Mechanism of action of antidote in cyanide and methanol poisoning
8	Mechanism of action of antidote in opiate and arsenic poisoning
9	Mechanism of action of antidote in carbon monoxide and nitrite poisoning
10	Mechanism of action of antidote in pesticide and acetaminophen poisoning
11	Identification of route of administration of poison-
12	Estimation of dose after administration of poison
13	Estimation of time after administration of poison
14	Recovery and after care of patients
15	Introduction and importance of Poison Information/Control Centre

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: III/FS 303: CB I: BIOCHEMISTRY & BIOCHEMICAL TECHNIQUES

Unit I: Introduction to Biomolecules & Cells, Proteins & Peptides

No. of Hours Allotted: 15

Name of the Teacher: **Dr. S. Venu**

Lecture No.	Topics to be covered
1	Biomolecules and cells – Biological fitness of organic compounds – Hierarchy of molecular organization of cells – Primordial biomolecules
2	Specialization and differentiation of biomolecules
3	The dimensions and shapes of biomolecules
4	Biomolecules supra molecular structures and cell organelles- Structural organization of cells.
5	Composition of proteins and Size of protein molecules
6	Confirmation and types of protein
7	supra molecular assemblies of proteins – Denaturation of proteins
8	Estimation and Functional diversity of proteins
9	Introduction and types of antibodies and immune response
10	The species specificity of proteins – Sequence isomerism in polypeptide chains
11	Genetic coding of amino acid sequences in proteins- Mutation
12	Structure of peptides – Optical and chemical properties of peptides
13	Steps in determination of amino acid sequence
14	Separation and analysis of peptides
15	Sequence analysis of peptide fragments

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Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: III/FS 303: CB I: BIOCHEMISTRY & BIOCHEMICAL TECHNIQUES

Unit II: Introduction & Analysis of Amino acids & Enzymes **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. S. Venu**

Lecture No.	Topics to be covered
1	Introduction and functions of amino acids
2	Common and Rare amino acids of proteins
3	Non protein amino acids
4	Physicochemical properties of amino acids
5	Absorption spectra of amino acids
6	Chemical reactions of amino acids
7	Analysis of amino acid mixtures
8	Complete hydrolysis of polypeptide chains and determination of amino acid composition
9	Identification of N-terminal and C-terminal residues of peptides.
10	Enzymes – Definition, types and classification
11	Biological activities and Kinetics of enzymes
12	Inhibition - Types of inhibition - Poisoning – Micheles-Mentor's equation
13	Enzyme polymorphism – Purification of proteins and enzymes
14	Enzyme assay techniques: UV-Vis, Luminescence, Radio isotope and immunochemical Methods
15	Automated enzyme analysis – Immobilized enzymes.

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Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: III/FS 303: CB I: BIOCHEMISTRY & BIOCHEMICAL TECHNIQUES

Unit III: Introduction to Nucleic acid, DNA sequencing techniques

No. of Hours Allotted: 15

Name of the Teacher: **Dr. S. Venu**

Lecture No.	Topics to be covered
1	Introduction and general structure of nucleotides
2	Introduction and types of nucleic acids
3	General structure and types of DNA
4	General structure and types of RNA
5	Short hand representation of nucleic acid back bones
6	Hydrolysis of nucleic acids by acids and bases
7	Enzymatic hydrolysis of nucleic acids
8	Analysis of nucleotide sequence in nucleic acids
9	Nucleic acid- Protein supra molecular complexes
10	Introduction and importance of DNA sequencing
11	Types of DNA sequencing methods
12	Forensic applications of DNA sequencing
13	Introduction and types of PCR
14	Protocol for PCR technique
15	Forensic application of PCR technique

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Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: III/FS 303: CB I: BIOCHEMISTRY & BIOCHEMICAL TECHNIQUES

Unit IV: Electrophoresis and Biochemical techniques **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. S. Venu**

Lecture No.	Topics to be covered
1	Introduction and principles of Electrophoresis, Factors affecting electrophoresis
2	Introduction, technique and forensic applications of Zone Electrophoresis
3	Introduction, technique and forensic applications of Cellulose Acetate Membrane Electrophoresis
4	Introduction, technique and forensic applications of Agar Gel Electrophoresis
5	Introduction, technique and forensic applications of Acryl amide Gel Electrophoresis
6	Introduction, technique and forensic applications of Capillary electrophoresis
7	Introduction, technique and forensic applications of Isoelectric Focusing
8	Introduction, technique and forensic applications of Isotachophoresis
9	General principles of pH, buffers and physiological solution
10	Introduction and importance of cell and tissue culture
11	Methods of cell and tissue culture and their applications
12	Introduction and importance of cell fractionation techniques
13	Methods of cell fractionation and its advantages and disadvantages
14	Introduction to centrifugation techniques
15	Types and application of centrifugation techniques

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
Course/Paper: IV/FS 304 CB-II (Statistics and forensic applications)

Unit I: Basics of Statistics **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. Bharath Porika**

Lecture No.	Topics to be covered
1	Statistics: Definition
2	Importance of statistics in interpreting forensic data in research work and quality control
3	Data and Types of data
4	Population, Distribution
5	Location
6	Random Experiment
7	Brief introduction to sampling and data collection
8	Frequency distribution – Theory and problems
9	Concept of measures of central tendencies
10	Arithmetic mean – Theory and problems
11	Median – Theory and problems
12	Mode - Theory and problems
13	Concept of measures of dispersion
14	Variance, Standard Deviation – Theory and problems
15	Coefficient of variation – Theory and problems

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
Course/Paper: IV/FS 304 CB-II (Statistics and forensic applications)

Unit II: Probability **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. Bharath Porika**

Lecture No.	Topics to be covered
1	Concept of probability
2	Definitions of probability
3	Discrete random variables and probability distributions
4	Addition, multiplication and Bayer's theorem & applications
5	Probability in Forensic Evidence
6	Concept of random variable - Discrete and continuous
7	Some examples
8	Concept of probability distribution
9	Binomial distribution – Definition, statement of properties and examples
10	Normal distribution – Definition, statement of properties and examples
11	Poisson distribution – Definition, statement of properties and examples
12	Simple linear regression and correlation
13	Concept of computational methodology, Examples
14	Concept of tests of hypothesis, Null and alternative hypothesis
15	Critical region, Types of errors & level of significance

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
Course/Paper: IV/FS 304 CB-II (Statistics and forensic applications)

Unit III: Statistical tests **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. Bharath Porika**

Lecture No.	Topics to be covered
1	Large samples tests
2	Test for single mean, Difference of means
3	Single proportion and difference of proportion, examples
4	Chi square test for goodness of fit
5	Chi square test for test for independence of attributes, Examples
6	Hypothesis testing for one or two population means
7	Student t-test, t-test for simple mean
8	Difference of means, Examples
9	Hypothesis testing for small sample sizes and multinomial experiments
10	Fisher's exact test
11	Analysis of variance and multiple comparison tests
12	F-test for equality of variance Examples
13	Concept of analysis of variance
14	Computational procedure for ANOVA one way classification, Examples
15	Computational procedure for ANOVA two way classification, Examples

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Class: M.Sc. Forensic Science **Section:** Semester III
Course/Paper: IV/FS 304 CB-II (Statistics and forensic applications)

Unit IV: Forensic applications **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. B. Saidulu**

Lecture No.	Topics to be covered
1	Introduction to Scientific evidence and statistics, Data Bases
2	Type and geographical factors
3	Statistical approach to DNA fingerprinting
4	Loci and alleles
5	Simple case genotypic frequencies
6	Hardy Weinberg equilibrium
7	Simple case of allelic frequencies
8	Accounting for sub-population
9	Paternity: mother and father unrelated
10	Data base searches and value of evidence
11	Evidence evaluation examples
12	Blood group frequencies
13	Clothing fibres, Shoe types
14	Air weapon projectiles, Height identification from eye witnesses
15	Uncertainty in scientific experimentation, Determination of uncertainty

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III
COURSE/ Paper: I/FS 351: FORENSIC CHEMISTRY LAB
No. of Sessions Allotted: 15 (Each 6 hours)

Name of the Teacher: **Mr. M. Mahesh**

Session No.	Topics to be covered
1	Detection of methanol, chloral hydrate and alprazolam in alcoholic liquors
2	Extraction and detection of inorganic explosive / explosion residues by spot/ colour tests
3	Extraction and detection of organic explosive / explosion residues by spot/ colour tests
4	Detection of Narcotic Drugs and Psychotropic Substances (NDPS)- Opiates by spot / colour tests.
5	Detection of Narcotic Drugs and Psychotropic Substances (NDPS)- barbiturates by spot / colour tests.
6	Detection of Narcotic Drugs and Psychotropic Substances (NDPS)- benzodiazepines by spot / colour tests.
7	Detection of Narcotic Drugs and Psychotropic Substances (NDPS)- amphetamines by spot / colour tests
8	Detection of Narcotic Drugs and Psychotropic Substances (NDPS) cannabis by spot / colour tests
9	Detection of (NDPS) by TLC
10	Determination of a drug of forensic interest by spectrophotometry
11	Determination of a drug of forensic interest by GC
12	Determination of a drug/explosive of forensic interest by HPLC
13	GC- MS / LC- MS of a drug of forensic interest (Demo only)
14	IR spectroscopy of samples of forensic interest
15	Examination of a bribe trap case

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester III)

Class: M.Sc. Forensic Science **Section:** Semester III

COURSE/ Paper: II/FS 352: FORENSIC TOXICOLOGY LAB
No. of Sessions Allotted: 15 (Each 8 hours)

Name of the Teacher:
Batch I: **Dr. K. Rama**
Batch II: **Ms. Manisha Keshavan**

Session No.	Topics to be covered
1	Preliminary tests directly on blood / urine / vomitus / tissues for heavy metals and alkaloids
2	Preliminary tests directly on blood / urine / vomitus / tissues for pesticides and cyanide
3	Preliminary tests directly on blood / urine / vomitus / tissues for phenolic compounds and alcohol
4	Detection and determination of ethyl alcohol in blood / urine / visceral tissue by Kozelka & Hine's method
5	Detection and determination of ethyl alcohol in blood / urine / visceral tissue by gas chromatography
6	Systematic extraction of basic substances from viscera
7	Systematic extraction of acidic substances from viscera
8	Systematic extraction of neutral substances from viscera
9	Identification of acidic drugs (from the extract) by colour tests and TLC
10	Identification of basic drugs (from the extract) by colour tests and TLC
11	Identification of pesticides (from the extract) by TLC
12	Determination of a drug / pesticide in toxicological specimen by spectrophotometry
13	Determination of a drug / pesticide in toxicological specimen by GC
14	Determination of a drug / pesticide in toxicological specimen by HPLC
15	GC-MS / LC-MS of a poison of forensic interest (Demo only)

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M.Sc. FORENSIC SCIENCE
Semester IV

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: I/FS 401T (Forensic serology and DNA fingerprinting)

Unit I: Forensic Serology **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Kanchan Singh**

Lecture No.	Topics to be covered
1	Forensic Serology- Introduction- history and types of biological samples considered in forensic investigation
2	The nature of blood- Blood stain pattern interpretation and significance
3	Age of bloodstain-
4	Collection and preservation of blood, semen, saliva samples
5	Collection and preservation of urine, faeces and milk samples
6	Identification of above biological stains by chemical methods
7	Identification of above biological stains by Biochemical methods
8	Identification of above biological stains b Crystal Chromatographic methods
9	Identification of above biological stains by Spectroscopic methods
10	Determination of origin of species by immunological methods
11	Methods of grouping biological stains
12	Methods to evaluate the Secretor and non-secretor status
13	Identification of menstrual blood
14	Identification of amniotic fluid
15	Identification of parturition stain

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: I/FS 401T (Forensic serology and DNA fingerprinting)

Unit II: Serogenetic Markers **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Kanchan Singh**

Lecture No.	Topics to be covered
1	Serogenetic Markers: Introduction of blood groups History
2	Biochemistry and genetics of ABO,
3	Biochemistry and genetics of MN, Rh, Lewis,
4	Biochemistry and genetics of Lutheran, Kidd,
5	Biochemistry and genetics of Duffy and P systems
6	Serum proteins- Km-Gm-Hp-Gc-Transferrin
7	Serum proteins - LDH- PCE
8	Cellular proteins- PGM-AK-ADA
9	Cellular Proteins- PepA-ESD-GLO
10	Cellular Proteins- GPT-G6PD-
11	Haemoglobin - introduction, structure, biochemistry
12	Hemoglobin variants – Hbf, Hbs, Hbc, HbA
13	Determination of sex and race from blood White blood group system HLA and its forensic significance
14	Determination of sex and race from HLA system
15	Forensic significance of serogenetic markers

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: I/FS 401 (Forensic Serology & DNA Fingerprinting)

Unit III: DNA typing **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. T. Sowmyya**

Lecture No.	Topics to be covered
1	DNA Typing, Introduction, Forensic significance, History, Why DNA, Introduction to human genetics, Physical basis of hereditary, Alleles, Population genetics
2	Molecular biology of DNA, Variation, Enzymes
3	Collection and Preservation of physical evidence for DNA typing
4	Forensic DNA Analysis: Introduction, Isolation of DNA, Determination of quality and quantity of DNA
5	RFLP analysis
6	PCR amplification
7	Types of PCR
8	Analysis of PCR product, Sequence polymorphism: HLA DQA1, Polymarker Amplitype PM6
9	Mitochondrial DNA
10	Length polymorphism (STRs, Gender identification, D1S80)
11	DNA separation, Slab Gel & Capillary Electrophoresis
12	DNA detection, Fluorescent dyes and silver staining
13	STR Genotyping, Instrumentation for STR typing
14	Automated analysis system, Applications of DNA profiling
15	Legal standards for admissibility of DNA profiling, Future technologies DNA chips, SNPS, DNA cloning

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: I/FS 401 (Forensic Serology & DNA Fingerprinting)

Unit IV: Interpretation of DNA typing results **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. T. Sowmyya**

Lecture No.	Topics to be covered
1	Interpretation of DNA Typing Results
2	Introduction to complicating factors
3	Multiple contributors, Degradation, Extraneous substance
4	System specific interpretational issues, RFLP based system: Multi banded patterns
5	Single banded patterns
6	PCR based systems: Nuclear DNA, Mitochondrial DNA
7	Determination of genetic concordance
8	Evaluation of results, Bayes theorem
9	Hardy Weinberg law
10	Frequency estimate calculations
11	Population sub structure, Likelihood rations
12	Introduction to bioinformatics
13	Genomics and Proteomics
14	DNA databank and database
15	Certification and accreditation

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: II/FS 402T (Fingerprints and Impressions)

Unit I: Fingerprints **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Kanchan Singh**

Lecture No.	Topics to be covered
1	Introduction, History, elements of fingerprints
2	Classification of Fingerprints (Henry Classification, Patterns & Types)
3	Identification and comparison of fingerprints
4	Development, lifting and preservation of Latent fingerprints on porous and non-porous surfaces
5	Development of fingerprints on adhesive surfaces, Development of fingerprints with blood and grease contamination
6	Development of latent fingerprints on dead body and of the dead body
7	Lip Prints: Introduction, History, Scope and Classification
8	Recording, processing and development of lip prints
9	Application of lip prints in crime detection and court of law
10	Ear Prints: Introduction and History, Morphology and shapes of ear
11	Location of ear prints, producing standards from suspects
12	Identification and comparison of ear prints
13	Palm Prints: Introduction, anatomical areas and major creases of the palm
14	Interdigital area, Hypothenar area, Thenar area and Finger joints
15	Digital imaging of fingerprints and AFIS

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Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: II/FS 402T (Fingerprints and Impressions)

Unit II: Types of evidentiary fingerprints **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Singaraju Manasa**

Lecture No.	Topics to be covered
1	Introduction to fingerprints
2	Development of latent fingerprints
3	Physical methods for development of finger prints
4	Chemical methods for development of finger prints
5	Visualization methods of illumination
6	Photography
7	Preservation and lifting of fingerprints
8	Development techniques on porous surfaces
9	Development techniques on non-porous surfaces
10	Development on adhesive surface
11	Development with blood contamination
12	Development with grease contamination
13	Development of latent fingerprints on dead body
14	Digital imaging of fingerprints
15	Case histories

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: II/FS 402T (Fingerprints and Impressions)

Unit III: Footwear Impressions & Tire Impressions **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Singaraju Manasa**

Lecture No.	Topics to be covered
1	Introduction to impressions
2	Forms of footwear impressions- Information from footwear impressions
3	Location and recovery of footwear impressions
4	Enhancement methods
5	Preparation of Exemplars The examination process
6	Case histories
7	Tire impressions- Introduction
8	Original equipment tires, Replacement tires
9	Tire construction
10	Tread nomenclature and sidewall information
11	Tread wear indicators- Retreated tires
12	Tire reference material and databases
13	Tire track evidence and recovery
14	Known tires and exemplars- Tire impressions examination process
15	Case histories

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: II/FS 402T (Fingerprints and Impressions)

Unit IV: Lip Prints, Ear Prints & Bite Marks **No. of Hours Allotted:** 15

Name of the Teacher: **Ms. Singaraju Manasa**

Lecture No.	Topics to be covered
1	Introduction Lip Prints
2	History & Scope of Lip Prints
3	Application in crime detection
4	Ear Prints- Introduction- History
5	Morphology of ear
6	Ear prints location
7	Producing standards from suspects
8	Identification and comparison
9	Case histories of Lip Prints & Ear Prints
10	Bite marks Introduction
11	Significance- Judicial Acceptance
12	Description of prototypical bite marks
13	Evidence collection on victim and suspects
14	Identification and comparison
15	Case histories

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: III/FS 403 CB-I (Questioned Documents)

Unit I: Handwriting examination **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. T. Sowmyya**

Lecture No.	Topics to be covered
1	Nature and problems of document examination
2	Classification of documents
3	Procurement of standards
4	Admitted / specimen writings
5	Handling and marking of documents
6	Preliminary examination of documents
7	Basics of handwriting identification
8	Individuality of handwriting
9	Natural variations
10	Process of comparison
11	Various types of documents
12	Various writing features and their estimation
13	General characteristics of hand writing
14	Individual characteristics of hand writing
15	Basic tools for forensic document examination

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: III/FS 403 CB-I (Questioned Documents)

Unit II: Other document frauds **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. T. Sowmyya**

Lecture No.	Topics to be covered
1	Disguised writing, Types of disguise
2	Anonymous letters, Classification
3	Identification of writer
4	Examination of signatures
5	Characteristics of genuine signatures
6	Characteristics of forged signatures
7	Examination of alterations
8	Examination of erasures
9	Examination of overwritings
10	Examination of additions and obliterations
11	Decipherment of secret writings
12	Decipherment of indented writings
13	Decipherment of charred documents
14	Examination of seal impressions
15	Examination of other mechanical impressions

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: III/FS 403 CB-I (Questioned Documents)

Unit III: Xerox copies, typewriting and security documents **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. T. Sowmyya**

Lecture No.	Topics to be covered
1	Examination of black and white xeroxed copies
2	Examination of colour xeroxed copies
3	Examination of carbon copies
4	Examination of fax messages
5	Forgeries and their detection
6	Various types of forgeries and their detection
7	Examination of built up documents
8	Determination of sequence of strokes, physical matching of documents
9	Identification of typewriter writings
10	Identification of typewriter
11	Identification of printed matter
12	Various types of printing of security documents
13	Printing of currency notes
14	Examination of counterfeit currency notes
15	Examination of passports, visa, stamp papers, postal stamps

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
Course/Paper: III/FS 403 CB-I (Questioned Documents)

Unit IV: Computer printouts and analytical instrumentation **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. T. Sowmyya**

Lecture No.	Topics to be covered
1	Determination of age of documents by examination of signatures
2	Determination of age of documents by examination of paper, ink, writing / signatures
3	Examination of computer print outs
4	Examination of computer printouts: dot-matrix, ink-jet and laser printers
5	Examination of computer printouts: electronic typewriters
6	Credit cards: Frauds and security features
7	e- documents
8	Digital signatures
9	Opinion writing
10	Reasons for opinion
11	Court testimony
12	Analytical instrumentation used in document examination
13	Video spectral comparators
14	Microscopes
15	TLC, HPLC, Spectrofluorimetry and X-ray fluorimetry

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU
LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
COURSE/ Paper: IV/ FS 404: CB I: MOLECULAR BIOLOGY & IMMUNOLOGY

Unit I: Regulation of Gene expression in prokaryotes & Eukaryotes

No. of Hours Allotted: 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction and types of gene expression
2	Introduction, types and need of gene regulation
3	Introduction to regulation by operons in prokaryotes
4	Lac operon and catabolite repression
5	Trp operon and attenuation
6	Promoter flipping- introduction, mechanism and examples
7	Introduction to regulation by operons in eukaryotes- central dogma of life
8	Introduction and types of chromatin modelling methods
9	Transcriptional regulation in prokaryotes
10	Transcriptional regulation in eukaryotes
11	Post transcriptional regulation by alternate splicing
12	Translational regulation in prokaryotes
13	Translational regulation in eukaryotes
14	Post translational modifications to modulate gene product activity
15	Applications of gene regulation

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
COURSE/ Paper: IV/ FS 404: CB I: MOLECULAR BIOLOGY & IMMUNOLOGY

Unit II: Recombinant DNA Technology **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction and history of Recombinant DNA technology
2	Overview of Recombinant DNA technology
3	Vectors involved in Recombinant DNA technology
4	Enzymes involved in Recombinant DNA technology
5	Preparation of cDNA library
6	Preparation of genomic DNA library
7	Screening to select clone of interest
8	Over expression of cloned proteins in bacteria
9	Introduction and history of transgenic plants
10	Production and applications of transgenic plants
11	Introduction and history of transgenic animals
12	Production and applications of transgenic animals
13	Introduction and history of gene silencing
14	Gene silencing by RNAi
15	Application of recombinant DNA technology in forensics

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
COURSE/ Paper: IV/ FS 404: CB I: MOLECULAR BIOLOGY & IMMUNOLOGY

Unit III: Introduction to Immunology **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction and history of immunology
2	Organization of the immune system
3	Haematopoiesis – Production and differentiation of the immune cells
4	Cells of the immune system
5	Organs of immune system
6	Introduction, types and functions of innate immunity
7	Introduction, types and functions of acquired immunity
8	Cell mediated immunity Vs Humoral immunity
9	Structure and Classes of immunoglobulins
10	Genetics of Antibody production and Generation of Antibody diversity
11	Introduction and types of antigens
12	Introduction and mechanism of super antigens
13	Auto immune disorders
14	Blood group antigens
15	Vaccines and their types

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV
COURSE/ Paper: IV/ FS 404: CB I: MOLECULAR BIOLOGY & IMMUNOLOGY

Unit IV: Basics of Immunotechnology & Applications **No. of Hours Allotted:** 15

Name of the Teacher: **Dr. K. Rama**

Lecture No.	Topics to be covered
1	Introduction to immunotechnology
2	Principles and factors affecting antigen and antibody reactions
3	Principle, procedure and applications of Mancicni's Radial immunodiffusion - Ouchterlony's Double diffusion
4	Principle, procedure and applications of Haemagglutination –Agglutination inhibition – Passive agglutination
5	Principle, procedure and applications of Immuno electrophoresis
6	Principle, procedure and applications of Rocket immunoelectrophoresis
7	Principle, procedure and applications of RIA
8	Principle, procedure and applications of ELISA
9	Principle, procedure and applications of Western blot
10	Inhibition of complement fixation
11	Direct and indirect Coomb's test
12	Immediate and delayed Hypersensitivity
13	Production and applications of monoclonal antibodies
14	Production and applications of polyclonal antibodies
15	Abzymes

FORENSIC SCIENCE, DEPARTMENT OF CHEMISTRY, UCS, OU

LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV

Course/Paper: I/FS 451: FORENSIC SEROLOGY & DNA FINGERPRINTING LAB

No. of Sessions Allotted: 15 sessions x 8 hours each

Name of the Teacher: **Dr. K. Rama**

Session No.	Topics to be covered
1	Examination of blood and its stains: Chemical and crystal tests
2	Examination of semen and its stains: Chemical and crystal tests
3	Examination of saliva and its stains: Chemical and crystal tests
4	Examination of urine and its stains: Chemical and crystal tests
5	Identification of spermatozoa by differential staining method
6	Determination of Species of Origin of blood, semen and saliva by gel diffusion method
7	Grouping of dried stain of blood, semen, saliva and hair by absorption elution technique
8	Determination of secretor status from semen stains by absorption inhibition technique
9	Determination of secretor status from saliva stains by absorption inhibition technique
10	Isolation of DNA from blood – purification
11	Amplification of DNA using PCR
12	Gel electrophoresis of proteins
13	Assay of amylase
14	Assay of urease
15	Quantitative estimation of proteins

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-2024 (Semester IV)

Class: M.Sc. Forensic Science **Section:** Semester IV

Course/Paper: II/FS 452 (Fingerprints, impressions & questioned documents lab)

No. of Sessions Allotted: 30 sessions x 3 hours each

Name of the Teacher:
Batch –I: Dr. T. Sowmyya
Batch –II: Mr. M. Mahesh

Session No.	Topics to be covered
1	To take plain and rolled inked fingerprints
2	To identify fingerprint patterns
3	To perform ridge tracing, ridge counting and identify the ridge characteristics
4	Comparison of fingerprints
5	To develop latent fingerprints with powder methods
6	To develop latent fingerprints using fuming methods
7	To develop latent fingerprints using chemical methods
8	Lifting of fingerprints
9	Footprint tracing, casting and comparison
10	Bite mark casting and comparison
11	Tire print tracing, casting and comparison
12	Identification of handwriting characteristics – Case 1
13	Identification of handwriting characteristics – Case 2
14	Identification of disguised writing
15	Decipherment of indented writings
16	Detection of freehand forgery
17	Detection of traced forgery
18	Detection of simulated forgery
19	Decipherment of secret writings and charred documents
20	Examination of currency notes: Denomination - 100
21	Examination of currency notes: Denomination - 200
22	Examination of currency notes: Denomination - 500
23	Examination of passports
24	Examination of inks by TLC
25	Examination of inks by Spectrophotometry
26	Examination of rubber stamps and other mechanical impressions like seals etc.
27	Examination of type scripts and printed material
28	Examination of alterations and additions
29	Examination of overwriting and obliterations in documents
30	Examination of erasures (mechanical and chemical)