

UNIVERSITY OF MUMBAI



Syllabus for the S.Y.B.Sc
Program: B.Sc
Course: Forensic Science

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

S.Y.B.Sc. Forensic Science Syllabus for
Credit Based and Grading System
To be implemented from the Academic year 2012-2013
SEMESTER III

B. Sc. Forensic Science														
S.Y. III Sem		Class Room Instruction Face to Face						50 Hrs. = 1 Credit						
Course Code	Title	Per Week		15 Week (Per Sem.)		Per Sem. (Hrs.)		Notinal Hrs.		Total Hrs.		Credits		Total Credits
		L (50 min)	P(50 min)	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	
USFS 301	Advanced Forensic Science	4		60		50		50		100		2		2
USFS 302	Advanced Forensic Chemistry	4		60		50		50		100		2		2
USFS 303	Advanced Forensic Physics	4		60		50		50		100		2		2
USFS 304	Advanced Forensic Biology	4		60		50		50		100		2		2
USFS EVS 305	Environmental Science	4		60		50		50		100		2		2
USFS 306	Advanced Digital & Cyber Forensics	4		60		50		50		100		2		2
USFS 3P1	Forensic Science & Forensic Chemistry		3		45		38		37		150		3	3
			3		45		38		37					
USFS 3P2	Forensic Physics & Forensic Biology		3		45		38		12		100		2	2
			3		45		38		12					
USFS 3P3	Digital & Cyber Forensics		3		45		38		112		150		3	3
Total		24	15	360	225	300	190	300	210	600	400	12	8	20

SEMESTER IV

B. Sc. Forensic Science														
S.Y. IV Sem		Class Room Instruction Face to Face						50 Hrs. = 1 Credit						
Course Code	Title	Per Week		15 Week (Per Sem.)		Per Sem. (Hrs.)		Notinal Hrs.		Total Hrs.		Credits		Total Credits
		L (50 min)	P(50 min)	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	Lect.	Pra.	
USFS 401	Advanced Forensic Science	4		60		50		50		100		2		2
USFS402	Advanced Forensic Chemistry	4		60		50		50		100		2		2
USFS 403	Advanced Forensic Physics	4		60		50		50		100		2		2
USFS 404	Advanced Forensic Biology	4		60		50		50		100		2		2
USFS 405	Advanced Forensic Psychology	4		60		50		50		100		2		2
USFS 406	Advanced Digital & Cyber Forensics	4		60		50		50		100		2		2
USFS 4P1	Forensic Science & Forensic Chemistry		3		45		38		37		150		3	3
			3		45		38		37					
USFS 4P2	Forensic Physics & Forensic Biology		3		45		38		12		100		2	2
			3		45		38		12					
USFS 4P3	Forensic Psychology & Digital & Cyber Forensics		3		45		38		37		150		3	3
			3		45		38		37					
Total		24	18	360	270	300	228	300	172	600	400	12	8	20

USFS301 - ADVANCED FORENSIC SCIENCE

		Marks 100	
		Lectures Per Week	Credits
		4	2
Units with Description	Total lectures		
UNIT I - Crime and Crime Scene management:			
<ul style="list-style-type: none"> • Criminals, criminal behaviour. • Criminal profiling, Modus operandi, 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 Lectures		
UNIT II - Recognition of Bloodstain Patterns:			
<ul style="list-style-type: none"> • 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 	15 Lectures		
UNIT III - Fingerprints			
<ul style="list-style-type: none"> • 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 • Classification of fingerprints- Henry System of classification, Single digit Classification, Extension of Henry system • Fingerprint Bureau. • Search for Fingerprints, Chance Fingerprints, Latent Fingerprints • 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. 	15 Lectures		

USFS 302 - ADVANCED FORENSIC CHEMISTRY

		Marks 100	
		Lectures per week	Credits
		4	2
Units with description	Total lectures		
Unit I - PHYSICAL SPECTROSCOPY	15 lectures		
<ul style="list-style-type: none"> • Chemical thermodynamics- Gibbs- Helmholtz's energy efficiency, entropy, work function. • Chemical kinetics –rate, order and molecularity of rxn. Energy of activation, molecular activation-collision theory, Specific reaction rate-half life expression. • Electro chemistry: Laws of electrochemistry, Electro chemical cell, salt bridge, EMF-set up of cell. 			
Unit II - INORGANIC CHEMISTRY			
<ul style="list-style-type: none"> • Metal and Non Metals- Preps/occurrence/props/uses. • Acids and alkalies - types, classifications, nexus / props. • Volumetric analysis-types/classifications/titrus-indicators 	15 lectures		
Unit III - U. V. VISIBLE SPECTROSCOPY	15 lectures		
<ul style="list-style-type: none"> • Electromagnetic radiations, full range, absorbance, transmittance, beer-Lambert's laws-deviations, applications. • U.V. Visible Spectrophotometer -Principle diagram, working and construction, types of instrument. • Interpretation of Spectra; Effect of Conjugation; Auxochromic and Chromophoric shifts. Qualitative and quantitative methods. Forensic applications. 			

USFS 303 - ADVANCED FORENSIC PHYSICS

	Marks 100	
	Lectures Per Week	Credits
	4	2
Units with description	Total lectures	
UNIT I – Basic Spectroscopy	15 Lectures	
<ul style="list-style-type: none"> • 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. 		
UNIT II – Analog and Digital Electronics	15 Lectures	
<ul style="list-style-type: none"> • Generation of various types of waveforms. • Wave shaping circuits. • Active filters. • A to D and D to A convertors. • Modulation, need of Modulation, Amplitude and Frequency Modulation and its applications. • Fourier transforms. 		
UNIT III – Physics of Speech	15 Lectures	
<ul style="list-style-type: none"> • Introduction of Sound. • 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. 		

USFS 304 - ADVANCED FORENSIC BIOLOGY

Marks 100	
Lectures Per Week	Credits
4	2
Units with description	Total lectures
UNIT I – Biological Evidence collection & Documentation	
<ul style="list-style-type: none"> • Crime Scene Investigation- • Protection of biological evidences • Documentation • Chain of custody • Recognition of biological evidences encountered in various cases • Search & collection of biological evidences • Packaging & Transportation of biological evidences. 	15 Lectures
UNIT II –Serology & Serological Techniques	
<ul style="list-style-type: none"> • Analysis of biological fluid • Saliva • Semen • Vaginal Fluid • Urine • Sweat • Serological Concept Antigen/Antibodies Polyclonal antibodies Monoclonal antibodies Antigen Antibody interaction. • Serological Techniques Electrophoretic methods: Agarose gel, SDS Natured /Denatured. • Identification of blood: Properties Blood Grouping- Human Non Human Presumptive & confirmatory tests. • Human &Animal Hair. 	15 Lectures
UNIT III – Genetics	
<ul style="list-style-type: none"> • Structural & properties of Chromosomes • Heterochromatin & Euchromatin • DNA Structure, Properties, Types. • Sources used as DNA Evidence • DNA extraction: Basic principles, Method of DNA Extraction • DNA Quantification: Slot Blot Assay, Southern Northern Blotting • DNA Amplification By Polymerase Chain Reaction • DNA Electrophoresis • DNA data-basing 	15 Lectures

USFS 305 - ENVIRONMENTAL STUDIES

Marks 100	
Lectures Per Week	Credits
4	2

Unit I : Multidisciplinary nature of environmental studies

Definition, scope and importance, need for public awareness.

Unit II : Natural Resources :

Renewable and non-renewable resources :

Natural resources and associated problems

- Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
 - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
 - Food resources : World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
 - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
 - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

Unit III : Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystems:-
 - Forest ecosystem
 - Grassland ecosystem
 - Desert ecosystem
 - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit IV : Biodiversity and its conservation

- Introduction - Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit V : Environmental Pollution

Definition

- Cause, effects and control measures of:-
 - Air pollution
 - Water pollution
 - Soil pollution

- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.

- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disastermanagement : floods, earthquake, cyclone and landslides.

Unit VI : Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit VII : Human Population and the Environment

- Population growth, variation among nations.
- Population explosion - Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

Unit VIII : Field work

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours) .

USFS 306 - ADVANCED DIGITAL AND CYBER FORENSICS

	Marks 100	
	Lectures Per Week	Credits
	4	2
Units with description	Total lectures	
UNIT I - Computer Forensic:		
<ul style="list-style-type: none"> • Introduction to Computer/Cyber Forensic. • Cyber Forensic Evidence Identification, Acquisition, Seizure, Presentation, Preservation and Authentication. • Computer Forensic Expert. • Cyber Forensic Investigation Process. • The Goal of the Forensic Investigation, need and object of Investigation (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 Lectures	
UNIT II – Incident Response		
<ul style="list-style-type: none"> • Introduction to Incident Response Process(Computer Security Incident, Goals of Incident Resonse, Who is involved in Incident Response Process, Incident Response Methodology, Formulating a Response Strategy, Investigate the Incident.) • Preparing For Incident Response, Overview of Pre-incident Preparation, Identifying Risk, After Detection of an Incident. 	15 Lectures	
UNIT III – Cyber Forensic Tools and Utilities		
<ul style="list-style-type: none"> • Introduction, Examining a Breadth of Products, Cyber Forensic Tools Good, Better, Best: Selecting Right Incident Response Tool for Your Organization, Tool Review Forensic Toolkit. • EnCase, Cyber check suites, Disk Imaging etc. Specifications for Forensic tools Tested. 	15 Lectures	

USFS3P1 – FORENSIC SCIENCE AND FORENSIC CHEMISTRY

	Marks 100	
	Period per Week (50 Min. Each)	Credits
	6	3
PART A:FORENSIC SCIENCE		
1. To take plain and rolled fingerprints	1Nos.	
2. To identify fingerprint pattern	1Nos.	
3. To perform ridge counting and ridge tracing	2Nos.	
4. To identify minutiae in finger print pattern	1Nos.	
5. To develop fingerprints using various methods	3Nos.	
6. Lifting and preservation of finger print	2Nos.	
PART B : FORENSIC CHEMISTRY		
1. Commercial analysis(double titration)	1Nos.	
2. Titration –complexometric (EDTA titration)	1 Nos.	
3. Qualitative analysis(Acidic /basic radicals)	1 Nos.	
4. Identification of organic compounds(characterization)	1 Nos.	
5. Gravimetric Analysis	2 Nos.	
6. Study of electroplating	1 Nos.	
7. Inorganic explosive residue analysis	1 Nos.	
8. Cement analysis by volumetric and gravimetric method	2 Nos.	
9. UV and IR studies of opiates	1 Nos.	

USFS 3P2 - FORENSIC PHYSICS AND FORENSIC BIOLOGY

		Marks 100	
		Period per Week (50 Min. Each)	Credits
		6	2
PART A- Forensic Physics		NUMBER OF LECTURES	
1. Investigations of fake documents using UV light.		1Nos.	
2. Waveform generator		1Nos.	
3. Study of AM modulation		1Nos.	
4. Study of FM modulation		1Nos.	
5. Study of low pass Active filters		1Nos.	
6. Study of High pass Active filters		1Nos.	
7. Analog to Digital Convertor		1Nos.	
8. Digital to Analog Convertor		1Nos.	
9. Wave clipping and Clamping using diodes.		1Nos.	
10. Digital counter		1Nos.	
11. Study of Timer (IC-555)		1Nos.	
PART B - Forensic Biology			
1. Microscopic Comparison of Hair a. Animal Hair b. Human Hair		1Nos.	
2. Microscopic Comparison of Fibres		1 Nos.	
3. Presumptive Tests for Blood a. Phenolphthalin Assay b. Benzidine c. Leucomalachite Green (LMG) d. Luminol Test		3 Nos.	
4. Confirmatory Tests for Blood a. Crystallization Assay		1 Nos.	
5. Species Identification from various biological fluids a. Electrophoresis b. Precipitin tests c. Acid Phosphatase test for semen d. Prostate Specific Antigen (PSA)		4 Nos.	
6. Isolation of DNA From 7. A Bacterial Cells 8. B Animal Cells 9. C Plant Cells		4 Nos.	
10. ABO Grouping & Rhesus Factor		1 Nos.	
11. Agarose Gel Electrophoresis Serum Lipase		1 Nos.	

USFS 3P3 - DIGITAL AND CYBER FORENCIS

Marks 100	
Period per Week (50 Min. Each)	Credits
6	3

PART A: Digital And Cyber Forencis	NUMBER OF LECTURES
1. Identification , Seizure ,Search of Digital media.	2 Nos.
2. Evidence Collection Forensic Report authoring and presentation	2 Nos.
3. Study of Encase software and its uses.	2 Nos.
4. Study of FTK software.	2 Nos.
5. Study of WinHex software and its uses.	2 Nos.
6. Demonstration of various Forensic tools.	2 Nos.

B. Sc. FORENSIC SCIENCE

SEMESTER IV

USFS 401: ADVANCED FORENSIC SCIENCE

	Marks 100	
	Lectures Per Week	Credits
	4	2
Units with description	Total lectures	
Unit I : Forensic Documents	15 Lectures	
<ul style="list-style-type: none">• Various types of forensic documents: genuine and forged documents,• Classification of forensic documents: Questioned, Admitted and Specimen writings.• Handling, preservation and marking of documents• Basic Tools needed for forensic documents examination and their use• Natural variation and disguise in writing• Principle of Handwriting Identification• General and individual characteristics of Handwriting• Identification of signatures and detection of forgery• Analysis of paper and inks• E- Documents		
UNIT II - Criminal Justice System	15 Lectures	
<ul style="list-style-type: none">• Structure of Police, Prosecution and Judicial Organization• Introduction to Indian Penal Code, 1860• Introduction to Criminal Procedure Code, and Criminal trial procedure.• Indian Evidence Act, 1872 – Introduction and Expert testimony• Examination in chief, Cross Examination and Re-examination		
UNIT III - Impressions and Prints:	15 Lectures	
<ul style="list-style-type: none">• 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.• Tool Marks- Location, collection and evaluation, taking control samples, Forensic Significance.		

USFS 402 - ADVANCED FORENSIC CHEMISTRY

		Marks 100	
		Lectures per week	Credits
		4	2
Units with description		Total lectures	
Unit I- I.R SPECTROSCOPY		15 lectures	
<ul style="list-style-type: none"> • Introduction, Types of molecular vibration, Strength of molecular vibration and absorption. • Instrumentation- Dispersive and Non-dispersive IR spectrophotometers, Fourier transform IR (FTIR) spectrophotometers, Interpretation of IR spectra, Forensic applications 			
UNIT II: QUALITATIVE-QUANTATIVE ANALYSIS		15 lectures	
<ul style="list-style-type: none"> • Qualitative and quantitative analysis of organic and inorganic products. <ul style="list-style-type: none"> ▪ Chemical- Acids, Alcohol, Aldehyde, Ketones, Esters, Amines, Amide, Nitrocompounds. ▪ Petroleum Product. ▪ Oils, Fats and Waxes. ▪ Cement 			
UNIT III: FORENSIC CHEMISTRY		15 lectures	
<ul style="list-style-type: none"> • Screening, sampling-methods type (collection), statistical method, different standard methods. • Inorganic analysis. • Micro-chemical method. • Characteristics/examination/act/organic-inorganic products- Gold,silver,tobacco,tea,sugar,salts,fertilizers,dyes,drugs,p aits. 			

USFS 403 – ADVANCED FORENSIC PHYSICS

		Marks 100	
		Lectures per week	Credits
		4	2
Units with description		Total lectures	
UNIT –I : Fire Arms		15 Lectures	
<ul style="list-style-type: none"> • Introduction of Fire arms. • Brief history of fire arms. • Weapon types and their operations. • Proof marks. 			
UNIT II– Ammunition		15 Lectures	
<ul style="list-style-type: none"> • A brief history of ammunition. • Ammunition components. • Non toxic shots. • Propellants. • Priming compound and primers. • Head stamp marking on ammunition. 			
UNIT III – Ballistics		15 Lectures	
<ul style="list-style-type: none"> • Introduction to Ballistics. • Types of ballistics: internal, external and terminal ballistics. • Velocity recoil. • Theory of recoil. • Barrel pressure measurement. • Ballistic coefficient. • Angle of elevation of the barrel. 			

USFS 404 – ADVANCED FORENSIC BIOLOGY

		Marks 100	
		Lectures per week	Credits
		4	2
Units with description	Total lectures		
<p>UNIT I – Forensic Anthropology, Odontology, Pathology.</p> <ul style="list-style-type: none"> • Analysis of Skeletal Remains • 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 • Facial Reconstruction • Forensic Odontology Development of dental structure Estimation of Age , Sex & race Bite-mark analysis • Forensic Pathology Decomposition Muscular Physiology Causes of death – Asphyxia, drowning, Time of Death Post mortem Examination - Wounds , injuries Digestive System & Digestive paths of macromolecules ,enzymes & end products Undigested stomach contents post mortem Role of a Forensic Pathologist • Forensic Entomology Basic principle of insect biology Life cycle Estimation of time Preservation of sample 	15 Lectures		
<p>UNIT II– Forensic Botany and Forensic Entomology</p> <ul style="list-style-type: none"> • Forensic Botany Morphological and Anatomical Identification of plants. Analysis of pollen & aquatic micro-organisms Techniques for dating specimen using material Dendrochronology Algal Colonisation • Forensic entomology Insect Fauna of forensic importance in India Types of Insects Insect activity case study. Scientific evidence and Forensic entomology as evidence in court 	15 Lectures		

UNIT III – Ecology & Ecosystem	15 Lectures
<ul style="list-style-type: none"> • Ecology Terrestrial Environment Aquatic Conditions: Water Chemistry Temperature control Chemical cycles Food chains • Endangered plants & animal species. 	

USFS 405 - ADVANCED FORENSIC PSYCHOLOGY

		Marks 100	
		Lectures Per Week	Credits
		4	2
Units with description	Total lectures		
UNIT I -The Content of Forensic Psychology:	15 Lectures		
<ul style="list-style-type: none"> • History of Forensic Psychology (Historical Perspectives). • Definition and Scope of Forensic Psychology. • Importance of Forensic Psychology. • Services provided by Forensic Psychologists. • Functions and Roles of Forensic Psychologist. • Forensic Psychology in India. 			
UNIT II –Assessment and Evaluation in Forensic Psychology:	15 Lectures		
<ul style="list-style-type: none"> • What is a Psychological Test? • Types of Tests. • Characteristics of good Tests. • Forensic Psychological Evaluation. • Tests which are used in Forensic Psychological Assessment. • Intelligence Tests. • Aptitude and Achievement Tests. • Personality Tests (Objective and Projective). • Neuropsychological Tests. • Difference between Forensic Evaluation and Clinical Psychological Assessment. 			
UNIT III –Theories of Criminal Behavior and Application of Social Psychology in the Interpersonal aspects of legal system	15 Lectures		
<ul style="list-style-type: none"> • Crime: Nature, Extent & Types (Violent and Sexual) • Theories of Crime: Genetic Factors, Psychoanalytic Theory, Behavioral & Social Learning Theory, Alcohol & Substance Abuse. • Eyewitness Testing: Problems and Solutions • Effect of Police procedure and Media coverage • The Central participation in the trial: Effect of Attorney, Judges, Jurors, and Defenders 			

USFS 406 - ADVANCED DIGITAL AND CYBER FORENSICS

		Marks 100	
		Lectures Per Week	Credits
		4	2
Units with description		Total lectures	
UNIT I- Evidence Collection and Analysis Tools		15 Lectures	
<ul style="list-style-type: none"> • Volatile and Non-volatile Evidences collection (Safeback, Gettime, FileList,Filecvr 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). 			
UNIT II–Concealment Techniques		15 Lectures	
<ul style="list-style-type: none"> • Introduction to Cryptography. • Types of Cryptographic Algorithms(Secret Key Cryptography, Public Key Cryptography, Hash Function). • Electronic Signature, Stenography. • Reversing the Stenographic Process, CloakingTechniques(Data Hide and Seek). • Renaming Files, Manipulating File System, Data Hiding on NTFS with Alternate data Stream. 			
UNIT III –Biometrics		15 Lectures	
<ul style="list-style-type: none"> • 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. 			

USFS 4P1 - FORENSIC SCIENCE AND FORENSIC CHEMISTRY

	Marks 100	
	Period per Week (50 Min. Each)	Credits
	6	3
PART A: Forensic Science	Number of Practicals	
1. Marking of Questioned and Standard Documents	1Nos.	
2. Identification of normal and disguise writings.	2 Nos.	
3. Detection of forgeries including traced and stimulated Forgery.	2 Nos.	
4. Examination of ink by chromatographic method.	1 Nos.	
5. Examination of security features of Currency Notes, Indian Passports and Plastic money.	2Nos.	
6. Lifting and preservation of Footprint, tire marks.	2Nos.	
7. Collection and Examination of Tool marks	2 Nos.	
8. Collection and Examination of Lip prints and Ear prints	2 Nos.	
PART B : Forensic Chemistry		
1. Conductometric Titration	1 Nos.	
2. Ph-metry Titration	1 Nos.	
3. Potentiometry Titration	1 Nos.	
4. Analysis of Petrol Diesel for adulteration	1 Nos.	
5. Analysis of vegetable oil for adulteration	2Nos.	
6. Studies of micro chemical tests for drug analysis	1 Nos.	
7. Study of canaille plants	1 Nos.	
8. Analysis of gold and silver by volumetric and gravimetric method.	2 Nos.	

USFS 4P2 – FORENSIC PHYSICS AND FORENSIC BIOLOGY

	Marks 100	
	Period per Week (50 Min. Each)	Credits
	6	3
PART A - Forensic Physics	NUMBER OF LECTURES	
1. Segregation of Speech Sample	1 Nos.	
2. Thermal Analysis of given sample using DSC/TGA	1 Nos.	
3. Gravimetric analysis (density measurement of given sample)	1 Nos.	
4. Electrostatic development analyzer	1 Nos.	
5. Classification and measurements of bullets	1 Nos.	
6. Study of absorption coefficient of given Sample	1 Nos.	
7. Study of transmission coefficient of given Sample	1 Nos.	
8. Fourier transforms	1 Nos.	
9. Photosensitive relay using LDR	1 Nos.	
PART B - Forensic Biology		
1. Microscopic examination for spermatozoa	1 Nos.	
2 Detection of Amylase activity a. Starch-Iodine Assay	1Nos.	
3 Microscopic examination of Pollen grains of forensic importance.	1 Nos.	
3 Identification of Foodstuffs A Macroscopic Examination B Microscopic Examination	2 Nos.	
4 Detection of Blood Alcohol Content	1 Nos.	
5 Identification of Wood by Physical Examination	1 Nos.	
6 Identification Of Wood by Anatomical Features	1 Nos.	
7 Mounting of mouth parts & legs of Insects of forensic importance.	1Nos.	
8 Study of quadrate of Aquatic and Terrestrial habitat.	1Nos.	

USFS 4P3 – FORENSIC PSYCHOLOGY AND DIGITAL AND CYBER FORENSICS

	Marks 100	
	Period per Week (50 Min. Each)	Credits
	6	3
PART A - Forensic Psychology	NUMBER OF LECTURES	
1. Experiment on Thinking and Problem Solving (Nine Dot Problem)	4Nos.	
2. Correlation Coefficient on Raven’s Standard Progressive Matrices (SPM) and Abstract Reasoning (AR)	3Nos.	
3. Thurston’s Interest Schedule	2Nos.	
4. Emotional Intelligence Test	2Nos.	
PART B - Digital and Cyber Forensics		
1. Study of Partitions in Hard drive and deleting and forming partitions	2Nos.	
2. Data Recovery , Deleted File Recovery viewing small Disk.	2Nos.	
3. Viewing small disk MBR .	2Nos.	
4. Use of open source tools for imaging and investigations.	2Nos.	
5. Demonstration of Concealment Techniques (Cryptography PGP).	2Nos.	
6. Demonstration of Concealment Techniques (Steganography).	2Nos.	
7. Demonstration of other Concealment Techniques.	2Nos.	
8. Formatting NTFS and EX2,EX3.	2Nos.	

List of Books

Advanced Forensic Science

1. Introduction to Forensic Science in Crime Investigation By Dr.(Smt) Rukmani Krishnamurthy
2. Introduction to Criminalistics: The foundation of Forensic Science by B. J. Fisher, W.J. Tilstone, C. Woytowicz.
3. Henry Lee's Crime Scene Handbook By Henry C. Lee, Timonthy Palmbach
4. Practical Crime Scene Analysis and Reconstruction by Ross M. Gardner and Tom Bevel.
5. Forensic Science: An Introduction to Scientific and Investigative Techniques By S.H James, JJ Nordby.
6. Advanced Crime Scene Photography by C.D. Duncan.
7. Forensic Science in Court- The Role of Expert Witness by Wilson Wall.
8. Scientific Examination of Questioned Documents by Ordway Hilton.
9. Questioned Documents by Albert S. Osborn.
10. Suspect Documents their scientific examination By Wilson R. Harrison.
11. Friction Ridge Skin By James F. Cowger
12. Speculation in Fingerprint Identification By Chatterjee S. K.
13. Criminal Investigation, Practical Fingerprinting by Briges B. C.

Advanced Forensic Chemistry

1. Thermodynamics for Chemists by S, Glasstone
2. Principles of 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. Introduction to Forensic Science in Crime Investigation By Dr.(Smt) Rukmani Krishnamurthy
6. Organic Chemistry by Moris and Boyed
7. Heterocyclic Chemistry by Gupta and Kumar Vol I and Vol II
8. Insecticides with Modes of Action by I. Ishaya and D. Deghilee
9. Natural Products by S.V. Bhat
10. Instrumental Analysis by Skoog, Holler and Crouch
11. Practical Books:
12. Physical Chemistry Parcticals by J.B. Yadav
13. Qualitative Analysis by Vogel

Advanced Forensic Physics

1. Spectroscopy by H.E. White.
2. The Physics of Speech by D.B.Fry (Cambridge University Press).
3. Introduction to Forensic Science in Crime Investigation By Dr.(Smt) Rukmani Krishnamurthy
4. Handbook of Firearms and Ballistics Examination and Interpreting Forensic Evidence by Brain J Heard, 2nd Ed. Publication: Wiley-Blackwell.
5. Op-Amp and liner Integrated circuits by Ramankat Gayakwad.
6. Op-Amp and liner Integrated circuits: by Robort Coughling and Driscoll
7. Electronics Communication systems: by Kennedy & Davis

Advanced Forensic Biology

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 Molecular & cell biology by Lodish.
5. Cell biology by Bruce Alberts
6. Cell by Cooper
7. Cell & Molecular biology by Karp
8. Cell Biology by C.B. Powar
9. Genetics by Gardner
10. Igenetics by Russel
11. Genetics by Klug et al
12. Genetics by Strickberger
13. Molecular Biology by David Friefilder
14. Molecular Biology by Clark
15. Molecular Biology of Gene by Watson
16. Molecular biology by T.A. Brown
17. Lehninger Biochemistry by Nelson & Cox
18. Biochemistry by Stryer
19. Biochemistry by Zubay
20. Biochemistry by Satyanarayan
21. Immunology by Kuby
22. Immunology by Riott
23. Immunology by Tizard
24. Microbiology by Prescott
25. Microbiology by Tortora
26. Microbiology by Pelzcar

Advanced Forensic Psychology

1. Clark, H.H., & Chase, W.G.(1972) on the process of sentences against pictures. *Cognitive Psychology*, 3, 472-571.
2. Galotti, K.M.(2004) *Cognitive Psychology: In and out of the laboratory*. (3rd ed.) Wadsworth/ Thomson Learning.
3. Underwood. B.J.(1968). *Experimental Psychology: An Introduction*. NewYork: Appleton Century Croft Ltd.
4. Anastasi, A.& Urbina, S. (1997) *Psychological Testing*. (7th ed.) International edition, Prentice Hall International, Inc.
5. Garret, H.E. (1973). *Statistics in Psychology and Education*. (6th ed.) Bombay: Vakils, Feffer and Simons Pvt.Ltd.
6. Surprenant, A.M., Francis, G., & Neath, I.(2005) . *Cog lab Reader*. Thomson Wadsworth.
7. Criminology by Larry Siegel.
8. Handbook of Forensic Psychology by Dr. Vimala Veerraghavan.

Advanced Digital and Cyber Forensics

Hardware and software required:

Hard Disk of any size,
Partation magic software,
Encase software,
PGP software,
Invisible Secret software,
WinHex software.

List of 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. Introduction to Forensic Science in Crime Investigation By Dr.(Smt) Rukmani Krishnamurth
5. First Responder's Gude to Computer Forensics by *Richard Nolanetal.* - Carnegi Mellon, 2005.
6. Cyber Forensic by *Marecella Menendez*.
7. Computer Forensic by *Newman*.
8. Cyber Crime Investigation Field Guide, by *B Middleton*.