

AC 27/2/13
Item No. 4.21

UNIVERSITY OF MUMBAI



Syllabus for Sem V & VI
Program: B.Sc.
Course: Forensic Science

(Credit Based Semester and Grading System with
effect from the academic year 2013–2014)

B. Sc. Forensic Science											
T.Y. Semester V		Class Room Instruction Face to Face									
Course Code	Title	Per Week		15 Week (Per Sem.)		Per Sem. (Hrs.)		Notinal Hrs.		Total Hrs.	
		L (50 min)	P(50 min)	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.
USFS 501	Applied Forensic Science	4		60		50		50		100	
USFS 502	Applied Forensic Chemistry	4		60		50		50		100	
USFS 503	Applied Forensic Physics	4		60		50		50		100	
USFS 504	Applied Forensic Biology	4		60		50		50		100	
USFS 505	Applied Forensic Psychology	4		60		50		50		100	
USFS 506	Applied Digital & Cyber Forensics	4		60		50		50		100	
USFS 5P1	Forensic Science & Forensic Chemistry		4		60		50		12		124
			4		60		50		12		
USFS 5P2	Forensic Physics & Forensic Biology		4		60		50		25		150
			4		60		50		25		
USFS 5P3	Applied Forensic Psychology and Digital & Cyber Forensics		4		60		50		12		124
				60		50		12			
Total		24	20	360	360	300	300	300	124	600	398

**T.Y.B. Sc. FORENSIC SCIENCE
Semester V - Theory**

**USFS501
Applied of Forensic Science**

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with Description	No. lectures
<p>Unit I : Forensic Medicine</p> <ul style="list-style-type: none"> • Medico legal aspects of death: - Diagnosis of death-somatic & molecular, early and intermediate changes following death, late changes after death- putrefaction, autolysis, bacterial action, factors affecting these changes. • Determination of time since death, including by histopathological methods. Medico legal investigation of sexual offences, including examination of victims and suspects. Medico legal aspects of death:- causes of death such as asphyxia, electrocution, thermal trauma, heat burns, starvation, natural death, sudden death, death by accident. • Medico legal aspects of wounds: - medical and legal definition of wounds, types of mechanical and regional injuries, aging of wounds, difference between suicidal, homicidal and accidental wounds. 	15
<p>Unit II: Questioned Documents I</p> <ul style="list-style-type: none"> • Functions of a Forensic Document Examiner: - Required training and education. • Identification of writer of anonymous writings. • Application of Forensic Stylistics/Linguistics in the identification of writer. • Determination of age of documents by examining various factors. • Identification and comparison of typescripts: - Identification of typist, alterations in typed text. Various types of typewriting devices: - examination of typewriters with proportional letter spacing, electronic typewriters . • Examination of alterations, erasures, overwriting, additions and obliterations. 	15
<p>Unit III Questioned Documents II</p> <ul style="list-style-type: none"> • Paper & watermark examination: - Paper size and thickness, paper opacity, color and brightness, understanding watermarks. • Decipherment of secret writings, indentations & charred documents. • Physical comparison of documents, examination of seal 	15

<ul style="list-style-type: none"> • rubber & other mechanical impressions. • Examination of counterfeit currency notes. • Various types of printer identification. 	
Unit IV : Procedural Criminal Law & Policing System	15
<ul style="list-style-type: none"> • Scientific Report writing: - Components of reports and report format relating to Crime Scene and Laboratory findings. • Stages in criminal proceedings: - FIR, Investigation, prosecution and trial stage. • Remand and bail processes. • Crimes under Special and Local laws: - Crimes under Dowry Prohibition Act, Crimes under Immoral Traffic Act, Specific offences under the Indian Penal Code. (Homicide, sexual offences, offences against property). • Classification of offences: Cognizable and Non cognizable offence, bailable and non bailable offences, compoundable and non-compoundable offences. • Role of media, Role & Functions of Police. 	

USFS502

Applied Forensic Chemistry

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with Description	Total Lectures
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Semester-V	
Unit –I: Separation And Detection Techniques	15
<ul style="list-style-type: none"> • Introduction to chromatographic techniques: Paper chromatography, Thin Layer Chromatography, Column Chromatography. • Gas chromatography: Theoretical Principles, Instrumentations And Technique, Columns, Stationary Phases, Detectors, Forensic Applications. • HPLC: Review Of Theory, Instrumentation, Technique, Column, Detectors, LC-MS, Forensic Applications. • Atomic Absorption Spectroscopy: Introduction, Basic principles, Instrumentation and Techniques, Forensic applications. • Flame spectrometry: Principle, Instrumentation And Working, Forensic Applications. • Inductive Coupled Plasma Spectroscopy: Principles And Instrumentation, Forensic Applications. • Thermal methods: TGA, DTA, DSC. 	
Unit-II: Forensic Toxicology	15
<ul style="list-style-type: none"> • Introduction And Concept Of Forensic Toxicological Examination And Its Significance • Poisons: Classification Of Poisons, Types Of Poisoning, Collection And Preservation Of Toxicological Exhibits In Fatal And Survival Cases, Signs And Symptoms Of Poisoning, Mode Of Action And Its Effect On Vital Functions, Medico-Legal And Postmortem Examination Report/Finding Studies, Specific Analysis Plan/ Approach To Toxicological Examination Of Poisoning Samples, Excretion Of Poisons, Detection Of Poisons On The Basis Of Their Metabolic Studies, Interpretation Of Analytical Data And Forming Of Opinion. 	
Unit-III: Miscellaneous	15
<ul style="list-style-type: none"> • Polymers: Introduction-General Idea Of Structures, Types, Tacticity, Polymerization Processes With Examples, Radical And Ionic Mechanism Of Polymerization, Structure, Preparation And Applications Of Polyethylene (Types And Ziegler-Natta Process), Teflon, PVC, Polystyrene, General Idea Of Plasticizers, Stabilizers, Fillers, Epoxy Resins, Feviseal. • Plastics: Classification Of Plastics, Application Of Plastics. • Rubber: Types Of Rubber, Vulcanisation Of Rubber, Synthetic Rubbers, • Fibres (Synthetic Fibres): Classification, Properties, Polyamides-Nylon, Polyesters: Terylene Or Dacron. • Fibre Reinforced Plastics: Types, Properties, Applications. • Glass Fibre Reinforced Plastics: Properties, Applications. 	
Unit-IV: Legal Aspects In Forensic Chemistry	15
<ul style="list-style-type: none"> • The Poisons Act, 1919, And Section 284 Of IPC, 1860 (Negligent Conduct With Respect To Poisonous Substance). 	

<ul style="list-style-type: none"> • Explosives Act 1984, (Definition, Powers Of Central Govt. And Licensing Authority, Offences And Penalties) And Section 286 Of IPC, 1860, (Negligent Conduct With Respect To Explosive Substance) • Explosive Substances Act 1908, (Definition, Offences And Penalties). • The Industries (Development And Regulation) Act, 1951 	
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USFS503

Applied Forensic Physics

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with Description	Total Lectures
Unit – I: Experimental Techniques	15 lectures
<u>Magnetic Measurement</u> : magnetic susceptibility, <u>Electric Measurements</u> : Hall voltage, Resistivity measurement & FET characteristics, <u>Radiation Detection</u> : Geiger Muller counter, Piezoelectricity and piezoelectric measurements Optical Fibre Communication system.	
Unit-II: Forensic Photography	
<u>Forensic Photography</u> : Introduction, 35 mm film / Digital SLR camera, Digital photo imaging, ISO number, Exposure Index, Photo imaging evidence; angle, scale, depth of field, light, ambient light, color temperature, flash/ strobe. Crime scene investigation report writing.	
Unit –III: Forensic Microscopy	15 lectures
Basics of microscope, parts functions and properties of: Compound microscope, Comparison microscope, Stereomicroscope, Polarizing microscope, polarization and applications, Micro spectrophotometer, Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM).	
Unit – IV: Forensic Applications in Trace Analysis	15 lectures
Review of physical properties of materials: temperature, weight and mass, density, refractive index; methods of comparing refractive indices, Composition of glass, Comparison of glass fragments, Measuring and comparing density and refractive index of glass, classification of glass samples, Glass fractures, Collection and preservation of glass evidence. Forensic analysis and examination of soil, the significance of soil evidence, Variations in soil, Collection and preservation of soil evidence. Fibre: Types, Identification and comparison of manufactured fibres (Microscopic examination, Dye composition, Chemical composition,	

USFS504

Applied Forensic Biology

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with description	Total lectures
UNIT I: FORENSIC SEROLOGY	15 lectures
<ul style="list-style-type: none"> • Determination of human and animal origin from bones, hairs, nails, skin, body tissue, and fluids strains viz. blood, menstrual blood, semen, saliva, sweat, pus, vomit, etc., through immune diffusion and immune – electrophoresis. • Serogenetic markers: - Blood groups – biochemistry and genetics of ABO, Rh, Mn systems, blood specific ABH substances, determination of secretor / non secretor Lewis antigen, Bombay Blood group, • Polymorphic enzymes typing – PGM, GLO, ESD, EAP, AK, ADA, etc., and their forensic significance, HLA typing, role Serogenetic markers in individualization, paternity disputes etc. 	
UNIT II: WILD LIFE FORENSIC	15 lectures
<ul style="list-style-type: none"> • Introduction and importance of wild life, Protected and endangered species of Animals and Plants. • Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants by conventional and modern methods. Identification of Pug marks of various animals census of wild life population. • Birds’ flight and means of locomotion, Strikes and collisions, Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts. • Applications of Forensic Ornithology, Feather structure and topography. 	
UNIT III: FORENSIC ORNITHOLOGY	

<ul style="list-style-type: none"> • Birds' flight and means of locomotion, Strikes and collisions, Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts. • Applications of Forensic Ornithology, Feather structure and topography. 	15 lectures
UNIT IV: FORENSIC MICROBIOLOGY AND PALYNOLOGY	
<ul style="list-style-type: none"> • Development of forensic microbiology, Types and identification of microbial organisms/ fungi of forensic significance, Techniques in forensic microbiology. • Understanding Bioterrorism: - Types of biological agents – Category A, B, C. Planning and response to bioterrorism – Preparedness, Biosurveillance, Biodefence. • Epidemiology of Bioterrorism, Punishments for Bioterrorism act under Prevention of Terrorism Act, 2002. Study of spore, powdered minerals and pollens of forensic importance, Use of pollen grains & spores in criminal or civil investigation, Applications of Forensic Palynology. 	15 lectures

		Marks 100	
Units with description		Lectures per week	Credits
		4	2
		Total Lectures	
UNIT I: Essentials of Forensic Psychology		15 Lectures	
<ul style="list-style-type: none"> • Development of forensic psychology • Ethical standards of forensic psychology • Scientific methods used in forensic psychology 			
UNIT II: Causes of criminal behavior and Psychological theories		15 Lectures	
<ul style="list-style-type: none"> • Psychological Factor & delinquency • ADHD & conduct disorder • Psychopathy & antisocial personality disorder • Sexual disorder • Substance abuse • Treatment 			
UNIT III: Investigative psychology		15 Lectures	
<ul style="list-style-type: none"> • Psychological autopsy • Forensic hypnosis (Narco analysis) • Polygraph • The Psychology of violence 			
UNIT IV: Theory and technique		15 Lectures	
<ul style="list-style-type: none"> • Importance of study of forensic psychology. • REBT • Criminal psychological profiling-Nature, definition 			

Applied Digital and Cyber Forensics

	Lecture Per Week	Credits
	4	2
Units with Description	Total lectures	
UNIT I: Data and Evidence Recovery	15 Lectures	
<p>Computer and cyber forensic basics, Cell Phone / Mobile Forensics, Data and Evidence Recovery-Formatted Partition Recovery, Data Backup and recovery, Backup Obstacles, Role of Backup in Data recovery, Data Recovery Procedures and Ethics,</p> <p>Evidence Collection and Data Seizure: Need of Evidence, Collection Options, Obstacles, Type of Evidence, Rules of Evidence, General Procedure for collecting and analysing evidence,</p> <p>Preserve and safely handle original media, Chain of Custody.</p>		
UNIT II: Cyber Forensics Investigation	15 Lectures	
<p>Digital Investigations and Evidence: Digital crime scene investigation process, General Guidelines for Investigation, Data Analysis, Essential and Non Essential Data, Hard Disk Technology (Hard disk Geometry and Internals), Hard disk data Acquisition: General Acquisition Procedure, Data Acquisition layers.</p> <p>Dead versus Live Acquisition, Hardware Write Blockers, software Write Blockers</p> <p>Digital Media Forensics.</p>		
UNIT III: E-Mail Investigation		
<p>Network based Acquisition Investigation Tools</p> <p>E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences from email ,</p>		

<p>Technical issues – Security Technologies: Certification and key Distribution, Cryptographic Applications, Digital Signature Protocols for Transactions, SSL-Secure Socket Layer, SET-Secure Electronic Transaction. Security Issues– Types of Attacks(Active and Passive) Stealing Passwords, Social Engineering, Bugs and Backdoors, Illegal accessing, Authentication Failures, Protocol Failures, Information Leakage, Viruses and Worms, Denial-of-Service, etc</p>	<p>15 Lectures</p>
<p>UNIT IV: Security Issues</p>	<p>15 Lectures</p>
<p>Firewalls, Packet Filters, Application-Level Filtering, Circuit-Level Gateways, Dynamic Packet Filters, Distributed Firewalls; Digging for Worms, Packet Filtering, Implementing policies (Default allow, Default Deny) on proxy, etc., Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Threats, crimes, etc.;</p> <p>Why require a security? Picking a Security Policy, Strategies for a Secure Network,</p> <p>The Ethics of Computer Security, Security Threats, and levels, Security Plan (RFC 2196)</p>	

Practical
Semester-V

USFS5P1: Applied Forensic Science and Applied Forensic Chemistry

Total Marks: 100

Lecture Per Week	Credit
8	2.5

Part A: Applied Forensic Science

PRACTICAL	No. of Practical
1. Identification of Handwriting characteristics (General and Individual characteristics.)	1
2. Detection of various type of forgery.	1
3. Identification of Indented writing.	1
4. Identification of Invisible writings.	1
5. Identification and examination of typescripts.	1
6. Examination of build up documents.	1
7. Physical comparison of documents, examination of seal rubber & other mechanical impressions	1

Part B: Applied Forensic Chemistry

	PRACTICAL	No. of Practical
1	Separation of Sampling Material by TLC (drugs, poison etc.)	2
2	Identification of food adulteration.-vegetable oil, Cold drinks etc.	2
3	Quantitative or qualitative study of drug opiates.	2
4	Examination of fire arson cases by GC, TLC	2
5	Detection and determination of various adulterants in alcohol, by colour tests.(Qualitative Analysis)	2
6	Chemical analysis of explosive materials.(Gun powder)- Colour test,	2

	Microscopic examination.	
7	Analysis of alcohol from blood (quantitative by GC).	2

USFS5P2: Applied Forensic Physics and Applied Forensic Biology

Total Marks: 100

Lecture Per Week	Credit
8	3

Part A: Applied Forensic Physics

Sr. No.	Practical	No. Of Practical
1	Comparison of glass fragments and Study of fractures in forensic material.	1
2	Examination of soil sample	2
3	Determination of density of a given sample.	1
4	Determination of refractive index of a transparent material.	2
5	To study the effect of magnetic field on aqueous solution of paramagnetic salt	2
6	Measurement of resistivity by four probe method	1
7	Measurement of Hall voltage	1
8	Working with Geiger Muller counter	1
9	Working with Compound microscope and Working with Comparison microscope	2
10	Working with Stereomicroscope and Working with Polarizing microscope	2
11	Working with Micro spectrophotometer	1
12	Development of 35 mm photograph	1

Part B: Applied Forensic Biology

Sr. No.	Practical	No. Of Practical
1	To determine titre of antisera.	1
2	To perform precipitin test for species of origin determination	1
3	To perform Immunodiffusion test for species of origin.	1
4	To perform electrophoresis for separation of various polymorphic enzymes.	1

5	Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption inhibition, Absorption-elution and mixed agglutination technique, determination of Secretor/non secretor status	3
6	Identification and culture of bacteria of forensic significance.	1
7	Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers plants.	3
8	Identification of birds from feathers.	1
9	Study of pollen grains and spores of forensic significance.	1
10	Examination of hair of different animals such as Dogs, Cats, Cow, Horse, Goats etc.	1
11	Separation& detection of biological fluid by using HPLC.	1

USFS5P3: Applied Forensic Psychology and Applied Digital and Cyber Forensics

Total Marks: 100

Lecture Per Week	Credit
8	2.5

PartA:Applied Forensic Psychology

Practical	No. Of Practical
Minnesota multiphasic personality inventory	3
Standard progressive matrices by Raven./ Koh's Block test/Alexander Pass Along test	2
Picture Frustration study by Rosenswieg (Adult form)	2

Part B: Applied Digital and Cyber Forensics

Sr. No.	Practical	No. of Practical
1	Data Recovery integrated with forensic technology	2
2	Mobile Forensic using cell phone forensic suit	2
3	Computer Forensic Investigation Tools, Digital Forensics investigation Tools	2

4	Live Acquisition, Hardware Write Blockers, software Write Blockers	2
5	Creation & verification of Digital Signature	2
6	Hardware Data Recovery-Salvation DATA Tools	2

B. Sc. FORENSIC SCIENCE
Semester VI - Theory

USFS601
Applied of Forensic Science

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with Description	No. lectures
Unit I: Crime Scene Management, Reconstruction & Crime Scene Analysis	15
<ul style="list-style-type: none"> • Components of Crime Scene Management – Information management, manpower, technology & logistics management, role of crime scene managers and first responding officers, educational background & hierarchy. Understanding crime scene security, contamination control, documentation protocols and maintaining health & safety procedures. • Crime Scene Reconstruction: - defining crime scene reconstruction, nature & stages of crime scene reconstruction, reconstruction based on blood spatter patterns, shooting range of firearm projectile and gunshot residue, linking cases by MO and Signatures. • Defining Crime Scene Analysis, interpretation of exhibits, role of a crime scene analyst, theory & principles of analysis, arguments and ethics in crime scene analysis and data interpretation. 	
Unit II: Global History & Development of Forensic Science & Other National Agencies	15
<ul style="list-style-type: none"> • Global perspective in the field of forensic science: - history, development, education and training. • Organizational setup of forensic science lab and other national & international agencies: - FSL, CFSL, GEQD, FPB, NICFS, CID,CBI, Central Detective Training Schools, NCRB, NPA, • Mobile Forensic Science Laboratories, IB, CPO, FBI, 	

<p>CIA, CSI, DAB, DEA, Bureau of Alcohol, Tobacco and Firearms.</p> <ul style="list-style-type: none"> • Understanding the role and duties of criminal investigators, qualification of a forensic scientist. • Ethical Issues in Forensic Science: - defining ethics, professional standards for practice of criminalistics, code of conduct for expert witnesses, sanction against expert for unethical conduct. 	
<p>Unit III : Quality Management System</p>	15
<ul style="list-style-type: none"> • General requirements for standardization and calibration of laboratories: - Introduction, scope and need of standardization. • Quality management requirements: - Testing and calibration procedures, total quality assurance, quality control, quality planning, Resulting and report writing. • Quality Audit:-Internal & External Audit, Accreditation & certification, NABL, ISO, IEC, BIS, ASCLD/LAB, ABC, IAI. • Laboratory management procedures: - Lab information management system, validation of equipments and safety protocols. 	
<p>Unit IV Medical Jurisprudence</p>	15
<ul style="list-style-type: none"> • Global Medical Jurisprudence, Legal Procedure in India: - Police inquest, Magistrate's inquest, Coroner's inquest, Oath and affirmation. • Documentary evidence: - Medical certificates, medical reports, dying declaration. • Understanding laws and ethics of medical practice. 	

Applied Forensic Chemistry

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with Description	Total Lectures
Semester-VI	
Unit-I: Narcotic Drug And Psychotropic Substances	15
<ul style="list-style-type: none"> • Analysis Of Narcotic Drugs And Psychotropic Substances, Drug Effects, Drug Hazards, Tolerance And Dependence Of Drugs, Problems Of Drug Addiction, Identification Of Drug Addict, Drug Addicts And Crimes, Classification Of Narcotics And Other Drugs, Analytical Techniques For Identification Of Drugs. • Types Of Pharma Drugs, Steroids, Forensic Pharmacological Studies, Ingestion Of Drugs, Absorption, Distribution, Metabolism, Pathways Of Drug Metabolism, Drug Metabolism And Drug Toxicity, Excretion Of Drugs. 	
Unit-II: Study Of Analysis Of Beverages	15
<ul style="list-style-type: none"> • Introduction, Definition Of Alcohol And Illicit Liquor, Alcoholic And Non-Alcoholic Beverages And Their Composition, Proof Spirit, Absorption, De-Toxification And Excretions Of Alcohol, Problems In Alcohol Cases And Difficulties In Diagnosis, Alcohol And Prohibition, Consequences Of Drunken Driving, Analytical Techniques In The Analysis Of Alcohol And Other Articles. Case Study. 	
Unit-III: Miscellaneous	15
<ul style="list-style-type: none"> • Arson: Chemistry Of Fire, Investigation And Evaluation Of Clue Material, Analysis Of Arson Exhibits By Instrumental Methods: Management Of Arson Cases. • Food Adulteration: Introduction, Prevention Of Food Adulteration, Analytical Techniques For Analysis Of Exhibits Involved In Food And Other Material Cases. 	
Unit-IV: Legal Aspects In Forensic Chemistry	15
<ul style="list-style-type: none"> • Prevention Of Food Adulteration Act 1954 (Definition, Power Of Food Inspector, Offences And Penalties), • Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation, Minimum And Commercial Quantity In Narcotic Drugs, Offences And Penalties), • Prevention Of Illicit Trafficking In NDPS Act 1985 (Detention Of A Person Under The Act), 	

<ul style="list-style-type: none">• Drugs Control Act 1940 (Definition, Power Of Chief Commissioner Under The Act),• Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs And Cosmetics, Offenses And Penalties),• Arson Cases.	
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USFS603

Applied Forensic Physics

Total Marks 100	
Lecture Per Week	Credit
4	2

Units with Description	Total Lectures
<p>Unit – I: Exterior Ballistics</p> <p>Introduction, General consideration, Parabolic trajectory of a bullet, Vacuum trajectory and calculation of remaining velocity, Air resistance, Bullet drop, Wind deflection, Gyroscopic drift, Twist versus stability, Canting, Shooting up/down, Velocity of falling shot and falling bullet, Escape velocity, Maximum horizontal and vertical range of shot pellets, Ricochet; Critical angle for ricochet for the bullet and the surface, Relationship between the angle of incidence and ricochet, Stability in flight after ricochet, Lethal effects of ricochet bullet.</p>	15 lectures
<p>Unit – II: Terminal (Wounds) Ballistics</p> <p>Introduction, stopping power of bullet, Injuries and the quantity of energy of projectiles, Shock wave and cavitation effect, Wounding mechanism, Elements of wound Ballistics; Nature of target, Velocity of projectile, Constructional features of projectile. Range; Classification of range (maximum horizontal/vertical, effective, dangerous, safe and legal sense), Contact Range, Point blank range, near range, chips range, distant range. Penetration of shots in different regions of the body. Legal Aspect: Arms Act, 1950, (Licensing, Offenses and Penalties).</p>	15 lectures
<p>Unit – III: Causes and Investigation of Vehicular/Road Accidents- an overview</p> <p>Automobile accidents- Introduction, sources of information, eye witnesses, Tire and other mark, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, curved scuffmarks, Time and distance, reaction time, Photography and plans; Legal Aspects: 1. Relevant Provisions of Motor Vehicle Act, 1939 (Offenses and Penalties). 2. Relevant Provisions of Railway Act, 1989, (Offenses and Penalties).</p>	15 lectures
<p>Unit – IV: Causes and Investigation of Rail Accidents- an overview</p> <p>Rail Accidents- Investigation of rail crash: criminal and safety</p>	15 lectures

investigation, Investigation principles, Best Practices: rail company tests, inspection of driving cab, examination of electrical/electronic/technological system and their failure. Necessary equipments required for forensic examination.

Legal Aspects:

Relevant Provisions of Indian Penal Code, 1860, (Sections 337 (causing hurt), 304 A (causing death due to negligence) and 279 (rash and negligent driving)).

Applied Forensic Biology

Marks 100	
Lectures per week	Credits
4	2

UNIT I: DNA PROFILING AND ITS FORENSIC SIGNIFICANCE	
<ul style="list-style-type: none"> • History of DNA fingerprinting, Human genetics – Heredity, Alleles, Mutations & Population Genetic, Molecular Biology of DNA. Forensic Application of recombinant DNA technology/ Forensic Biotechnology, Human Genome Project. • Polymorphism in DNA system – DNA markers RELP, RAPD, VNTRs, SNP, Autosomal – STR, Y-STR, Mitochondrial DNA. • Forensic Significance of DNA Profiling: - Application in disputed paternity cases, child swapping, Missing person’s identity – immigration, veterinary & wild life and Agriculture cases, legal perspectives – legal standards for admissibility of DNA profiling, procedural and ethical concerns, status of development of DNA profiling in India and abroad. • New and future technologies: DNA chips, SNPs and limitations of DNA profiling. 	15 lectures
UNIT II: FORENSIC ANTHROPOLOGY	
<ul style="list-style-type: none"> • Introduction & History of Anthropology, Physical Anthropology & Human Variability, Understanding Archeology & Osteology, Scene Processing, Examining remains – Human or Animal / Old or New, Issues involved in development of biological profile, Issues in Identification, , Sexual Dimorphism, Population Ancestry, Stature estimation, Individualization & Identification, Evidence for cause and manner of death from bones, Documentation & Expert Witness Testimony. Portrait Parle, Bertillon system. 	15 lectures
UNIT III: FORENSIC ODONTOLOGY	

<ul style="list-style-type: none"> • Introduction & History of Odontology, Dental Training required, Expert Witness Testimony, Body Identification by Dental Records, Post Mortem Examination & Records, Ante mortem examination & records, Record Analysis & Processing, Forensic Dentistry in Mass Disasters, Response of Assailant or Victim, Collection of Bite mark evidence & comparison. 	15 lectures
UNIT IV: FORENSIC ENTOMOLOGY	
<ul style="list-style-type: none"> • Introduction & History, Identification of insects, Training required, Determination of Time elapsed since death, Dipterans Larval Development, Successional Colonization of Body, Determination of displacement and disturbance of the body, Presence and Position of wounds, • Drugs consumption ante mortem, Human & Animal neglect or abuse, Collection of entomological evidence, Challenges encountered in Entomology, Report Submission, Testifying in Court. 	15 lectures

		Marks 100	
		Lectures per week	Credits
		4	2
Units with description		Total Lectures	
UNIT I: Police psychology		15 Lectures	
<ul style="list-style-type: none"> • Psychological testing & selection of police officer: aptitude test, intelligence test, personality test. • Fitness for duty evaluation • Police suicide 			
UNIT II: Counselling:		15 Lectures	
<ul style="list-style-type: none"> • Nature ,definition & scope • Type of counselling: legal, crisis, preventive • Characteristics of a counselor • Skill to counsel criminal 			
UNIT III: Rehabilitation		15 Lectures	
<ul style="list-style-type: none"> • Rehabilitation of victim of crime • Type of rehabilitation • Stress & stress management 			
UNIT IV: Psychology & court		15 Lectures	
<ul style="list-style-type: none"> • Competency to stand trial • Insanity • Mc Naughten rule • Sentencing evaluation • Risk assessment 			

USFS606

Applied Digital and Cyber Forensics

Marks 100	
Lectures per week	Credits
4	2

	Lecture Per Week	Credits
	4	2
Units with Description	Total lectures	
Unit I: Electronic World	15 Lectures	
E-Governance, Introduction, IT and business, EDI, E-Business, E-Banking, Real Time Gross Settlement (RTGS), Mobile Banking E-commerce: Concerns for E-commerce Growth, Concepts Electronic Communication, PCs and Networking, E-mail, Internet and intranets. EDI, EDI to E-commerce, UN/EDIFACT Concerns for E-commerce Growth, Internet bandwidth, Technical issues, Security issues. India E-commerce Readiness, Legal issues, Credit Card Business Electronic Commerce providers. Cyber Cash, Digicash, VeriSign Software Package: EDI software developed by NIC for Customs		
Unit II: Forensics Auditing	15 Lectures	
Forensics auditing – step-by-step, how-to process for securing, investigating, and auditing or assessing various IT environments. Introduction to Forensic Accounting: Introduction to Forensic Accounting and Fraud Examination; Principles of Forensic		

<p>Accounting and Fraud Examination; Roles of the Forensic Accountant; Introduction to Fraud and Forensic Accounting; Resolution of Fraud, Legal Follow-Up, Being an Expert Witness; Financial Statement Fraud Standards; Avoiding common mistakes in fraud risk assessment and examination; Credit Card Frauds, Online Transaction Frauds, Cheque Frauds etc.</p>	
<p>Unit III Types of Fraud</p>	
<p>The Nature of Fraud, Why People Commit Fraud, Fighting Fraud, Fraud Prevention, Fraud Detection, Recognizing the Symptoms of Fraud; Data-Driven Fraud Detection, Fraud Investigation, Investigating Theft Acts; Investigating Concealment, Conversion Investigation Methods; Private Sources of Information, Inquiry Methods and Fraud Reports Honesty Testing, The Fraud Reports, Management Fraud; Financial Statement Fraud; Revenue-and Inventory-Related Financial Statement Frauds; Liability, Asset, and Inadequate Disclosure Frauds; Fraud Against Organizations, Consumer Fraud; Identity Theft, Investment Scams, Money Laundering; Bankruptcy, Divorce, and Tax Fraud, Fraud in E-Commerce;</p>	<p>15 Lectures</p>
<p>Unit IV: Information Technology Law</p>	<p>15 Lectures</p>
<p>IT Act 2000: Scope, Objectives, E- Governance, Creation, Recognition and Verification of Digital Signature Digital Signature and Penalties under IT Act 2000, Certifying Authority and Controller. Emerging trends in Information Technology law.</p>	

Practical

Semester VI

USFS6P1: Applied Forensic Science and Applied Forensic Chemistry

Total Marks: 100

Lecture Per Week	Credit
8	2.5

Part A: Applied Forensic Science

Practical	No. of Practical
1. Calibration of Glassware	1
2. Reconstruction based on blood spatter patterns	1
3. Report writing and interpretation	1
4. Presentation of expert evidence in a mock courtroom	1
5. Crime Scene Sketching using Triangulation method	1
Industrial visit report Project: Review of latest publish papers	

Part B: Applied Forensic Chemistry

	Practical	No. of Practical
1	Extraction methods of drugs, Poisons.	2
2	Colour Tests for identification of poisons, drugs.	2
3	Plant, animal, Metallic poison analysis.	2
4	Polymer Testing.	2

5	Study of Steroids (separation by TLC).	2
6	Examination of chemicals used in Trap cases by UV-visible spectroscopy. (2 nos).	2
7	Examination of other metal.	2

USFS6P2: Applied Forensic Physics and Applied Forensic Biology

Total Marks: 100

Lecture Per Week	Credit
8	3

Part A: Applied Forensic Physics

Sr. No.	Practical	No. Of Practical
1	Examination of tire/ other marks	2
2	Study of scuffmarks	1
3	Analysis of accident scene photography and Physical examination accidental vehicle	2
4	Testing and examination of given electric components / parts / circuits	2
5	Working with communication kit and Optical fiber parameters	1
6	Simulation of bullet trajectory	1
7	Measurement of recoil (Sample calculations) and Determination of remaining velocity (Sample Calculations)	1
8	Twist versus muzzle velocity (Sample Calculations) and Muzzle velocity (Sample Calculations)	1
9	Determination of remaining velocity (Sample Calculations)	1
10	Identification of firearm injury	3
11	Piezoelectric measurements	1
12	Fiber strength measurements	2

Part B: Applied Forensic Biology

Sr. No.	Practical	No. of Practical
1	Extraction and isolation of DNA from blood.	1
2	Identification of orders of insects and other arthropods of forensic significance	1

3	Determination of age from skull sutures.	1
4	Determination of age from Teeth.	1
5	Determination of sex from skull.	1
6	Determination of sex from Pelvis.	1
7	To examine Barr bodies from blood sample	1
8	Quantitative estimation of DNA / RNA by using UV –visible spectrophotometer	1
9	Quantitative estimation of protein by using UV –visible spectrophotometer	1
10	Separation of protein by using SDS-PAGE Electrophoresis	1
11	Restriction Digestion of Genomic DNA	1
12	Ligation of DNA by using T4 DNA ligase	1
13	Bacterial transformation and screening of transformed bacterial cells.	1
14	Study the germination pattern of pollen grain and spores of forensic significance	1

USFS6P3: Applied Forensic Psychology and Applied Digital and Cyber Forensics

Total Marks: 100

Lecture Per Week	Credit
8	2.5

Practical	No. of Practical
1. 16.P.F. by R.B. Cattle	2
2. Nonverbal test of intelligence by Dr. Nafde.	2
3 Differential aptitude test. 1. Abstract reasoning 2. Numerical 3. Spatial 4. Verbal 5. Verbal 6. Clerical 7. Mechanical 8. Differential aptitude test. 9. Measuring Locus of control .	3

Part A–Applied Forensic Psychology

Part B: Applied Digital and Cyber Forensics

Sr. No.	Practical	No. of Practical
1	Network Analysis	2
2	Detail Analysis of E-mail, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery	2
3	Working on EnCase Software	2
4	Imaging of discs using various tools	2
5	E-Commerce (E-shopping of any product to understand the	2

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