DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANAGABAD

Syllabus

Of

B.Sc. FORENSIC SCIENCE
II Year
III/IV SEMESTER

Effective from Academic Year
2009-2010 onwards

FORENSIC SCIENCE
Paper I
Advanced Forensic Science

Title: Paper I: Advanced Forensic Science **Max Marks: - 30**
Semester: - III **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	**Crime and Crime Scene management: :** (Credit 1) Criminals, criminal behavior, criminal profiling, portrait parley, general crime scene procedures and their management, Crime Scene survey, Crime Scene Documentation, collection and preservation of physical evidence, crime scene reconstruction.	15
Unit-II	**Recognition of Bloodstain Patterns:** (Credit 1) History of Bloodstain Pattern interpretation, properties of human blood, target surface considerations, Size, Shape and Directionality of bloodstains, Spattered blood, other Bloodstain Patterns, interpretation of Bloodstain on clothing and footwear, Documentation and Photography for Bloodstain Pattern Analysis.	15
Unit-III	**Fingerprints:** (Credit 1) Fingerprints as evidence: Its recognition, Collection and Preservation, History and Development of fingerprints, Formation of ridges, Fingerprints patterns, Pattern Areas, General and Individual characteristics of fingerprint, Composition of Sweat,	15

	Classification of fingerprints- Henry System of classification, Single digit Classification, Extension of Henry system, Fingerprint Bureau. Search for Fingerprints, Chance Fingerprints, Latent Fingerprints, and Various methods of development of fingerprints: conventional methods, physical and chemical methods, florescent method, Magnetic Powder method, fuming method, laser method. Taking fingerprints from living and dead persons.	
	Total	45
		3 credits

Title: Paper I: Advanced Forensic Science **Max Marks: - 30**
Semester: - IV **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-IV	Forensic Documents: (1 Credit) Various types of forensic documents: genuine and forged documents, classification of forensic documents: Specimen writings, admitted writings, Handling, preservation and marking of documents, natural variation and disguise in writing, Principle of Handwriting Identification, general and individual characteristics, Basic Tools needed for forensic documents examination and their use. Various types of forgeries and their detection. Analysis of paper and inks.	15
Unit-V	Criminal Justice System: (1 Credit) Structure of Police, Prosecution and Judicial Organization, Introduction to IPC (Indian Penal Code) and Cr.P.C – section 291, 292 and 293. Indian Evidence Act – Introduction and Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 159. Court Testimony-	15

	admissibility of expert testimony, Examination in chief, Cross Examination and Re-examination, Ethics in Forensic Science.	
Unit-VI	Unit 6: Impressions and Prints: (1 Credit) Footprints: Importance, Gait Pattern, Casting of footprints in Different medium, Taking Control samples. Tire Marks/prints and Skid marks, taking control samples, Forensic Significance. Lip Prints- Nature, Location, collection and evaluation, taking control samples, Forensic Significance. Bite Marks- Nature, Location, collection and evaluation, taking control samples, Forensic Significance. Ear Prints- Nature, Location, collection and evaluation, taking control samples, Forensic Significance.	15
	Total	45
		3 credits

Practicals - **Advanced Forensic Science:**

Sr. No.	Topic	No. of Lectures
	SEMESTER-III(Total 3 credits)	**2 nos.**
1.	Reconstruction and evaluation of various type of crime scene.	**2 nos.**
2.	Sketching and Photography of various type of crime scene.	**2 nos.**
3.	Document and Fingerprint Photography.	**2 nos.**
4.	To take Plain and Rolled inked fingerprints and to identify the patterns.	**2 nos.**
5.	To perform ridge tracing and ridge counting.	**2 nos.**
6.	To identify ridge characteristics.	**2 nos.**

	SEMESTER-IV(Total 3 credits)	
7.	To develop Latent fingerprints with Powder method.	**2 nos.**
8.	Lifting of Fingerprints.	**2 nos.**
9.	Identification of normal/ disguise writings.	**2 nos.**
10.	Detection of forgeries including traced and stimulated Forgery and build up documents.	**2 nos.**
11.	Examination of ink by TLC method.	**2 nos.**
12.	Examination of security features of Currency Notes and Indian Passports.	

Suggested Readings:

Sr. No.	Topic
1.	Introduction to Criminalistics: The foundation of Forensic Science by B. J. Fisher, W.J. Tilstone, C. Woytowicz.
2.	Henry Lee's Crime Scene Handbook By Henry C. Lee, Timonthy Palmbach
3.	Practical Crime Scene Analysis and Reconstruction by Ross M. Gardner and Tom Bevel.
4.	Forensic Science: An Indroduction to Scientific and Investigative Techniqes By S.H James, JJ Nordby.
5.	Advanced Crime Scene Photography by C.D. Duncan.
6.	Forensic Science in Court- The Role of Expert Witness by Wilson Wall.
7.	Scientific Examination of Questioned Documents by Ordway Hilton.
8.	Questioned Documents by Albert S. Osborn.
9.	Suspect Documents their scientific examination By Wilson R. Harrison.
10	Friction Ridge Skin By James F. Cowger
11.	Speculation in Fingerprint Identification By Chatterjee S. K.
12.	Criminal Investigation, Practical Fingerprinting by Briges B. C.

FORENSIC SCIENCE
Paper II
Advanced Forensic Chemistry

Title: Paper II: Advanced Forensic Chemistry **Max Marks: - 30**
Semester: - III **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	**PHYSICAL CHEMISTRY**: (Credit 1) a) Chemical thermodynamics- Gibbs- Helmholtz's energy efficiency, entropy, work function. b) Chemical kinetics –rate, order and molecularity of rexn. Energy of activation, molecular activation-collision theory, Specific reaction rate-half life expression. c) Electro chemistry: Laws of electrochemistry, Electro chemical cell, salt bridge, EMF-set up of cell –callus	**15**
Unit-II	**INORGANIC CHEMISTRY**: (Credit 1) a) Metal and Non Metals- Preps/occurrence/props/uses b) Acids and alkalis - types, classifications, nexus / props c) Volumetric analysis-types/classifications/titrus-indicators	**15**

Unit-III	**SPECTROSCOPY (PHYSICAL ANALYTICAL):** (Credit 1) a)electromagnetic radiations, full range, absorbance, transmittance, beer-Lambert's laws,-Applications b)U.V. Visible IR-molecular spectra, electronics, vibrational, rotational spectra- Principle diagram, working and construction, uses applications.	**15**
	Total	**45**
		3 credits

Title: Paper II: Advanced Forensic Chemistry **Max Marks: - 30**
Semester: -IV **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit -IV	**QUALITATIVE-QUANTATIVE ANALYSIS** (1 Credit) Organic - inorganic products. Chemical, oils, petroleum products, cement	**15**
Unit -V	**UNIT V: FORENSIC CHEMISTRY**(1 Credit) a) Screening, sampling-methods type (collection), statistical method, different standard methods b) Inorganic analysis. c) Micro-chemical method	**15**
Unit -VI	**MISCELLANEOUS**(1 Credit) Characteristics/examination/act/organic-inorganic products	**15**

	Gold,silver,tobacco,tea,sugar,salts,fertilizers,dyes,drugs,paits,fats various acts (legal aspects)	
	Total	**45**
		3 credits

Practical's - **Advanced Forensic Chemistry**

Sr. No.	Topic
	SEMESTER-III
1.	Commercial analysis(double titration)
2.	Titration –complexometric (EDTA titration)
3.	Qualitative analysis(Acidic /basic radicals)
4.	Identification of organic compounds(characterization)
5.	Gravimetric Analysis
	SEMESTER-IV
6.	Physical Experiments
7.	Conductometric Titration
8.	Ph-metry Titration
9.	Potentiometry Titration

Sr. No.	List Of Books
1.	Thermodynamics for Chemists by S, Glasstone
2.	Principles f Physical Chemistry and Puri, Sharma and Pathania
3.	Advanced Inorganic Chemistry by Madan , Malik and Tuli
4.	Concise Inorganic Chemistry by J.D. Lee
5.	Organic Chemistry by Moris and Boyed
6.	Heterocyclic Chemistry by Gupta and Kumar Vol I and Vol II
7.	Insecticides with Modes of Action by I. Ishaya and D. Deghilee
8.	Natural Products by S.V. Bhat
9.	Instrumental Analysis by Skoog, Holler and Crouch

10	Practical Books:
11.	Physical Chemistry Parcticals by J.B. Yadav
12.	Qualitative Analysis by Vogel

FORENSIC SCIENCE
Paper III
Advanced Forensic Physics

Title: Paper III: Advanced Forensic Physics **Max Marks: - 30**
Semester: - III **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	Basic Spectroscopy: (1 Credit) Introduction, electromagnetic spectrum, sources of radiations, conventional sources for UV, Visible and IR rays, shorter wavelength radiation (X-ray tube), Interaction of radiation with matter: Reflection, absorption, transmission, fluorescence,, phosphorescence.	15
Unit-II	Analog and Digital Electronics (1 Credit) Generation of various types of waveforms, wave shaping circuits, Active filters, A to D and D to A converters, Modulation, need of Modulation, Amplitude and Frequency Modulation and its applications, Fourier	15

	transforms.	
Unit-III	Unit 3: Physics of Speech (1 Credit) Introduction, the generation of sound, amplitude vibration, simple harmonic motion, addition of sine waves, physical properties of vibrating systems, propagation of sound waves, standing waves, modes of vibration.	15
	Total	**45**
		3 credits

Title: Paper III: Advanced Forensic Physics **Max Marks: - 30**
Semester: - IV **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	Fire Arms: (1 Credit) Introduction, brief history of fire arms, weapon types and their operations, proof marks.	
Unit-II	Ammunition: (1 Credit) A brief history of ammunition, ammunition components, non toxic shots, propellants, priming compound and primers, head stamp marking on ammunition.	
Unit-III	Ballistics: (1 Credit) Introduction, types of ballistics: internal, external and terminal ballistics, velocity recoil, theory of recoil, barrel pressure measurement, ballistic coefficient, angle of elevation of the barrel.	

	Total	**45**
		3 credits

List of Experiments (Advanced Forensic Physics)

	Semester III
1.	Investigations of fake documents using UV light.
2.	Thermal Analysis of given sample using DSC/TGA
3.	Gravimetric analysis (density measurement of given sample)
4.	Electrostatic development analyzer
5.	Classification and measurements of bullets
6.	Segregation of Speech Sample
7.	Study of absorption coefficient of given Sample
8.	Study of transmission coefficient of given Sample
9.	Waveform generator
10.	Study of AM modulation
	Semester IV
11.	Study of FM modulation
12.	Study of low pass Active filters
13.	Study of High pass Active filters
14.	Analog to Digital Convertor
15.	Digital to Analog Convertor
16.	Fourier transforms
17.	Wave clipping and Clamping using diodes.
18.	Digital counter
19.	Photosensitive relay using LDR
20.	Study of Timer (IC-555)

Reference Books:

Sr.No.	**Books**
1.	Spectroscopy by H.E. White (for unit 1)
2.	The Physics of Speech by D.B.Fry (Cambridge University Press) (for Unit 3)
3.	Handbook of Firearms and Ballistics Examination and Interpreting Forensic Evidence by Brain J Heard, 2nd Ed. Publication: Wiley-Blackwell (for Unit 4,5 and 6)
4.	Op-Amp and liner Integrated circuits by Ramankat Gayakwad.

5.	Op-Amp and liner Integrated circuits: by Robort Coughling and Driscoll
6.	Electronics Communication systems: by Kennedy & Davis

FORENSIC SCIENCE
Paper IV
Advanced Forensic Biology

Title: Paper IV: Advanced Forensic Biology **Max Marks: - 30**
Semester: -III **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	Crime Scene Investigation- o Protection of Biological Evidences o Documentation o Chain of Custody Recognition of Biological evidences encountered in various cases. Search & Collection of Biological Evidences Packaging & transportation of Biological	15

	Evidences	
Unit-II	Analysis of Biological Fluid o Saliva o Semen o Vaginal Fluid o Urine o Sweat Serological Concepts o Antigen / Antibodies o Polyclonal antibodies o Monoclonal antibodies o Antiglobulins Serological Techniques o Electrophoretic Methods – Agarose gel, SDS, Natured/Denatured Identification of Blood o Properties o Blood Grouping – Human & Non-human o Presumptive & Confirmatory Tests Human & Animal Hair morphology	15
Unit-III	Genetics o Structural & definitive properties of Chromosomes o Human Genome o Deoxyribose Nucleic Acid – Structural properties o Sources of DNA evidence DNA Extraction o Basic Principles o Method of DNA extraction DNA Quantification o Slot Blot Assay o Southern /Northern Blotting DNA Amplification by Polymerase Chain Reaction DNA Electrophoresis DNA databasing	15
	Total	**45**
		3 credits

Title: Paper IV: Advanced Forensic Biology **Max Marks: - 30**
Semester: -IV **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-IV	Analysis of Skeletal Remains o Forensic Anthropology ▪ Skeletal system & bone formation ▪ Skeletal indicators of health & injuries ▪ Identification of joint wear & deterioration ▪ Estimation of Age, Sex & Race ▪ Estimation of Time Since Death ▪ Human V/s Animal Bone morphology o Facial Reconstruction Forensic Odontology o Development of Dental structure o Estimation of Age, Sex & Race o Bitemark Analysis Forensic Pathology o Decomposition – Muscular Physiology o Causes of Death – Asphyxia, drowning, etc. o Time of Death o Post Mortem Examination – wounds, injuries, etc. o Digestive System & digestive paths of macromolecules, enzymes & end products o Undigested stomach contents post mortem o Role of a Forensic Pathologist	**15**
Unit-V	Forensic Entomology o Basic Principle of Insect Biology o Life Cycle o Estimation of Time of Death o Preservation of Sample Forensic Botany o Identification of Plant specimen	**15**

	o Analysis of pollen & aquatic microorganisms o Techniques for dating specimens using plant material o Dendrochronology o Algal colonisation o Application of plant ecology	
Unit-VI	Ecology o Terrestrial environments o Aquatic conditions ▪ Water Chemistry ▪ Temperature control ▪ Chemical cycles ▪ Food chains Endangered plants and animal species	**15**
	Total	**45**
		3 credits

Biological Practical's

	Semester III
1.	Microscopic Comparison of Hair a. Animal Hair b. Human Hair
2.	Microscopic Comparison of Fibres
3.	Presumptive Tests for Blood a. Phenolphthalin Assay b. Benzidine c. Leucomalachite Green (LMG) d. Luminol Test
4.	Confirmatory Tests for Blood

	a. Crystallization Assays
5.	ABO Grouping & Rhesus Factor
	Semester IV
6.	Species Identification from various biological fluids a. Electrophoresis b. Precipitin tests c. Acid Phosphatase test for semen d. Prostate Specific Antigen (PSA)
7.	Microscopic examination for spermatozoa
8.	Detection of Amylase activity a. Starch-Iodine Assay
9.	DNA Extraction & Quantification
10.	Microscopic examination of Pollen and Aquatic microorganism

Reference Books:

Sr.No	Books
1.	Forensic Biology – Richard Li
2.	Practical Skills in Forensic Science – Alan Langford, John Dean et al
3.	Fundamentals of Forensic DNA Typing – John M. Butler
4.	Scientific & Legal Applications of Bloodstain Pattern Interpretation – Stuart H. James

FORENSIC SCIENCE

Paper V

Advanced Forensic Psychology

Title: Paper V: Advanced Forensic Psychology **Max Marks: - 30**
Semester: -III **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	**The Content of Forensic Psychology. (Credits 1)** History of Forensic Psychology(Historical	15

	Perspective) Defining Forensic Psychology. Importance of Forensic Psychology. Services provided by Forensic Psychologists. Forensic Psychology in India.	
Unit-II	**Assessment and Evaluation in Forensic Psychology** **(Psychological Testing) (Credits 1)** What is Psychological Tests? Types of Tests. Characteristics of good test. Tests that are used in Forensic Psychology Assessment. Intelligence Tests. Achievement Tests Personality Tests The MMPI Test.	15
Unit-III	**Applying Social Psychology in the interpersonal** **aspects of legal system. (Credits 1)** Before the trial begins: 1. Effect of police procedure and media coverage. 2. Eye Witness Testing: Problems and Solutions. The Central participation in trial 1. Effect of Attorney, Judges, Jurors, and Defenders	15
	Total	**45**
		3 credits

Title: Paper V: Advanced Forensic Psychology **Max Marks: - 30**
Semester: - IV **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-IV	**Legal Aspects of Forensic Psychology.** (1 Credit) Introduction. Historical Background Survey into Psychological evidence in court.	**15**

	Ethical and Professional Issues The role of Forensic Psychology. Civil cases, Criminal cases.	
Unit-V	**Personality Disorders.** (1 Credit) Defining and Diagnosing Personality Disorders. Odd-Eccentric Personality Disorders. Dramatic-Emotional Personality Disorders. Anxious-Fearful Personality Disorders. Alternative Conceptualization of Personality Disorder.	**15**
Unit-VI	**Stress and Health.** (1 Credit) Stress Factors in the stress reaction. Coping with the stress. Statistics in Forensic Psychology. Descriptive Statistics, Inferential Statistics	**15**
	Total	**45**
		3 credits

FORENSIC SCIENCE

Paper VI

Advanced Digital and Cyber Forensic

Title: Paper VI:Advanced Digital and Cyber Forensic **Max Marks: - 30**

Semester: -III **3 credits (45 lectures)**

Sr. No.	Topic	No. of Lectures
Unit-I	**Computer Forensic**(1 Credit) Introduction to Computer/Cyber Forensic, Cyber Forensic Steps (Identification, Seizure, Acquisition, Authentication, Presentation, Preservation), who is Computer Forensic Expert, Cyber Forensic Investigation Process, The Goal of the Forensic Investigation, Why Investigate(Internet usage exceeds norm, Using e−mail inappropriately, Use of Internet, e−mail, or PC in a non−work−related manner, Theft of information, Violation of security policies or procedures, Intellectual property infractions, Electronic tampering), Establishing a Basis or Justification to Investigate, Determine the Impact of Incident, Auditing V/s Cyber Forensic Investigations	15
Unit-II	**Incident Response**(1 Credit) Introduction to Incident Response Process(What is Computer Security Incident, What are the goals of Incident Resonse, Who is involved in Incident Response Process, Incident Response Methodology, Formulate a Response Strategy, Investigate the Incident.),Preparing For Incident Response, Overview of Pre-incident Preparation, Identifying Risk, After Detection of an Incident.	15
Unit-III	**Cyber Forensic Tools and Utilities** (1 Credit) Introduction,Examining a Breadth of Products ,Cyber Forensic Tools Good, Better, Best: What's the Right Incident Response Tool for Your Organization? , Tool Review Forensic Toolkit, EnCase, Cyber check suites, what is disk Imaging etc. Specifications for Forensic tools Tested	15
	Total	**45**
		3 credits

Title: Paper VI:Advanced Digital and Cyber Forensic Max Marks: - 30
Semester: -IV 3credits (45 lectures)

Sr. No.	Topic	No. of Lectures
Unit-IV	**Evidence Collection and Analysis Tools**(1 Credit) Volatile and Non volatile Evidences collection (Safeback, Gettime, FileList,Filecvt and Excel, Getfree, Swapfiles and Getswap ,GetSlack, Temporary Files), Detailed Procedures for Obtaining a bit stream backup of hard drive, File System (Details of File system,Data Structure Of File System,Data Recovery in Different file system)	**15**
Unit-V	**Concealment Techniques:** (1 Credit) Introduction to Crytography, Types of Cryptographic Algorithms(Secret Key Cryptography, Public Key Cryptography, Hash Function),Electronic Signature, Stegnography, Reversing the Stegnographic Process, Cloaking Techniques(Data Hide and Seek),Renaming Files, Manipulating File System, Data Hiding on NTFS with Alternate data Stream	**15**
Unit-VI	**Biometrics** (1 Credit) Introduction to Biometrics, What is Biometrics, Why use Biometrics, Model of Biometric system Various types of Biometric methods, User Acceptance,Evaluating Accuracy, Advantages & disadvantages General Biometric System (Identification and Verification), General Architecture Comparison of different Biometric Technologies, What makes Biometrics difficult.	**15**
	Total	**45**
		3 credits

Paper VI –List of Practical's

	Semester III
1.	Identification , Sezure ,Search of Digital media
2.	Evidence Collection
3.	Demonstration of various Forensic tools like Partation magic, Encase etc.
4.	Data Recovery , Deleted File Recovery viewing small Disk.
5.	Viewing small disk MBR .
	Semester IV
6.	Demonstration of Concealment Techniques (Cryptography PGP)
7.	Demonstration of Concealment Techniques (Stegnography)
8.	Demonstration of other Concealment Techniques
9.	Formatting NTFS and EX2,EX3.
10.	Case study of Biometric Techniques

Reference Books:

Sr.No	**Books**
1.	Incident Response and Computer Forensic by *Kelvin Mandia*, TMH Publication.
2.	Digital Forensics: Digital Evidence in Criminal Investigations by *Angus McKenzie Marshall*
3.	Cyber Forensic A Field Manual for Collecting, Examining and Preserving Evidence of Computer Crimes by *Albert J Menendez.* Auerbach Publications.
4.	First Responder's Gude to Computer Forensics by *Richard Nolanetal*. - Carnegi Mellon, 2005. Cyber Forensic by *Marecella Menendez.*
5.	Computer Forensic by *Newman*.
6.	Cyber Crime Investigation Field Guide, by *B Middleton*.