

A. C. 10/2/2012

Item No. 4.19

# UNIVERSITY OF MUMBAI



**Syllabus for M.Sc. (Forensic Science)**

**Semester I &II**

**Program: M.Sc.**

**Course : Forensic Science**

(Credit Based Semester and Grading System with  
effect from the academic year 2012–2013)

## **Preamble**

### **M.Sc. (Forensic Science)**

**Ordinance ....:- Title of the Programme:- M.Sc. Forensic Science**

**Ordinance ...:- Eligibility :- B.Sc. Forensic Science, Any Science Degree with P. G. Diploma in Forensic Science and Related Laws OR P. G. Diploma in Digital and Cyber Forensics and Related Laws.**

**Regulation No.--- :- Duration :- Two Years.**

**Regulation No.--- :- Intake Capacity :- 20 Seats as per following Details**

**I) 14 seats shall be reserved for the student holding a B.Sc. Forensic Science degree from Mumbai University,**

**II) 2 Seats shall be reserved for candidate holding Science Degree with P. G. Diploma in Forensic Science and Related Laws**

**III) 2 Seats shall be reserved for candidate holding Science Degree with P. G. Diploma in Digital and Cyber Forensics and Related Laws.**

**IV) 2 Seats shall be reserved for the student holding a B.Sc. Forensic Science degree from other University**

**If any seat remains vacant then it will be allotted to candidate pertaining to criteria I) above further vacant seat/s if any will be allocated to waitlist candidate belonging to criteria II or then to criteria III or to then to criteria IV .**

**Regulation No.--- :- Teacher Qualifications :- As per the U.G.C./State Government Norms and Experts from the Forensic Science Field and Related Industry with minimum Ten years of experience.**

**M.Sc. FORENSIC SCIENCE**  
**SEMESTER 1**  
**PSFS 101**  
**ADVANCED CRIMINALISTICS**

| Marks 100         |         |
|-------------------|---------|
| Lectures per Week | Credits |
| 4                 | 2       |

**Unit I : Crime Scene Investigation & Management**

Crime Scene Investigation (CSI): Types of crime scenes: indoor, outdoor, mobile, & hydro. Physical evidences, Crime scene search methods, Recovery & packaging of evidences, Crime scene documentation: Notes taking, Sketching, Photography & Videography. Preservation of evidences. Various Crime Scenes: Homicide, Suicide, Accidents (Vehicular, Train, Air-crash, Industrial etc), Mass Murders, House Breaking and Theft (HBT), Dacoity, Cybercrimes, Terrorism, etc. Crime Scene Management (CSM): Introduction & Components: Information, Manpower, Technology & Equipment and Logistics Management. Role of various experts at crime scene. Security, safety and preservation of crime scene. Contamination control. Scene Survey and initial documentation. Co-ordination amongst various agencies involved in investigation. Co-ordination of Interstate investigation agencies. Evidence recovery log. Chain of custody. Forwarding & Authorization letters and relevant paper work. National & International scenario on Crime Scene Investigation (CSI) and Crime Scene Management (CSM). Report Writing and Evidence Evaluation: Components of reports and Report formats in Crime Scene and Laboratory findings. Constitutional validity of Forensic Evidence, Expert Testimony: Admissibility in court of law, Pre-Court preparations & Court appearance,.

**Unit II : Fingerprinting & Other Impressions**

History and development of fingerprints. Formation and variation of ridges at various stages of life. Factors affecting fingerprint patterns. Classification of fingerprints; Henry system, single digit, extension of Henry system. Fingerprint bureau. Poroscopy & Edgescopy. Sweat analysis. Conventional methods of latent fingerprint development: fluorescent method, magnetic power method, fuming method, chemical method etc. Recent techniques: digital imaging and enhancement, Laser and other radiation based techniques, Metal deposition method. Development and preservation of latent print on skin: Living and Dead. Photography and image processing of fingerprints. Comparison of fingerprints: Class characteristics, individual characteristics, ridge tracing and ridge counting. Automated fingerprint identification system (AFIS): History, developments and components, Latent print and high quality image processing. Types of AFIS searches and reports. Footprints: Importance, Gait pattern analysis, Evaluation and analysis of various casts. Electrostatic lifting of latent footprints and comparison with reference sample. Tyre marks / prints and skid marks and comparison with control samples. Cheiloscopy: Nature, location, collection and evaluation of lip print. Ear prints: Introduction, growth & development, evaluation and analysis of ear print. Tool marks & Mechanical fits:

Introduction, nature, location, collection and comparison of tool marks. Introduction and types of mechanical fits. Forensic significance of various impression marks and its accountability in criminal investigation.

### **Unit III: Bloodstain Forensics & Crime Scene Reconstructions**

Bloodstain Pattern Analysis (BPA): History perspective of bloodstain evidence, Introduction, Terminologies and classification, Biological and physical properties of human blood, Droplet Dynamics in Flight and on Impact, Droplet Directionality from bloodstain patterns, Determination of Point of Convergence and Point of Origin. Impact spatter and mechanisms. Concept of Preponderant Stain size, Spatter associated with a projection mechanism. Altered bloodstain patterns. Formation of spatter and spatter associated with a secondary mechanism. Documentation and Evaluation of bloodstain evidence. Importance and Legal aspects of BPA. Manual and Computer-assisted reconstruction of BPA. Dealing with risk of bloodborne pathogens. Crime Scene Reconstruction(CSR): Nature & Importance of CSR. Basic Principles & Stages involved: Data Collection, Conjecture, Hypothesis formulation, Testing & Theory formation. Types & classification of reconstruction. Pattern evidence & Shooting scene reconstruction. Role of Logic in CSR. Writing a Reconstruction report. Correlation of crime scene analysis with behavioral analysis. Cases of Special Importance pertaining to forensic examination.

### **Unit IV: Research Methodology & Statistics in Forensic Science**

Introduction and types of Research Report. Introduction to Research Methodology: Definition, concept and research. Research Design: Experimental and Non-Experimental. Review of Literature: Research Reading, Critical Reading, Consulting Source Material. Components of a Research report: Title, Authors and addresses, Abstract, Summary, Synopsis, key words, General Introduction, Materials and Methods, Results, discussion, Conclusions, Acknowledgements, Appendixes. References: Different Systems of Citing References; Harvard system and Vancouver system. Bibliography. Copyright and Plagiarism issues. Footnotes. Report formatting and typing. Statistics: Types of Data, Populations & Samples, Frequency distribution, Measure of location: Mean, median and mode. Measures of dispersion: Range, Mean deviation and standard deviation. Correlation and Regression analysis. Probability: Theory& Fundamentals, Aleatory probability, Binomial probability, Poisson probability, Empirical probability. Theorems- Baye's Theorems, Addition and Multiplication Theorem, Conditional and Coincidence Probabilities. Coefficient of Variation. Binomial and Normal distribution. Derivation and evaluation of evidence by discriminating powers. Transfer of evidence- Likelihood ratio, probability of guilt, correspondence probabilities, direction of transfer. Test of significant of attributes, Z-test of significance and coefficient of correlation, small sample test, T-test, Paired Test, Chi-square test. F-Test for equality of variance, Large sample test. Normal Test

## PSFS P101

| Marks 100                         |         |
|-----------------------------------|---------|
| Period per Week<br>(60 Min. Each) | Credits |
| 4                                 | 2       |

### PRACTICALS :

1. Crime scene protection and security
2. Photographing the scene of crime using 3 angle views – Birds-eye view, mid range, close-up
3. Sketching the scene of crime – Rough and Finished
4. Sketching the crime scene using Rectangular coordinates, Baseline and Triangulation method
5. Collection and Packaging of various Physical evidences
6. To obtain class characteristics of fingerprints
7. To obtain individual characteristics of fingerprints
8. Study of pores on friction ridges
9. Sweat Analysis of palmer and plantar surfaces.
10. To perform ridge tracing and ridge counting.
11. To develop latent finger Prints with Powder methods.
12. To develop latent finger Prints with Fuming methods.
13. To develop latent finger Prints with Chemical methods.
14. Fingerprint classification using Henry system
15. Crime scene report writing
16. Forensic Result report writing
17. To measure the Gait of Individuals under various circumstances
18. To study various wear and tear characteristics on footwear
19. To examine anatomical difference in footprints of individuals. Under various circumstances.
20. To study bloodstain impact pattern at different velocity
21. To determine point of convergence and point of origin using string method in BPA
22. To study droplet dynamics of blood on various surfaces and different heights and angles.
23. Reconstruction and evaluation of various scenes of crime.
24. Tyre print tracing, casting and comparison
25. Footprint tracing, casting and comparison
26. Examination of Ear print and lip print found at the crime scene
27. To study and examine toolmarks and mechanical fits

## PSFS 102

### FORENSIC CHEMISTRY

| Marks 100         |         |
|-------------------|---------|
| Lectures per Week | Credits |
| 4                 | 2       |

#### **Unit I: Toxicology-Metallic Poisons & Related Laws.**

Introduction to toxicology & metallic poisons

Concept of exposure: Concept of time-Weight-Average, Peak exposure , Acute and chronic exposure

##### **Specific Metal Exposure ;**

(Al,AS,Co,Be,Pb,Li,Mn,Hg,Ni,Pt,Se,Tl,Sn,U,Fa,Zn)

**Metal Metabolism and Toxicity** (Cu,Zn,Fe,Se,Hg,Cd,Pb,As): toxicokinetics, biotransformation, Mechanism of toxicity and antidote required, toxicology or effect on vital organs

**Toxic Anions**(Borates, Bromide, Chlorate, Cyanides, Fluorides): poisoning, toxicokinetics, Mechanism of toxicity and antidote required, toxicology or effect on vital organ

##### Analysis of toxicological Samples:

Evidence collection in metal poisoning cases, extraction of poisons, Analysis by Colour-test (reinsch, gutzeit Test), Atomic absorption spectroscopy(ASS, Electro thermal ASS, Hydride generation ASS, Cold Vapour ASS ), Inductively coupled plasma atomic emission spectrometry , Inductively coupled plasma mass spectrometry(ICP-MS), Neutron activation analysis

##### **Legal Aspect:**

Relavant provisions of The Poisons Act,1919.

#### **Unit II: Toxicology- Organic Poisons & Related Laws.**

**Pesticides & Insecticides** (Organo phosphates, Organo chlorine compounds, Carbamates, Pyrethroids, Bipyridyl derivatives) : Chemical composition and sub-types, Signs and symptoms of poisoning, Site and mechanism of toxic action, Biotransformation and distribution, Antidote

Analysis: Collection & preservation of toxicological sample, Extraction of poisons from visceral material, Analysis by TLC, GC, HPLC and comparing results with standard.

**Animal Poisons:** Snake venom, composition, site of action, mode of action, effect on the body as a whole, and tests for identifications

**Carbon monoxide poisoning:** significance, signs and symptoms, methods of diagnosis, tests for identification.

##### **Legal Aspect:**

Relavant provisions of The Poisons Act,1919.

#### **Unit III : Prohibition & Related Laws.**

Introduction, Definition of alcohol and illicit liquor, Alcoholic and non-alcoholic beverages and their composition, Proof spirit, absorption, de-toxification and excretions of alcohol, Crime scene management in illicit liquor cases, problems in alcohol cases and difficulties in diagnosis,

Alcohol and prohibition, Consequences of drunken driving, Breath analysis, blood alcohol analysis by GC-HS.

Analysis of Beverages: Analysis of alcoholic beverages as per BIS and PFA Act, Detection and determination of ethanol, furfural, organic acids, aldehydes, chloral hydrate, methanol and ethylene glycol in liquors by colour tests, TLC, GC, and GC-MS methods, Distinction between licit and illicit liquors.

**Legal Aspect:-**

Case Studies and Relevant Provisions of-

1. Indian Penal Code, 1860.
2. The Bureau Of Indian Standards Act, 1986
3. Prevention of Food Adulteration Act, 1954.

**Unit IV: Explosive & Related Laws.**

Classification, Composition and characteristics of Explosive, Commonly used Explosive devices Explosion process and affects, types of hazard, effect of blast wave on structures, human etc. Crime scene management in explosive cases, post-blast residue collection,

Analytical Techniques for the analysis of exhibits involved in Explosive cases:-

Separation of Explosive in a mixture, Analysis by wet tests, Ion chromatography, Capillary electrophoresis, ED-XRF, Thin layer Chromatography (TLC), IR-Spectrophotometer, GC-Ion Scan, LC-MS.

**Legal Aspect:-**

Case Studies and Relevant Provisions of –

1. Explosives Act 1884
2. Explosive Substances Act

## PSFS P102

| <b>Marks 100</b>                          |               |
|---|---------------|
| <b>Period per Week<br/>(60 Min. Each)</b> | <b>Credit</b> |
| <b>4</b>                                  | <b>2</b>      |

### **PRACTICALS:**

1. Analysis of alcoholic liquor as per BIS specifications.
2. Determination of methanol and ethanol in alcoholic liquors.(wet test, GC,TLC)
3. Analysis of gasoline as per BIS specifications.
4. Estimation of ethyl alcohol in blood sample by wet test, TLC, GC-HS.
5. Analysis of viscera (simulated sample) for organo-chloro /organo-phosphorus pesticides by TLC.(2 Nos
6. 6.Detection of metallic poisons (arsenic and mercury & other poisons metals) in viscera and food stuff (simulated samples).by wet test, AAS, UV-Visible
7. Adulteration of vegetable oils by GC & HPLC.
8. Systematic analysis of pharmaceutical products as per IPC specification by using HPLC
9. Systematic analysis of pharmaceutical products as per IPC specification by using GC.



## PSFS 103

### FORENSIC BALLISTICS & FORENSIC PHYSICS

| Marks 100         |         |
|-------------------|---------|
| Lectures per Week | Credits |
| 4                 | 2       |

#### **Unit I : Forensic Ballistics (I)**

History and background of firearms; Their classification and characteristics, various component of small arms, smooth bore and class characteristics, purpose of rifling, types of rifling and methods to produce rifling, trigger and firing mechanism, cartridge-firing mechanism, Shotguns; Classification, choking, determination of bore. Techniques of dismantling / assembling of firearm, identification of origin, improvised / country-made / imitative firearm and their constructional features.

Legal Aspect :-

Case studies and relevant provisions of Arms Act,1959.

#### **Unit II: Ammunition:**

Types and classification of ammunition, Constructional features and characteristics of different types of cartridges, types of primers and priming composition, propellants and their compositions, , various types of bullet and compositional aspects, latest trends in their manufacturing and design projectile, identification of origin, improvised ammunition and safety aspects for handling firearm and ammunition.

Legal Aspects of Ammunition;

#### **Unit III: Motor Vehicle Crimes**

Crimes and vehicles, Road accidents, Theft of Vehicle, Abandoned Vehicles Vehicle involved in terrorism and Investigation. Evidentiary clues; the vehicle, the scene, the culprit/victim. Collection and Evaluation of; Tyre, tyre marks, tyre residues, tyre bursts. Mechanical failure. Crime Scene Management in motor vehicle cases, Forwarding Exhibits in Motor vehicle cases, Important Crime cases:-Vehicle involved in Explosion

Legal Aspects:-

Case studies and relevant provisions of offences under Motor Vehicle Act,1988 .

#### **Unit IV: Hit and Run cases and investigation:**

Nature and causes, Collection of evidence; paint, automobile window glass, Head light- tail light, scratch marks, bulb filament, fibre and rubber, chassis and engine number, RTO registration number and related documentary clues.

Analytical Technique for the analysis of evidence involved in Hit and Run cases; Types of glass and their composition, forensic examination of glass fractures under different conditions, determination of direction of impact cone- fracture, rib marks hackle marks, backward fragmentation, colour and fluorescence, physical matching, density comparison, physical measurements, refractive index by refractometer, elemental analysis and interpretation of glass evidence by Atomic Emission spectroscopy, XRD of glass, Raman and IR spectroscopic analysis

of Paints, Restoration of erased serial numbers and engraved marks, Document examination by VSC, Microscopic examination, Micro chemical tests, Differential solubility.

Legal Aspects:-

Case studies and relevant provisions of Indian Penal Code,1860.

### PSFS P103

| Marks 100                         |         |
|-----------------------------------|---------|
| Period per Week<br>(60 Min. Each) | Credits |
| 4                                 | 2       |

#### Practical

1. Study of calibre and rifling characteristics
2. Examination of firearm(s).
3. To study assembling and dismantling of firearms.
4. To study the working mechanism of firearm(s).
5. Examination of air guns / rifles as per Arms Act 1959.
6. Determination of shot number from size and weight of shots.
7. Physical examination of propellant of ammunition.
8. Examination of choking in shotgun.
9. Study of constructional features of improvised firearms.
10. To study proof mark of firearm.
11. Study of constructional features of cartridge.
12. To study proof mark of cartridge.
13. To study lands and grooves in rifled weapons.
14. To study brake action of various automobiles.
15. To study the working mechanism of important components of automobile engine.
16. Study of speedometer.
17. Examination and analysis of paint chips collected from hit and run cases.
18. Examination and analysis of glass pieces collected from hit and run cases.
19. Comparison of head light glass and automobile window glass.
20. Restoration of erased serial numbers using physical / chemical methods.
21. Examination of bulb filament.
22. Restoration of engraved marks.
23. Automobile related Document Examination using VSC.

## PSFS 104

### BIOCHEMICAL & MOLECULAR ASPECTS OF CELL

| Marks 100         |         |
|-------------------|---------|
| Lectures per Week | Credits |
| 4                 | 2       |

#### Unit I: Metabolism, biochemical techniques

##### Basic concepts of Metabolism:

Concept of catabolism and anabolism: metabolic strategies, organization, clustering of enzymes. Regulation of Metabolic Pathways: energy charge, phosphorylation potential etc.

##### Carbohydrate metabolism

Glycolysis, glycogenolysis, gluconeogenesis, pentose phosphate pathway, glucuronic acid pathway.

Dark reactions of Photosynthesis: CO<sub>2</sub> fixation: C<sub>3</sub>, C<sub>4</sub> and CAM pathways.

Cyclic overview and reactions. Metabolic sources of acetyl CoA. Regulation and amphibolic nature of the cycle. Glyoxylate cycle.

##### Lipid metabolism

β oxidation of unsaturated and saturated fatty acid and its regulation.

significance of ketone bodies, Biosynthesis of palmitate and its regulation.

Mitochondrial and microsomal pathways of chain elongation, long term dietary changes and enzyme level.

Metabolism of cholesterol: Biosynthesis of cholesterol and its regulation, lipoprotein metabolism, chylomicrons, LDL, HDL, VLDL.

Transamination, deamination, Fate of amino acid skeleton, urea cycle, precursors for compounds other than proteins, Genetic diseases.

Salvage and *de novo* pathways of purine and pyrimidine nucleotide biosynthesis.

Formation of deoxyribonucleotides, origin of thymine.

Biosynthesis of Nucleotide coenzymes.

Nucleotide degradation: catabolism of purines and pyrimidines, fate of uric acid.

Vitamins: Types, structure Biosynthesis, deficiencies

Affinity chromatography, gel exclusion, Immunoelectrophoresis, complement fixation, RIA, ELISA & Types, Fluorescence immunoassay, flow cytometry, immunohistochemical techniques, Immunoprecipitation, Elispot assay, immunoelectron microscopy, isoelectric focussing techniques.

#### UNIT II: Molecular Biology

Central dogma of Molecular biology, process of DNA replication, properties of DNA polymerases, chromosome replication initiation at ori C & termination at ter C, concept of replicon, replicating linear DNA in eukaryotes, multiple origins of replication eukaryotic chromosomes.

Transcription of genes: terminologies- eukaryotic genome, cistrons, coding sequence & ORF, RNA polymerases types & function, Activators, repressors, regulatory proteins. Transcription in eukaryotes, transcription of r RNA, t RNA & protein encoding genes in eukaryotes, enhancer control of transcription.

Protein Synthesis: Initiation, elongation & termination of protein synthesis, transcription, translation coupled in bacteria, initiation of protein synthesis in eukaryotes, role of molecular chaperon in protein folding, post translation modification,

Regulation of transcription in prokaryotes: Significance of gene regulation, alternative sigma factor in prokaryotes: Heat shock sigma factors, sigma factor in Bacillus spore formation, activators & repressors in positive & negative regulation. Crp protein-global control in protein synthesis. Antitermination.

Regulation of transcription in eukaryotes: Enhancers and insulator sequences. Heterochromatin, methylation & acetylation in gene expression, gene silencing, X –chromosome inactivation.

### **UNIT III: Microbial Forensics**

Defining the microbial forensics program, epidemiology, Microbial forensic tools.

Dynamics of disease transmission, Outbreak Investigation.

Deliberate introduction of a biological agent.

Emerging Microbial Forensic Techniques- PCR, Terminal Restriction Fragment Length Polymorphism (TRFLP), Amplified Fragment Length Polymorphism (AFLP), Single Stranded Conformation Polymorphism Analysis (SSCP), Thermal and Denaturing Gradient Gel Electrophoresis (TGGE, DGGE), Amplified Ribosomal DNA Restriction Analysis (ARDRA), Randomly Amplified Polymorphic DNA (RAPD).

Non-PCR DNA Fingerprinting Techniques with Applicability in Forensic Studies- Restriction Fragment Length Polymorphisms (RFLP) and Ribotyping.

Forensic Interpretation of DNA Data, Isotopic Testing and Correlation to Contaminant Source

Microbes of forensic importance: *Bacillus anthracis*, *Yersinia pestis*, *Francisella tularensis*, *Brucella spp.*, ***Burkholderia Pseudomallei***, *Clostridium botulinum*, *Listeria monocytogenes* and their morphological & biochemical studies. DNA of microbes in soil for crime detection

Fungi of forensic importance: Opportunistic mycoses, *Chytridiomycota* *zygomycota*, *Aspergillus fumigates*, *microsporidium*, *pneumocytosis jiroveci*, *Asp.flavus* & *Candida* sp, epidemiology, Antifungal agents.

Food borne – shigella, salmonella.

Forensic Aspects of Biological Toxins

Microbial Forensic Analysis of Trace and Unculturable Specimens

### **Unit IV: Forensic Virology and Animal cell culture**

Introduction to virus classification.

Naturally emerging viruses: West Nile, SARS, MonkeyPox, H1N1, Severe acute respiratory syndrome, HIV.

Viral forensics, Engineering Novel Viruses: Recombinant DNA.

Revolution in virology, Synthetic Poliovirus, mousepox, determining source of an engineered virus.

#### **Cell culture techniques**

Media, Role of media components: preparation, sterilization, MEM, DMEM, Eagles MEM, MF9 MF12, etc.

Types of cell lines: Establishment of cell lines, Transformed cell lines, properties & applications.

## PSFS P104

| Marks 100                         |         |
|-----------------------------------|---------|
| Period per Week<br>(60 Min. Each) | Credits |
| 4                                 | 2       |

### PRACTICALS

1. Chromosome banding technique.
2. pH, Buffers, Buffering capacity
3. To perform serum electrophoresis.
4. Extraction and isolation, estimation of DNA from buccal swabs, blood, semen and other biological samples (from Cows, Bulls, Buffalos, Chicken fishes, other wild animals etc.)
5. Restriction digestion of DNA from above samples.
6. DNA fingerprinting for testing of paternity disputes and rape cases.
7. To perform Western Blotting
8. Estimation of Amino Acid (Tyrosine)
9. Estimation of Nitrogenous Base (Guanine)
10. Detection of Ag/ Abs by ELISA and immunohistostaining.
11. Culture of animal cells and their observation.
12. Passage of cells for subculturing.
13. Organ culture from chick.

## PSFS 105

### FORENSIC PSYCHOLOGY

| Marks 100         |         |
|-------------------|---------|
| Lectures per Week | Credits |
| 4                 | 2       |

#### **UNIT I -Basics of Forensic Psychology:**

- Introduction, Definition of Forensic Psychology
- History and Development of Forensic Psychology
- Scope of Forensic Psychology
- Ethics of Forensic Psychology

#### **UNIT II – Psychology and Criminal Behavior:**

- Psychopathology and Abnormal behavior
- Biological factors & Crime, Social Learning theories, Psychosocial Factors, Abuse.
- Intelligence & Crime, Effects of Media, Gender & Crime
- Psychology of Terrorism.

#### **UNIT III - Juvenile Delinquency:**

- Theories of Offending: Social Cognition, Moral Reasoning.
- Child Abuse: Physical, Sexual, Emotional
- Juvenile Sex Offenders
- Prevention of Delinquency
- **Legal Aspect:**
- Juvenile in conflict with Law: (Juvenile Justice Act,2000. Bail of Juvenile, Court orders regarding Juvenile, Penalties and Case-studies)

#### **UNIT IV – Areas under Forensic Psychology**

- Competency to stand trial
- Sentence Litigation
- Criminal Responsibility
- Civil Commitment
- Guardianship and Conservatorship



## PSFS P105

| Marks 100                         |         |
|-----------------------------------|---------|
| Period per Week<br>(60 Min. Each) | Credits |
| 4                                 | 2       |

### Practicals

1. NEO-PI
2. Minnesota Multiphasic Personality Inventory-2/A (MMPI-2/A)
3. Rorschach Test
4. Bhatia's Battery for Intelligence
5. Thematic Apperception Test
6. Word Association Test

## PSFS 106

### FORENSICS COMPUTING AND OFFENSES

| Marks 100         |         |
|-------------------|---------|
| Lectures per Week | Credits |
| 4                 | 2       |

#### **UNIT I: Evolution of Computer Technology & Cyberspace**

History of Digital Computer, Generation of Computers, Basics of Computer, Recent Trends in Computer Technology

Computer Programming:

Programming Cycle, Basics of Programming, Interpreter, and Compiler, Various programming languages and their special features, Programming in C, Object Oriented Programming, Java programming, JSP and Servlet .

Internet & Web Technologies:

Role of Networking in IT, Evolution and Impact of Internet, Internet Services, Internet Process Concept of World Wide Web, History of World Wide Web, Purpose of Web, Functioning & Mechanism of Web, Web Hosting & Development, Website Legal Issues

HTML ( Elements, Attributes, Headings, Paragraphs, Formatting, Fonts, Styles, Links, Images, Tables, Lists, Forms, Frames, Iframes, Colors, Colornames, Colorvalues, Layout, Doctypes, CSS, Head, Meta ,Scripts, Entities, URLs, URL Encode, Webserver ) XML, PHP, Installing PHP on wamp server

PHP( Syntax, Variables, String, Operators, If...Else, Switch, Arrays, While Loops, For Loops, Functions, ,forms, GET, POST, Date, Include, PHP File, File Upload, Cookies, Sessions, E-mail, Secure E-mail, Error, Exception Filter)

Cyberspace:

Concept of Cyberspace, Emergence of Cyberspace, Nature & Meaning of Cyberspace, Attributes of Cyberspace, Classification of Cyberspace, Legal Framework for Cyberspace.

#### **UNIT II: Image Processing**

Image Processing Fundamentals, Digital Image Processing and Computer Graphics Understanding Digital Image Processing, Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Steps in Digital Image Processing, Components of an Image Processing System, Image File Forensic: Understanding various image formats (Vector and Raster), and File Compression, Locating and recovering image files. Various Image Enhancement Techniques, Image Enhancement in the Spatial Domain (Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Smoothing and sharpening filters) Image Enhancement in the Frequency Domain (Frequency domain filters: Smoothing and Sharpening filters Homomorphic filtering)

#### **UNIT III: Wireless Networks and Internet Forensics.**

**Wireless Networks:**

Wireless Infrastructure, Difference between wired and wireless networks. Wireless Transmission, Telecommunication Systems

Wireless LAN: IEEE 802.11 (Architecture Physical Layer MAC Layer Addressing mechanism)

Cellular Telephony: Frequency reuse principal, Transmitting- Receiving Handoff roaming, First Second and Third Generation.

Satellite Networks: Orbits, Footprints, three categories of satellites (GEO, MEO, LEO)

### **Internet Forensic:**

Obfuscation: Anatomy of URLs, IP Addresses in URLs, Usernames in URLs, Encoding the Entire Message, Similar Domain Names, Making a form look like a URL, Bait and Switch-URL Redirection, JavaScript, Browsers and Obfuscation

Websites:

Capturing Web Pages, Viewing HTML Source, Comparing Pages, Non-Interactive Downloads Using wget, Mapping out the entire website, Hidden Directories, In Depth Example- Directory Listing, Dynamic WebPages, Filling Out Forms, In depth Example-Server side Database, Opening the Black Box

Web Servers: Viewing HTTP Headers, Understanding Header Information, Cookies, Redirection, Web Server Statistics, Controlling HTTP Headers

### **UNIT IV: Cyber crimes and related offences and penalties.**

- Introduction to Cybercrimes;
- Classification of cybercrimes.
- Distinction between cyber crime and conventional crimes
- Reasons for commission of cyber crime
- Kinds of cyber crimes – cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism etc.
- Relevant provisions under Information Technology Act, 2000, Indian Penal Code, 1860.
- Jurisdictional challenges in cyberspace.
- Investigation challenges in cyberspace
- Emerging trends in Information Technology Act, 2000.

## PSFS P106

| Marks 100                         |         |
|-----------------------------------|---------|
| Period per Week<br>(60 Min. Each) | Credits |
| 4                                 | 2       |

### PRACTICALS

1. C Program Structure, data input and output, control statements, functions arrays etc
2. Basics of Java programming. Servlet and JSP Programs and Java Script
3. Structure of HTML, XML and PHP : Creating webpage using Structure of HTML, XML and PHP
4. Image Processing Using Matlab (Using Image Processing Toolbox)
5. Image Processing Using Java (Java Advance Imaging)
6. Image Processing Using Turbo C
7. study of wireless devices
8. study of wireless networks and wireless network analysis.
9. Understanding dynamic and static pages, Viewing HTML Source and HTTP Headers, Understanding Header Information
10. Working with wireshark for Network analysis
11. Studying of packets and packet formats.
12. Log Collections and analysis
13. Network evidence collection offline and online

## REFERENCES

### Paper I

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6. Bridges : Practical Finger Printing, 1942, Funk and Washalls Co. New York.
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11. Kirk : Criminal Investigation, 1953, Interscience Publisher Inc. New York.
12. Cummins & Midlo : Finger Prints, Palms and Soles, 1943, The Blakiston office London.
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