

Academic Council :
Item No. :

UNIVERSITY OF MUMBAI



Syllabus for F.Y.B.Sc.

Program : B.Sc.

Course : Forensic Science

(Credit Based Semester and Grading System with
effect from the Academic Year 2015-2016)

F.Y.B.Sc. (Forensic Science) (Semester I) Credits
To be implemented from Academic Year 2015-2016

Class	Title	Class Room Instruction Face to Face						50 Hours = 1 Credit					
		Per Week		15 Weeks (Per Sem)		Per Sem (Hours)		Notional (Hours)		Credits		Total Credits	
		L (50 Min)	P (50 Min)	L	P	L	P	L	P	L	P		
USFS 101	Forensic Science – I	3		45		36		100		2		2	
USFS 102	Chemical Science - I (Inorganic Chemistry)	3		45		36		100		2		2	
USFS 103	Physical Science - I (Optics)	3		45		36		100		2		2	
USFS 104	Biological Science – I	3		45		36		100		2		2	
USFS 105	Psychology – I	3		45		36		100		2		2	
USFS 106	Computer Science – I	3		45		36		100		2		2	
USFS 107	Criminology and Penology	3		45		36		100		2		2	
USFS P1	Forensic Science and Chemical Science Practical		6		90		72		100		2	2	
USFS P2	Physical Science and Biological Science Practical		6		90		72		100		2	2	
USFS P3	Psychology and Computer Science Practical		6		90		72		100		2	2	
Total	--	21	18	315	270	252	216	700	300	14	6	20	

B.Sc. (FORENSIC SCIENCE)

Semester I - Theory

Course Code	Title	Credits
USFS 101	Forensic Science – I	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	History and Development of Forensic Science 1.1 Development of Human Civilizations (Laws, Rules, Crime and Justice) 1.2 Forensic in Pre-historic Era 1.3 Global Development of Forensic Science 1.4 Sir Arthur Conan Doyle and His Contribution 1.5 Sir Edmond Locard and His Contribution 1.6 Forensic Science in India 1.7 Chemical Examiner's Laboratory 1.8 Anthropometric Bureau 1.9 Fingerprint Bureau 1.10 Department of Explosives 1.11 Government Examiner of Questioned Documents 1.12 Central Detective Training School, National Crime Record Bureau, Bureau of Police Research and Development 1.13 Central and State Forensic Science Laboratories 1.14 Organizational Set up of Maharashtra Forensic Laboratories 1.15 International and National Academic Institutes and Universities imparting Forensic Science Education	15
Unit II	Fundamentals of Forensic Science 2.1 Definition and Origin of Term " <i>forensis</i> " 2.2 Nature, Need and Function 2.3 Principles and Laws of Forensic Science 2.4 Tools and Techniques of Forensic Science 2.5 Problems of Proof (Scientific Evidence and Proof, Investigation Problems, Scientific Aspects, Legal Problems) 2.6 Expert Testimony (The Expert, Illustrations, Language, Defense Counsel, The Court, The Element) 2.7 Laws Governing Expert Evidence (Enacted Law, Case Law, Court Conventions) 2.8 Reports Admissible under CrPC 2.9 Death Penalty, Case Law Binding, Presumption of Innocence 2.10 The Evidence, Corpus Delicti, Insufficient Evidence, Improper Identity 2.11 Third Degree Methods, Police Padding, Stock Witness, Circumstantial Evidences, Trap Evidences 2.12 Time Element, Testimonial Compulsion, Minority Judgment, Voluntary Confession	15

	2.13 Investigating Officer, Expert, Prosecution 2.14 The Court, Strictures, Fair Criticism of Courts	
Unit III	Functional Forensic Science 3.1 Forensic Science Laboratories : Divisions and Facilities Provided 3.2 Chemistry Division (Narcotics, Explosives, Adulteration, Petroleum, Blood Alcohol, Prohibition, Toxicology and General Analytical) 3.3 Biology Division (Serology, DNA, Wildlife, Limnology, Botany, Zoology, Microbiology, Palynology) 3.4 Physics Division (Ballistics, Voice, Audio Video, Automobile, Engineering) 3.5 Questioned Documents Division (Stylistics, Linguistics, Counterfeit) 3.6 Cyber Division, Superimposition, Forensic Artistry 3.7 Fingerprint Division (Prints and other Impressions) 3.8 Psychology (Criminal Profiling, Polygraphy, Narco Analysis, Brain Mapping) 3.9 Crime Scene Investigation and Reconstruction, Forensic Photography 3.10 Forensic Medicine (Pathology, Postmortem, Odontology, Anthropology, Entomology, Radiology, Psychiatry, Nursing) 3.11 Other New Areas of Forensics 3.11.1 Forensic Archeology, Forensic Paleontology, Forensic Geology , Forensic Ornithology 3.11.2 Industrial Forensic, Analytical Forensic, Forensic Accounting Forensic Auditing, Forensic Journalism, Forensic Cinematography, Agro Forensic, Crop Forensic, Rural Forensic, Forensic Gemology 3.11.3 Nuclear Forensic, Aeronautical Forensic, Space Forensic, Forensic Genetics, Underwater Forensic, Environmental Forensic	15

Course Code	Title	Credits
USFS 102	Chemical Science – I (Inorganic Chemistry)	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	<p>1.1 Introduction to Periodic Table</p> <p>1.1.1 Study of Modern Periodic Table</p> <p>1.1.2 Periodic properties –Atomic radius, ionization potential, electron affinity, electro negativity, metallic characters, Non-metallic characters and magnetic properties</p> <p>1.1.3 Comparative study of S and P block elements</p> <p>1.2 Acids, Bases and Solvents</p> <p>1.2.1 Definition of acids and bases</p> <p>1.2.2 Arrhenius theory of acid and bases</p> <p>1.2.3 Lowry –Bronsted theory of acid and bases</p> <p>1.2.4 Lewis concept of acid and bases</p> <p>1.2.5 Lux-Flood theory of acid and bases</p> <p>1.2.6 Strength of acids and bases - trends in the strength of hydracids and oxyacid's</p> <p>1.2.7 Properties of solvents - M.P-B.P range, dipole moment, dielectric constant, Lewis acid-base character and types of solvent</p>	15
Unit II	<p>Mole Concept and Oxidation-Reduction</p> <p>2.1 Mole concept – Equivalent weight, determination of molecular weight by gram molecular volume relationship</p> <p>2.2 Problems based on mole concept</p> <p>2.3 Methods of expressing concentrations - strength, normality, molarity, molality, percent w/v, percent v/v, ppm</p> <p>2.4 Standardization of solutions - primary and secondary standard substances, preparation of standard solution of acids and bases</p> <p>2.5 Problems related to acid base titrations</p> <p>2.6 Oxidation and reduction - Definitions related to terms like oxidation, reduction, oxidizing agent, reducing agent, oxidation number, balancing of redox reactions using oxidation number method and ion electron method</p> <p>2.7 Problems based on equivalent weight of oxidant and reductants</p>	15
Unit III	<p>Chemical Bonding</p> <p>3.1 Attainment of stable configuration</p> <p>3.2 Types of bonds - Ionic, Covalent, Co-ordinate and Metallic</p> <p>3.3 Types of overlaps - s-s, p-p, s-p, p-d, d-d and their examples</p> <p>3.4 Formation of sigma and pi bonds</p> <p>3.5 Theories of bonding- a) valance bond theory, b) Heitler</p>	15

	London theory and c) Pauling Slater theory	
3.6	Concept of hybridization: Definition and need of hybridization, steps involved in hybridization, explanation of covalency of atoms in the moles based on hybridization, types Of hybridization involving s, p, and d orbitals	
3.7	Applications of hybridization in geometries of molecules like i) BeH ₂ ii) BF ₃ iii) [MnCl ₄] ²⁻ iv) [Ni(CN) ₄] ²⁻ v) Fe(CO) ₅ vi) [Cr(H ₂ O) ₆] ⁷⁺ vii) IF ₇	
3.8	VSEPR theory - Assumptions, need of theory, application of theory to explain geometry of irregular molecules i) ClF ₃ ii) Cl ₂ O iii) BrF ₅ iii) TeCl ₄ iv) XeO ₃ v) XeOF ₄	
3.9	Molecular orbital theory of Homonuclear and heteronuclear diatomic	

Course Code	Title	Credits
USFS 103	Physical Science – I (Optics)	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	<p>Geometrical Optics, Interference and Polarization</p> <p>1.1. Geometrical Optics:</p> <p>1.1.1. Reflection and Refraction</p> <p>1.1.2. Reflection at Plane, Spherical, Elliptical and Parabolic Mirrors (Graphical Method)</p> <p>1.1.3. Lenses: Terminology, Image tracing, Location of image, Sign Convention.</p> <p>1.1.4. Thin Lens: Lens equation, Lens maker's formula, Newton's lens equation, Magnification, Deviation by thin lens, Power, Equivalent focal length of two thin lenses.</p> <p>1.1.5. Optical system and Cardinal Points: Cardinal Points, Construction of image using Cardinal Points, Newton's Formula, Gaussian Formula.</p> <p>1.1.6. Thick lens: Cardinal Points, Thick lens equation, Behavior of lens with thickness, Combination of two Thick Lenses.</p> <p>1.1.7. Applications of Lens Combination</p> <p>1.2. Interference in Thin Films:</p> <p>1.2.1. Thin films</p> <p>1.2.2. Plane parallel films</p> <p>1.2.3. Interference due to transmitted light</p> <p>1.2.4. Haidinger Fringes</p> <p>1.2.5. Wedge shaped films</p> <p>1.2.6. Newton's Rings</p> <p>1.2.7. Michelson Interferometer</p> <p>1.2.8. Fabry-Perot Interferometer</p> <p>1.2.9. Applications: Antireflection Coatings, Dielectric Mirrors, Interference filters.</p> <p>1.3. Polarization:</p> <p>1.3.1. Introduction,</p> <p>1.3.2. Types of Polarization</p> <p>1.3.3. Production of Plane polarized light</p> <p>1.3.4. Polarizer and Analyzer</p> <p>1.3.5. Malus law</p> <p>1.3.6. Anisotropic crystal: Calcite crystal</p> <p>1.3.7. Nicol prism</p> <p>1.3.8. Retarders: Quarter and Half wave plates</p> <p>1.3.9. Production and detection of linearly, elliptically and circularly polarized light</p>	15
Unit II	<p>Diffraction</p> <p>2.1. Fresnel's diffraction:</p> <p>2.1.1. Introduction</p>	15

	<p>2.1.2. Huygen's-Fresnel's theory, Fresnel's assumptions</p> <p>2.1.3. Distinction between interference and diffraction</p> <p>2.1.4. Fresnel and Fraunhofer types of diffraction</p> <p>2.1.5. Diffraction due to single edge</p> <p>2.1.6. Position of maximum and minimum intensity</p> <p>2.1.7. Intensity at a point inside a geometrical shadow</p> <p>2.1.8. Diffraction due to a narrow slit</p> <p>2.1.9. Diffraction due to narrow wire.</p> <p>2.2. Fraunhofer diffraction:</p> <p>2.2.1. Introduction</p> <p>2.2.2. Fraunhofer diffraction at a single slit, intensity distribution in diffraction pattern due to single slit</p> <p>2.2.3. Fraunhofer diffraction due to double slit</p> <p>2.2.4. Distinction between single slit and double slit diffraction patterns</p> <p>2.2.5. Plane diffraction grating, theory of plane transmission grating, width of principal maxima, prism and grating spectra.</p> <p>2.3. Resolving Power:</p> <p>2.3.1. Raleigh's criterion, resolving power of optical instruments, criterion for resolution according to Lord Rayleigh's</p> <p>2.3.2. Resolving power of telescope</p> <p>2.3.3. Resolving power of a prism</p> <p>2.3.4. Resolving power of a plane transmission grating.</p>	
Unit III	<p>Lasers and Optical Fibres</p> <p>3.1. Laser :</p> <p>3.1.1. Interaction of radiation with matter-Quantum mechanical view</p> <p>3.1.2. Einstein Coefficients and their relations, Conditions for light amplification</p> <p>3.1.3. Population and thermal equilibrium; Population inversion</p> <p>3.1.4. Metstable state</p> <p>3.1.5. Optical resonator</p> <p>3.1.6. Components of Laser</p> <p>3.1.7. Lasing action</p> <p>3.1.8. Pumping; Principal pumping scheme</p> <p>3.1.9. Types of Lasers: Ruby, Nd:YAG, He-Ne, CO₂, Semiconductor diode laser</p> <p>3.1.10. Laser beam Characteristics</p> <p>3.1.11. Applications.</p> <p>3.2. Holography:</p> <p>3.2.1. Principle of Holography</p> <p>3.2.2. Construction and Reconstruction of Hologram</p> <p>3.2.3. Important properties of Hologram</p> <p>3.2.4. Applications.</p> <p>3.3. Fibre Optics :</p> <p>3.3.1. Fibre Geometry</p> <p>3.3.2. Total internal reflection</p>	15

	<ul style="list-style-type: none">3.3.3. Light propagation through Fibres3.3.4. Numerical Aperture3.3.5. Skip distance of Total internal reflection3.3.6. Modes of propagation3.3.7. Classification of Optical Fibres3.3.8. Step-Index and Graded-Index Fibres3.3.9. V-Number3.3.10. Fabrication3.3.11. Losses in Optical Fibre3.3.12. Spicing3.3.13. Applications of Fibres.	
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Course Code	Title	Credits
USFS 104	Biological Science – I	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Biology of Cell 1.1 Ultrastructure of prokaryotic and eukaryotic cells 1.2 Study of cell organelles: Mitochondria, Ribosomes, Chloroplasts, ER, Golgi apparatus, Nucleus 1.3 Study of cytoskeleton: Microtubules, Microfilaments and Intermediate filaments 1.4 Prokaryotic cell – Gram positive and Gram negative cell wall structure, slime layer, components of cell membrane 1.5 Eukaryotes : Models of membrane structure, Membrane lipids, proteins and carbohydrates 1.6 Cell cycle - An overview of cell cycle; Programmed cell death (Apoptosis), intrinsic and extrinsic pathways of cell death	15
Unit II	Human Anatomy And Physiology 2.1 Musculoskeletal system : Anatomy and Physiology 2.2 Nervous system : Anatomy and Physiology 2.3 Circulatory system : Anatomy and Physiology 2.4 Respiratory system: Anatomy and Physiology 2.5 Digestive system : Anatomy and Physiology 2.6 Reproductive system : Anatomy and Physiology 2.7 Endocrine system : Anatomy and Physiology 2.8 Excretory System : Anatomy and Physiology	15
Unit III	Serology: 3.1 Blood: Composition: Plasma, serum, Blood corpuscles, Proteins, Hemoglobin structure and function, Presumptive tests, Confirmatory tests 3.2 Saliva: Composition, Presumptive tests and Confirmatory tests 3.3 Semen: Composition, Presumptive tests and Confirmatory tests 3.4 Composition and analysis of other fluids such as sweat, urine, vaginal fluid, menstrual blood, vomit, pus, fecal matter 3.5 Blood Grouping systems: ABO, Rhesus, MNO, Lewis Antigens, Secretor, non-secretor status	15

Course Code	Title	Credits
USFS 105	Psychology – I	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	THE SCIENCE OF PSYCHOLOGY 1.1 Science of Psychology: Definition, Goals of Psychology 1.2 History of Psychology: Development of Psychology, History of Psychology in India 1.3 Modern Perspectives in Psychology: Psychodynamic, Behavioristic, Humanistic, Cognitive, Bio-psychological, Socio-cultural, Evolutionary 1.4 Types of Psychology Professions: Psychiatrist, Psychologist, Counselor 1.5 Research methods in Psychology: Interview, Observation, Case study 1.6 Ethics in Psychology: APA code of conduct for Psychologists, Animal Ethics	15
Unit II	THE BIOLOGY OF MIND 2.1 Neurons: Structure, Neural impulses, Building the network, Neurotransmitters 2.2 Nervous System: Central Nervous System, Peripheral Nervous System 2.3 Human Brain: Structure and Function, Left and Right Hemispheres, Functions and significance 2.4 Endocrine System: Pituitary, Thyroid and others	15
Unit III	CONSCIOUSNESS AND PERCEPTION 3.1 Consciousness : Definition and States of Consciousness 3.2 Sleep: Stages of sleep, REM and Non-REM sleep, Dreams, Sleep disorders 3.3 Altered states of consciousness: Hypnosis and Drugs 3.4 Attention: Definition, Characteristics, Types 3.5 Sensation and Perception: Basic Concepts, Gestalt Principles	15

Course Code	Title	Credits
USFS 106	Computer Science – I	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Computer Organization 1.1 Organization and Structure 1.2 Structure and Function 1.3 Brief History of Computers 1.4 Designing for Performance 1.5 The Evaluation of Intel X86 Architecture 1.6 Performance Assessment 1.7 Computer Components 1.8 Computer Function 1.9 Interconnection Structure 1.10 Bus Interconnection 1.11 PCI	15
Unit II	Operating System 2.1 What is Operating System? 2.2 Mainframe Systems, Desktop Systems 2.3 Multi-Processor Systems, Distributed Systems 2.4 Clustered, Real-Time, and Hand-Held Systems 2.5 Computing Environments 2.6 Computer System Operation 2.7 I/O Structure, Storage Structure, Storage Hierarchy 2.8 Hardware Protection, Network Structure 2.9 System Components 2.10 Operating System Services 2.11 System Calls, System Programs, System Structure 2.12 Virtual Machines 2.13 System Design and Implementation 2.14 System Generation	15
Unit III	Internet Forensics 3.1 What is Internet Forensics? 3.2 The Seamy Underbelly of the Internet 3.3 Pulling Back the Curtain 3.4 Tacking Back our Internet 3.5 Protecting Your Privacy 3.6 What is Internet, Internet Services 3.7 Types of Accounts 3.8 Choosing an ISP 3.9 What is an Intranet?, Components of Intranet 3.10 How do you get your Email? 3.11 E-Mail Addressing, Downloading E-mail 3.12 Elements of the Web, Web Browsers 3.13 Keeping Track of Your Favorite Web Sites 3.14 Security and Privacy Issues	15

Course Code	Title	Credits
USFS 107	Criminology and Penology	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Criminology: Concept and Schools/Theories 1.1 Definition and Scope of Criminology 1.2 Nature and Concept of Criminology 1.3 Schools of Criminology 1.4 Classical and Neo Classical Schools 1.5 Lombroso Theory/Positive School 1.6 Typological School 1.7 Socialistic School 1.8 Sociological School 1.9 Anthropological School 1.10 Multiple Factors Theory 1.11 Theory of Behavior 1.12 Constitutional Theories 1.13 Hereditary Theories 1.14 Traits Theories 1.15 Theories of Personality	15
Unit II	Crime Causes and Categories 2.1 Social Causes of Crime 2.2 Economic Causes of Crime 2.3 Physical and Mental Defects 2.4 Geographical Causes of Crime 2.5 Political Causes of Crime 2.6 Terrorism, Cyber Crimes 2.7 Environmental Crimes 2.8 Crime and Politics 2.9 White Collar Crimes and Organized Crimes 2.10 Juvenile Delinquency and Female Delinquency	15
Unit III	Penology : Punishments, Prison Reforms and Correctional Administrations : 3.1 Introduction and History 3.2 Theories of Punishments 3.3 Kinds of Punishments 3.4 Historical Development from Punishment to Correction and Reformation 3.5 Prevention and Control Mechanism 3.5.1 Prison Systems: Traditional Prison, Open Air Prison, Pennsylvanian System etc. 3.6 Prison Reforms in India 3.7 Correctional Administrations 3.8 Probation and Parole 3.9 Recidivism/Victimology	15

B.Sc. (FORENSIC SCIENCE)

Semester I – Practical

Course Code	Title	Credits
USFS P1	Forensic Science and Chemical Science Practical	2
Practical No.		
Title of the Practical		
No. of Practicals		
Forensic Science Practical		
1	Introduction to Lab and Safety Protocols in Forensic Science Laboratory	1
2	Study the Locard's Principle of Exchange A. Examination of Macro Evidences B. Examination of Micro Evidences	2
3	Study the Law of Individuality A. Establishment of Individuality in Living B. Establishment of Individuality in case of Non Living C. Establishment of individuality in case of Man Made Things	3
4	Study the Law of Progressive Change A. Study of changes with Time in Living B. Study of changes with Time of the Scène of Crime	2
5	Study of Principle of Comparison A. Comparison of Forensic Exhibits to prove they are from same Origin B. Comparison of Suspected Exhibit with Standard Sample. C. Study of Class and Individual Characteristics	3
6	Validation of Principle of Analysis A. Analysis of Biological Sample of Forensic Interest. B. Analysis of unknown Matrix to identify its Contents.	2
7	Law of Probability A. Implementation of Probability in Forensic Sampling.	1
8	Facts do not lie – Prove experimentally	1
9	Discussion of a Case in a Forum	1
10	Handling of Basic Forensic Science Instruments	1
Chemical Science Practical		
1	Storage and handling of chemicals, handling of acids, bases, toxic and poisonous chemicals, MSDS, antidotes, threshold vapor concentration and first aid procedure	1
2	Heating methods, stirring methods, filtration techniques, calibration of pipette, standard measuring flask and burette	1
Any Three Inorganic qualitative analyses without phosphate and borate removal,		
3	Mixture-1 (water soluble)	1
4	Mixture-2 (water insoluble)	1
5	Mixture-3 (water insoluble)	1

6	Inorganic qualitative analysis of Binary Mixtures (including phosphate and borate removal). Sodium carbonate extract is to be used wherever necessary for detecting acidic radicals	1
7	Determination of hardness of water from a given sample of water by EDTA method	1
8	Analysis of alkali mixture by volumetric method	1
9	To standardize NaOH solution and hence find the strength of given HCl solution	1
10	To standardize KMnO_4 soln. and hence find strength of the given solution	1
11	Estimation of percent purity of a given sample of sodium chloride	1
12	Analysis of brass	1
13	Determination of Ca in presence of Mg by using EDTA	1
14	Estimation of Al (III) from the given aluminum salt solution by using Eriochrome Black-T indicator (Back titration method).	1
15	To determine amount of acetic acid in commercial vinegar	1
16	Estimation of sodium carbonate content of washing soda	1
17	The Separation and Identification of Metal Ions Using Paper Chromatography	1
19	Crystallization with M.P. and percent yield of purified compound	1
20	Distillation with B.P. and percent yield of purified compound	1
21	Sublimation with M.P. and percent yield of purified compound	1

Course Code	Title	Credits
USFS P2	Physical Science and Biological Science Practical	2
Practical No.	Title of the Practical	No. of Practical's
Physical Science Practical		
1.	Standard operating procedures for using Vernier Caliper, Micrometer Screw Gauge, Travelling Microscope, Spectrometer , pH meter, Turbidity meter and Sound level meter	1
2.	Determination of combined focal length, Magnification using Combination of lenses	1
3.	Spectrometer: Schuster's Method Adjustment of Collimator and Telescope for Parallel rays	1
4.	Determination of angle of prism A using Spectrometer	1
5.	Determination of refractive index of material of prism using Spectrometer	1
6.	Determination of radius of capillary using Travelling microscope	1
7.	Determination of radius of curvature of Plano convex lens using Newton's rings	1
8.	Wedge Shaped Film: Determination of thickness of a thin foil using air wedge	1
9.	Determination of principle refractive indices of double refracting crystals	1
10.	Cylindrical obstacle : A) Determination of Wavelength of Sodium light B) Determination of thickness C) Determination of sharpness of obstacle	3
11.	Determination of wavelength of sodium light using Fresnel's biprism	1
12.	Determination the Resolving power of telescope	1
13.	Determination of wavelength of spectral lines using Plane diffraction grating	1
14.	Laser experiments : A) Measurement of divergence of laser B) Interference with double slit C) Interference with a biprism D) Diffraction due to Plane transmission grating E) Fraunhofer diffraction at a circular aperture F) Verification of Malus Law G) Determination of wavelength of light using Plane transmission grating H) Determination of Refractive Index of given liquid using Laser	8
15.	Determination of Acceptance angle and NA of Optical Fibre	1
16.	Determination of Fill Factor and Efficiency and study of the characteristics of Solar Cell	1
17.	Use of Origin 8 Software for graphs plotting	1

Biological Science Practical		
1	Study of construction and working of compound microscope.	1
2	Monochrome staining of prokaryotic cell (Bacterial cells).	1
3	Monochrome staining of eukaryotic cell (Yeast)	1
4	Gram staining of bacterial cells.	1
5	Study of mold by slide culture technique.	1
6	Wet mount of different fungal spores.	1
7	Detection of mitochondria by differential centrifugation.	1
8	Study of different stages of mitosis.	1
9	Study of different stages of meiosis.	1
10	Qualitative test for detection of DNA by diphenylamine method.	1
11	Qualitative test for detection of RNA by Orcinol method.	1
12	Staining of epithelial cells from oral cavity	1
13	Study of permanent slides of muscular, bone tissues	1
14	Phenolphthalein test for blood detection	1
15	Teichmann/ Takayama crystal assay for blood detection	1
16	Starch-Iodine assay for saliva detection	1
17	Christmas tree staining of spermatozoan cells	1
18	Separation of serum from blood using centrifugation	1
19	Blood grouping	1
20	Differential WBC count	1

Course Code	Title	Credits
USFS P3	Psychology and Computer Science Practical	2
Practical No.	Title of the Practical	No. of Practical
Psychology Practical		
1	Introduction to Psychology Practicals	2
2	Objective Personality test: Locus of Control test	3
3	Projective Personality test: House, Tree, Person test	3
Computer Science Practical		
1	Demonstration of Desktop Computer Organization, Number Systems	1
2	Study of Logic Gates – AND, NOT, OR	1
3	Study of Logic Gates – NOR, XOR, NAND	1
4	Study of Combinations of Logic Gates	1
5	Study of Flip-Flops	1
6	Demonstration of Assembly Language Programming Editor	1
7	Write an Assembly Language Program for Arithmetic Operations	1
8	Write an Assembly Language Program for Logical Operations	1
9	Write an Assembly Language Program for Conditions	1
10	Write an Assembly Language Program for Loops	1
11	Demonstration of Working of Internet.	1
12	Demonstration of Email Concepts	1
13	Study of Cyber Forensic Tool – wireshark	1
14	Study of Cyber Forensic Tool – nmap	1
15	Study of Cyber Forensic Tool – IP Sniffer	1

B.Sc. (FORENSIC SCIENCE)

Semester I – References

USFS 101: Forensic Science - I

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Forensic Science in India and the World, Deepak Ratna and Mohd. Zaidi, Alia Law Agency, Allahabad	I	2-52 57-66 67-74 77-81 83-97 105-110 261-263 264-276 280-307 357-380
2	Forensic Science and Crime Investigation, Third Edition, B.S.Nabar, Asia Law House, Hyderabad	II	1-14
3	Forensic Science in India - A Vision for 21 st Century, B. B. Nanda and Dr. R. K. Tewari, Select Publishers	III	1-26 29-51
4	Fundamentals of Forensic Science, Second Edition, Max M. Houck and Jay A Siegel, Academic Press	III	1-49
5	Introduction to Criminalistics, Second Edition, Richard Saferstein, Pearson	I	1-15
6	Forensic Science in Criminal Investigation and Trials, Fourth Edition, B. R. Sharma, Universal Law Publishing Co. Ltd.	II	6-12 13-21 21-30 30-55 55-60 61-126
7	Forensic Science, Third Edition, Stuart H James and Jon . J.Nordby	I II	1-40 61,81,101, 137 243-260

Sr. No.	Additional References
1	John, D. Deehan, Kirk's Fire Investigation, 5th Edn., Prentice Hall (2002)Turrey B; Criminal Profiling - An Introduction to Behavioral Evidence Analysis, Acad. Press London (1999)
2	Richard Saferstein, 2001, Criminalistic: An Introduction to Forensic Science. 7 th edition Prentice-Hall, New Jersey.
3	L.J. Kaplan, 2001. A laboratory manual for the introduction to the Crime Lab. Williamstown, Massachusetts.
4	Moenseens, A.A., Starrs, J.E., Henderson, C.E. and Inabare, F.E., 1995. Scientific
5	Evidence in Civil and Criminal cases, IV edition, Foundation Press, Westbury, New

	York.
6	Fishes, B.A.J., 2000. Techniques of Crime Scene Investigation. VI edition CRC Press, Boca Raton, 2000.
7	James, S.H. and Nordby J.J. Forensic Science : An introduction to Scientific and investigative techniques, CRC Press, USA, 2003.
8	Redsicker, 2000. The Practical Methodology of Forensic Photography
9	Henry Lee's Crime Scene Handbook by Henry C Lee
10	Crime Scene Processing and Laboratory Work Book by Patric Jones
11	Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. by Stuart H. James
12	Forensic Science in Criminal Investigation and Trial, 4th ed. By B.R. Sharma
13	Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology by Parikh C.K.
14	Introduction to Criminalistics: The foundation of Forensic Science by B. J. Fisher, W.J. Tilstone, C. Woytowicz.
15	Practical Crime Scene Analysis and Reconstruction by Ross M. Gardner and Tom Bevel.
16	Forensic Science: An Introduction to Scientific and Investigative Techniques By S.H James, JJ Nordby.
17	Advanced Crime Scene Photography by C.D. Duncan.
18	Forensic Science in Court- The Role of Expert Witness by Wilson Wall.
19	W.W. Bennett and Karen M. Hass; Criminal Investigation, 6th Ed., Wordsworth Thompson Learning (2001)
20	Barry, A.J. Fisher; Techniques of Crime Scene Investigation, 7th Ed, C.R.C. Press NY (2003)
21	Mordby, J Deed Reckoning; The Art of Forensic Detection, CRC Press LLC (2000)
22	Eckett, W.G and James S.H; Interpretation of Blood stains, Evidence of Crime scene, Elseiver Pub. NY (1989)
23	James S.H; Scientific and Legal applications of Blood stain pattern Identification, CRC Press (1998)

USFS 102 :Chemical Science – Inorganic Chemistry

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Advanced Inorganic Chemistry, Volume-I, Nineteenth Edition, Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan, S. Chand Publication, ISBN- 81-219-0263-0.	I	59-180 657-702
2	Concept and model of Inorganic Chemistry, Third Edition, Douglas Mc. Doniels, Wiley India	II	350-373
3	Concise Inorganic Chemistry, Fifth Edition, J. D. Lee, Wiley India	III	30 -91
4	General Chemistry, Sixth Edition, Raymond Chang, McGraw Hill	III	251-348

Sr. No.	Additional References
1	Inorganic Chemistry by James Hughey
2	New guide to Modern Valance Theory by G.I. Brown, 3rd Edn.
3	A textbook of macro & semi micro qualitative analysis by A.J. Vogel, fifth edition
4	Vogel's textbook of Quantitative Analysis, sixth edition by J. Mendham, R.C. Denney, J.D. Barnes, MJK Thomas
5	Advanced Inorganic Chemistry, Satyaprakash, Tuli, Basu
6	Text book of Inorganic Chemistry, P.L. Soni
7	Fundamental Chemistry by A. K. Dee. (3rd Ed)
9	University general Chemistry, by C.N.R.Rao, McMillan
10	Inorganic Chemistry by D.F. Shiver & P.W. Atkins, C.H. Largeford ELBS - 2nd edition
11	Theoretical Inorganic Chemistry by Day and Selbin
12	Inorganic Chemistry by Sharpe - 3rd Edition

USFS 103 : Physical Science – Optics

Sr. No.	Name of Book	Referred Units	Referred Pages
1	A text book of Optics, Multicoloured Revised Edition 2014, Subramanyam, Brij Lal, Avadhanulu, S. Chand and Co. Pvt. Ltd, ISBN 81-219-2611-4	I to III	2.1 to 2.10, 3.1 to 3.11, 4.1 to 4.17, 5.1 to 5.10.2, 6.1-6.8.2. 15.1 to 15.17. 17.1, 17.2, 17.3, 17.6, 17.7, 17.10, 17.10.1, 17.10.2, 17.11, 17.12, 18.1, 18.2, 18.2.1, 18.4, 18.4.2, 18.7, 18.7.1, 18.7.2, 18.7.8(I to VI) 19.1, 19.2, 19.5, 19.6, 19.7, 19.11, 19.12. 20.1 to 20.32. 22.1 to 22.19 23.1 to 23.10
2	Engineering Physics Seventh Enlarged, Revised Edition 2004, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd. ISBN 81-219-0817-5	III	14.1 to 14.15

Sr. No.	Additional References
1	Optics – Ajoy Ghatak (3rd Ed) Mc. Graw Hill Co.
2	Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication.
3	Principles of Optics – B. K. Mathur and T. P. Pandya (3rd Ed.) 1981, McGraw Hill International.
4	Fundamentals of Optics – Khanna and Gulati (1994), S. Chand.
5	Optics – C. L. Arora, S. Cand and Co. Ltd (2001)
6	Fundamentals of Physics-Resnik, Halliday and Walker, John Wiley Publication.
7	Fundamentals of Optics – Jenkins and White. (4th Ed) McGraw Hill International.
9	Optics – Ajoy Ghatak (2nd Ed.) Tata McGraw Hill.
10	Electronic Communication System and Device – Kennedy. (4th Ed) Tata McGraw Hill.
11	Fibre Optics – Kaiser, McGraw Hill.
12	An Introduction To Laser Theory And Application- M. N.Avdhanulu S.Chand publications
13	Advanced course in Practical Physics D. Chattopadhyaya, PC. Rakshit and B. Saha. (6th Edition) Book and Allied Pvt. Ltd.
14	BSc Practical Physics – Harnam Singh S. Chand and Co. Ltd. – 200.
15	B Sc. Practical Physics – CL Arora (1st Edition) – 2001 S. Chand and Co. Ltd.
16	Practical Physics – CL Squires – (3rd Edition) Cambridge University Press.
17	University Practical Physics – D C Tayal. Himalaya Publication.
18	Advanced Practical Physics – Worsnop and Flint.
19	A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3rd edition)

USFS 104 : Biological Science – I

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Cell Biology, Sixth Edition International Students Edition, Gerald Karp, Wiley Publications, 2010	I	7-12, 303-317, 354-358, 389-393, 454-455, 465-467, 505-508, 528-535, 561-594, 642-644
2	Human Physiology : From Cells to Systems, Lauralee Sherwood, Cengage Learning, 2008	II	133-182 257-390 461-556 589-640 661-800
3	Forensic Biology, Richard Li, CRC Press	III	85-95 115-180

Sr. No.	Additional References
1.	Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D. and James Darnell, J. Molecular Cell Biology , Freeman, 6 th edn 2007.
2.	Alberts, B. et al. Essential Cell Biology, Garland, 3 rd edn 2009.
3.	Karp, G. Cell and Molecular Biology: Concepts and Experiments. Wiley, 6 th edn 2010.
4.	Morgan, David O. The Cell Cycle. OUP 2006
5.	Hancock, J.T., Cell Signalling. 3 rd edn. OUPr, 2010.
6.	Parikh C.K., Medical Jurisprudence
7.	Nordby & James Introduction to Forensic Science
8.	Gray H., Gray's anatomy.
9.	Chaurasia B.D., Human Anatomy.
10.	Chatterjee C.C., Human Physiology, Medical Allied Agency, 1 st edn, 1951
11.	Drake R.L., Vogl A.W., Gray's Anatomy, Elsevier, 2 nd edn.
12.	Nordby & James Introduction to Forensic Science
13.	Lodish, Molecular Cell Biology.
14.	Reddy, Synopsis of Forensic Medicine.

USFS 105 : Psychology - I

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Psychology, Sandra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	I	2-41
2	Psychology, Sandra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	II	50-84
3	Psychology, Sandra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	III	116-120 136-171

Sr. No.	Additional References
1	Psychology, Sixth Edition, Henry Glictman, Norton and Company, 2004
2	Psychology in Action, Fifth Edition, Huffman, Mark and Judith Vernoy, John Willey and Sons, 2000
3	Cognitive Psychology, Galotti and Wadsworth, Sangage Learning, 2004
4	Social Psycholgy, Baron, Pearson Education, 2010

USFS 106 : Computer Science - I

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Computer Organization and Architecture Designing for Performance, Eight Edition, William Stallings, Pearson Publication	I	9-15 17-50 66-104
2	Operating System Concepts, Galvin, Wiley Publication	II	3-22 27-51 57-89
3	Internet Forensics, Robert Jones, O'Reilly Publication	III	1-6
4	Internet : The Complete Reference, Millennium Edition, Margaret Young, Mc-Graw Hill Publication	III	4-18 85-93 102-109 390-408

Sr. No.	Additional References
1	Computer Networking by Tanenbaum
2	Computer Security Basics by Rick Lehtines
3	Cyber Forensic by Mareculla Menendez
4	Computer Forensic by Newman
5	Data Communication and Networking by Forouzan
6	Network and System Security by John Vacca
7	Security Policies and Implementation Issue by Robert Jahnsen
9	Introduction to Computer by Rammohan Joshi
10	Basics of Computer by P. K. Singh
11	Computer Basics by Micheal Miller
12	Internet by John Hamilton
13	The Internet Basics by Jason Whittaker
14	Basic Electronics by V. K. Mehta
15	Digital Electronics by R. K. Jain

USFS 107 : Criminology and Penology

Sr. No.	Reference Book	Referred Units	Referred Pages
1	Criminology and Penology, Second edition, Paranjape N. V., Central Law Publication, Allahabad, U.P, 2001.	Unit I, II,III	1 to 350

Sr. No.	Additional References
1	Crime and Criminology/ Rohinton Mehta
2	Crime and Science: The New Frontier in Criminology /Jurgen Thorwald
3	Maguire Mike, Morgan Rod and Reiner Robert, 2007. The Oxford Handbook of Criminology, Oxford University Press.
4	E.H.Sutherland, 1968, Principles of Criminology (6th Edition), Times of India Press, Bombay.
5	Siegal Larry J, 2007, Criminology, Wordsworth Thomson Learning, New Delhi.

F.Y.B.Sc. (Forensic Science) (Semester II) Credits
To be implemented from Academic Year 2015-2016

Class	Title	Class Room Instruction Face to Face						50 Hours = 1 Credit					
		Per Week		15 Weeks (Per Sem)		Per Sem (Hours)		Notional (Hours)		Credits		Total Credits	
		L (50 Min)	P (50 Min)	L	P	L	P	L	P	L	P		
USFS 201	Forensic Science – II (Crime Scene Management)	3		45		36		100		2		2	
USFS 202	Chemical Science – II (Physical Chemistry)	3		45		36		100		2		2	
USFS 203	Physical Science – II (Nuclear Physics and Optical Instrumentation)	3		45		36		100		2		2	
USFS 204	Biological Science – II	3		45		36		100		2		2	
USFS 205	Psychology – II	3		45		36		100		2		2	
USFS 206	Computer Science – II	3		45		36		100		2		2	
USFS 207	Law – Indian Penal Code – I	3		45		36		100		2		2	
USFS P4	Forensic Science and Chemical Science Practical		6		90		72		100		2	2	
USFS P5	Physical Science and Biological Science Practical		6		90		72		100		2	2	
USFS P6	Psychology and Computer Science Practical		6		90		72		100		2	2	
Total	--	21	18	315	270	252	216	700	300	14	6	20	

B.Sc. (FORENSIC SCIENCE)

Semester II – Theory

Course Code	Title	Credits
USFS 201	Forensic Science – II (Crime Scene Management)	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Scene of Crime Occurrence 1.1 Crime Scene, Importance, Problems, Location, Nature of Scene 1.2 Types of Crime Scene (with and without Corpse, Indoor, Outdoor, Mobile and Aquatic Crime Scene, Primary and Secondary, recent and old Crime Scene) 1.3 Crime Scene investigation and management: Primary Survey (Line of approach, Point of Entry, Actual Scene, Point of exit, Line of retreat) 1.4 Cordoning the Scene and Crime Scene Security 1.5 Crime Scene Photography 1.6 Documentation of crime scene (photography, videography, note making) 1.7 Sketching (rough and final using conventional symbols) 1.8 Methods of sketching (base line, cross projection, co-ordinate, extended co-ordinate, polar method and mix method) 1.9 Searching (Zonal, spiral, strip, cross-hatch and circular method) 1.10 Evidence photography, method of evidential photography (using highlighter, scale, evidence number, handling of camera for still photography) 1.11 Documentation of evidence (list making and log maintenance) 1.12 Crime scene closing photography	15
Unit II	Physical Evidences 2.1 Definition, importance, utility, sources of physical evidence 2.2 Types of physical evidence 2.3 Biological evidence/ body Fluids- Blood in liquid form, blood stain (dry/wet), bloody objects, scrapes, semen stain (dry/wet) urine (liquid/stain), saliva, mammary gland secretions, perspiration, matrix, vaginal (secretion/stains/discharge), sputum, vomit, purge, vitreous humor, pus, sweat etc. 2.4 Corpse : Body, body parts, bones, hair, skin, flesh, teeth, nails, viscera, intestines, muscles, kidney, liver, ear and other organs 2.5 Documents : Register, account book, cheques, receipts, bills, files, applications, notepad, letters, pens, stamps, typewriters, sealing wax, seals, erasures, alterations, additions, deletions, photographic documents, burnt documents, currency, passports, tickets, licenses, suicide note, manuscripts, secret	15

	<p>writing etc.</p> <p>2.6 Explosive : Exploded products, fuses, tins, explosive device, electronic fragments etc.</p> <p>2.7 Finger prints : Objects bearing fingerprint evidence, photographs, lifts, latent and patent prints</p> <p>2.8 Fiber : Hair, fibers, strings, ropes, thread, clothes, rags and wood</p> <p>2.9 Firearms : Bullets, pellets, wads, gunpowder, objects bearing bullets holes, GSR, postmortem reports, guns and their parts, ammunitions, live and fired cartridges etc.</p> <p>2.10 Miscellaneous: Ash, buttons, cigarettes, soil, vehicles, tools marks, tools, poisons, foot and footwear marks, glass, paints, etc.</p> <p>2.11 Location of physical evidence at scene of crime, searching tools and techniques</p> <p>2.12 Collection of physical evidences along with control/ standard/ reference samples</p> <p>2.13 Handling of physical evidences, packaging, labeling, sealing, forwarding of evidence</p> <p>2.14 Chain of custody, transportation and storage</p> <p>2.15 Special instructions for specific evidences</p>	
Unit III	<p>Crime Scene Reconstruction</p> <p>3.1 Forensic evidence at laboratory (Reception, forwarding to the respective departments based on their nature and priority)</p> <p>3.2 Preliminary examination, concrete analysis, interpretation of results, report writing, final report generation of forensic exhibits</p> <p>3.3 Formulation of hypothesis</p> <p>3.4 Introduction, Importance of Crime Scene Reconstruction, Nature of Reconstruction,</p> <p>3.5 Basic Principles of reconstruction (Recognition, Identification, Individualization, Reconstruction)</p> <p>3.6 Stages in Reconstruction</p> <p>3.7 Types of Reconstruction-Classification</p> <p>3.8 Pattern Evidence in Reconstruction</p> <p>3.9 Writing a reconstruction report, general recommendations</p> <p>3.10 Final report for court presentation, case study</p>	15

Course Code	Title	Credits
USFS 202	Chemical Science – II (Physical Chemistry)	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	<p>1.1 Distribution law</p> <p>1.1.1 Nernst distribution law - Statement and thermodynamic proof for Nernst distribution law</p> <p>1.1.2 Association and dissociation of solute in solvent</p> <p>1.1.3 Application of distribution law</p> <p>1.1.4 Numerical</p> <p>1.2 Solutions of Liquids in Liquids</p> <p>1.2.1 Types of solutions</p> <p>1.2.2 Raoult's law</p> <p>1.2.3 Ideal and non-ideal solutions</p> <p>1.2.4 Henry's law and Application of Henry's law with example CS₂ in acetone</p> <p>1.2.5 Problems based on Raoult's law and Henry's law</p> <p>1.2.6 Vapor pressure-composition diagram of ideal and non-ideal solution</p> <p>1.2.7 Temperature-composition diagram of miscible binary solutions</p> <p>1.2.8 Distillation from temperature-composition diagram, Azeotropes, Partially immiscible liquids</p>	15
Unit II	<p>Kinetics of Homogeneous Reactions</p> <p>2.1 Molecularity and order</p> <p>2.2 First order reactions and its characteristics</p> <p>2.3 Second order reactions (with equal and unequal initial concentrations) and its characteristics</p> <p>2.4 Third order reactions (with equal initial concentrations) and its characteristics</p> <p>2.5 Pseudo molecular reactions</p> <p>2.6 Zero order reaction</p> <p>2.7 Effect of temperature on rate of reaction</p> <p>2.8 The energy of activation</p> <p>2.9 Theories of reaction rate</p>	15
Unit III	<p>Electrochemistry</p> <p>3.1 Conductance and measurement of conductance</p> <p>3.2 Cell constant, specific conductance and molar conductance</p> <p>3.3 Variation of specific and equivalent conductance with dilution for strong and weak electrolytes</p> <p>3.4 Kohlrausch's law of independent migration of ions, ion conductance and ionic mobility</p> <p>3.5 Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes</p> <p>3.6 Ostwald's dilution law</p> <p>3.7 Debye-Huckel model</p> <p>3.8 Application of conductance measurement (determination of</p>	15

	solubility product and ionic product of water)	
3.9	Conductometric titrations	
3.10	Determination of transport number by moving boundary method	
3.11	Types of electrochemical cells and examples, cell reactions, emf and change in free energy, ΔH and ΔS of cell reactions from emf measurements	
3.12	Thermodynamic derivation of Nernst equation	
3.13	Standard cells, Half-cells / electrodes, different types of electrodes (with examples)	
3.14	Standard electrode potential (IUPAC convention) and principles of its determination	
3.15	Types of concentration cells	
3.16	Liquid junction potential and its minimization	
3.17	Glass electrode and determination of pH of a solution	
3.18	Potentiometric titrations - acid-base titration and redox titration	

Course Code	Title	Credits
USFS 203	Physical Science – II (Nuclear Physics and Optical Instrumentation)	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Nuclear Physics, Refractometry and Polarimetry 1.1. Nuclear Physics: 1.1.1. Isotopes 1.1.2. Nuclear Forces 1.1.3. Atomic Mass Unit, Binding Energy, Mass Defect 1.1.4. Nuclear reactions (Fission and Fusion) 1.1.5. Nuclear reactors 1.1.6. Radioactivity, Half-life, Mean life 1.1.7. Successive radioactive transformation ABC type, radioactive equilibrium (transient and secular) 1.1.8. Carbon dating 1.2. Refractometry: 1.2.1. Introduction 1.2.2. Abbe Refractometer 1.2.3. Applications of Abbe Refractometry 1.3. Polarimetry : 1.3.1. Introduction 1.3.2. Plane Polarized Light 1.3.3. Optical Activity 1.3.4. Laurent's Half Shade Polarimeter	15
Unit II	FORENSIC PHOTOGRAPHY AND MICROSCOPY 2.1. Forensic Photography: 2.1.1. Introduction 2.1.2. 35 mm Film / Digital SLR camera 2.1.3. Digital Versus Film 2.1.4. Lenses, Lens filters and Attachments 2.1.5. Tripod and Other Camera Supports 2.1.6. Identification Markers 2.1.7. Electronic and Strobe Flashes 2.1.8. Cable Release 2.1.9. Lens Attachments 2.1.10. Hard Cases, Soft Cases and Backpacks 2.1.11. Basic Exposure: Proper Exposure Triangle 2.1.12. Shutter Speed and Motion Control 2.1.13. Reciprocal Exposure 2.1.14. ISO number 2.1.15. Exposure Index 2.1.16. Focus and Depth of Field and Lenses 2.1.17. Crime Scene Photography 2.2. Forensic Microscopy: 2.2.1. Concept of Magnification and Resolution 2.2.2. Parts functions and properties of Compound microscope	15

	<p>2.2.3. Parts functions and properties of Comparison microscope</p> <p>2.2.4. polarization and applications</p> <p>2.2.5. Parts functions and properties of Stereomicroscope, Polarizing microscope</p> <p>2.2.6. Parts functions and properties of Stereomicroscope, Micro spectrophotometer</p> <p>2.2.7. Scanning Electron Microscope (SEM)</p> <p>2.2.8. Transmission Electron Microscope (TEM).</p>	
Unit III	<p>UV-VIS, FTIR AND RAMAN SPECTROPHOTOMETERS</p> <p>3.1. UV-Vis Spectrophotometer:</p> <p>3.1.1. Introduction</p> <p>3.1.2. Theory of Spectrophotometry</p> <p>3.1.3. Deviation from Beer's Law</p> <p>3.1.4. Basic principle working and instrumentation of UV-Vis Spectrophotometer</p> <p>3.2. FTIR Spectrophotometer:</p> <p>3.2.1. Introduction, Range of IR radiation</p> <p>3.2.2. Nomenclature of IR Spectra</p> <p>3.2.3. Theory of absorption spectroscopy</p> <p>3.2.4. Modes of vibrations</p> <p>3.2.5. Selection rules</p> <p>3.2.6. Position and intensity of bands</p> <p>3.2.7. Units of measurements</p> <p>3.2.8. Basic principle working and instrumentation of IR and FTIR Spectrophotometer</p> <p>3.3. Raman Spectrophotometer:</p> <p>3.3.1. Introduction</p> <p>3.3.2. Characteristic properties of Raman Lines</p> <p>3.3.3. Difference between Raman and IR spectra</p> <p>3.3.4. Mechanism of Raman effect</p> <p>3.3.5. Basic principle working and instrumentation of Raman Spectrophotometer</p> <p>3.3.6. Obtaining and interpretation of data</p> <p>3.3.7. Applications</p>	15

Course code	Title	Credits
USFS 204	Biological Science – II	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	<p>Biochemistry :</p> <p>1.1 Basic chemistry of biomolecules : Carbohydrates, Lipids, Proteins and Nucleic acids</p> <p>1.2 Amino acids : Classification, properties and biological significance</p> <p>1.3 Proteins</p> <p>1.3.1 Classification based on structure and functions, structural organization of proteins (primary, secondary, tertiary and quaternary structures)</p> <p>1.3.2 separation techniques based on molecular size(dialysis, ultrafiltration, density gradient centrifugation, molecular-exclusion chromatography), solubility differences (isoelectric precipitation, solvent fractionation, salting-in and salting out), electric charge (electrophoresis, ion exchange chromatography), ligand specificity (affinity chromatography)</p> <p>1.4 Carbohydrates metabolism : Glycolysis, Kreb’s Cycle and oxidative phosphorylation, Gluconeogenesis, Pentose phosphate pathway, Glyoxylate cycle</p> <p>1.5 Lipids : Structure, properties, classification and functions, lipid metabolism</p> <p>1.6 Vitamins : Chemistry, biological significance, deficiencies</p> <p>1.7 Enzymology</p> <p>1.7.1 Structure and types of enzymes</p> <p>1.7.2 Enzyme kinetics : Enzyme cofactors, Chemical kinetics, Michaelis-Menten equation, Effect of pH and temperature on enzyme activity, Enzyme inhibition (Reversible and Irreversible)</p>	15
Unit II	<p>Wildlife Flora</p> <p>2.1 Classification : Outline of the important systems of classification - Bentham and Hooker's system, Hutchinson system</p> <p>2.2 Plant parts and products of Forensic significance</p> <p>2.2.1 Pollen (Palynology) : nature, structure, types of pollination, identification, significance (case studies)</p> <p>2.2.2 Spore : structure, identification, significance</p> <p>2.2.3 Plant fluids : Identification and collection of sap, gum</p> <p>2.2.4 Wood (Dendrochronology) : Properties, Wood types, Identification of wood, study of tree rings, dating</p> <p>2.2.5 Fibres : Cotton, jute, flax, hemp.</p> <p>2.3 Plants of Forensic significance: ornamental plants, common poisonous plants and plant parts, narcotic plants,</p>	15

	<p>endangered plants</p> <p>2.4 Role of algal diversity in forensics</p> <p>2.5 Role of fungi in Forensics</p> <p>2.6 Study of diatoms(Limnology) : structure, identification, significance (case studies)</p>	
Unit III	<p>Wildlife Fauna</p> <p>3.1 Classification : Outline of the Five kingdom system</p> <p>3.6 Animal parts of forensic importance: Antlers, horns, shahtoosh hair, hides of leopards, tigers and reptiles, bearbile, ivory, claws, meat, mongoose hair, fur</p> <p>3.7 Poisonous animals : venomous snakes, scorpions, cantharides</p> <p>3.8 Endangered animals according to the Red Data List</p> <p>3.9 Role of insects in forensics (Entomology): Study of life-cycle of insects (blowfly), significance (cases of entomology)</p> <p>3.10 Role of birds in Forensics (Ornithology): Feather structure, types of feathers, forensic significance</p>	15

Course Code	Title	Credits
USFS 205	Psychology – II	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	LEARNING AND MEMORY 1.1 Learning : Definition, Principles of Conditioning: Classical and Operant conditioning, Observational learning and models 1.2 Basic Processes of Memory - Encoding, Storage, Retrieval 1.3 Stages of Memory : Working memory, STM and LTM 1.4 Types of Memory : Declarative, Procedural, Semantic, Episodic, Explicit and Implicit memory 1.5 Models of Memory : LOP, PDP, Information processing approach	15
Unit II	COGNITION, MOTIVATION AND EMOTION 2.1 Thinking – Theories and models of thinking, types of thinking 2.2 Decision making and Problem solving: Stages of problem solving, Methods of problem solving, Theories of decision making 2.3 Concept formation: Types of concepts 2.4 Intelligence: Tests of Intelligence, Creativity and Emotional Intelligence 2.5 Motivation: Types and approaches of Motivation and Emotion 2.6 Thinking and Language: Language development, Language information thinking	15
Unit III	PERSONALITY THEORIES 3.1 Understanding Personality: Definition, Temperament, Character 3.2 Approaches to understanding Personality 3.3 Psychodynamic Theory, Humanistic Theory, Cognitive-Behavioral and Social Learning Theory, Trait Theories 3.4 Assessment of Personality: Projective and Objective Tests, Behavioral and Biological assessment of Personality	15

Course Code	Title	Credits
USFS 206	Computer Science – II	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Computer Architecture 1.1 Cache Memory 1.2 Computer Memory System Overview 1.3 Cache Memory Principles 1.4 Elements of Cache Design 1.5 Internal Memory Technology 1.6 Semiconductor Main Memory 1.7 Error Corrections 1.8 Advanced DRAM Organization 1.9 External Memory 1.10 Magnetic Disk 1.11 RAID 1.12 Optical Memory 1.13 Magnetic Tape 1.14 Operating System Support 1.15 OS Overview 1.16 Scheduling 1.17 Memory Management.	15
Unit II	Windows 2.1 Microsoft Windows Overview 2.2 Windows 7 Thread and SMP Management 2.3 Windows Concurrency Management 2.4 Windows Memory Management 2.5 Windows Scheduling 2.6 Windows I/O 2.7 Windows File System	15
Unit III	Linux 3.1 Traditional Unix Systems 3.2 Modern Unix Systems 3.3 Linux 3.4 Linux VServer Virtual Machine Architecture 3.5 UNIX SRV4 Process Management 3.6 Linux Process and Thread Management 3.7 Linux Kernel Concurrency Management 3.8 Linux Memory Management 3.9 Linux Scheduling 3.10 Linux I/O 3.11 Linux File System	15

Course Code	Title	Credits
USFS 207	Law – Indian Penal Code - I	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Basics of Crime 1.1 Definition, Nature and Essentials of Crime 1.2 Criminals and Society 1.3 Classification of Crime 1.4 Cognizable and Non Cognizable Offence 1.4 Bailable and Non-Bailable Offence 1.5 Compoundable and Non Compoundable Offences 1.6 Complaint, FIR, Arrest, Custody And Bail 1.7 Expert Testimony 1.8 Fundamental Rights Under The Constitution	15
Unit II	General Exceptions 2.1 Mistake of Facts 2.2 Mistake of Law 2.3 Privileged Acts Judicial Acts 2.4 Accidental Acts 2.5 Necessity 2.6 Incapability to Commit a Crime 2.7 Triviality 2.8 Private Defense 2.9 Abetment and Criminal Conspiracy	15
Unit III	Various Types of Crime 3.1 Various Types of Crime Under IPC 3.2 Crime Against State 3.3 Crime Against Army, Navy and Air Force 3.4 Crime Against Public Tranquility 3.5 Crime Relating to Public Servant 3.6 Offences Relating to Election 3.7 False Evidence and Offence Against Public Justice 3.8 Offence Relating to Coin and Government Stamps 3.9 Offence Relating to Weight and Measures 3.10 Offence Relating to Religion	15

B.Sc. (FORENSIC SCIENCE)

Semester II – Practical

Course Code	Title	Credits
USFS P4	Forensic Science and Chemical Science Practical	2
Practical No.	Title of the Practical	No. of Practicals
Forensic Science Practical		
1	Understanding the basic component of crime scene investigation and management, safety and security protocol	1
2	Protection and recording of scene crime scene by different methods of barrication (indoor and outdoor)	2
3	Photography at scene of crime : A. Crime Scene photography (Bird eye view, angular photography and close-up photography) B. Evidential photography with and without light sources. C. Closing photography D. Photography of corpus E. Ante mortem and Postmortem photography	5
4	Videography of crime scene A. Full scene videography B. Evidential videography	2
5	Sketching of crime scene A. Rough sketch of indoor/ outdoor crime Scene B. Final sketch of indoor/outdoor crime scene C. Rough and final sketch using software	3
6	Searching of evidence on scene of crime A. Evidence Search using traditional method of searching B. Evidence searching using light sources and mordent technology. C. Search of evidence in case of old crime scene	3
7	Dealing with physical evidence on the scene of crime A. Collection of evidence at scene of crime (physical, chemical, biological, document, fingerprint, ballistic, etc.) B. Preservation of evidences according to their nature/stability/ reactivity C. Packaging, sealing and forwarding of physical evidence to the forensic laboratory.	3
Chemical Science Practical		
1	To determine relative viscosity of given organic liquids by viscometer (Four liquids)	1
2	To determine critical solution temperature of phenol water system	1
3	To determine the rate constant (or to study kinetics) of acid catalysed ester hydrolysis	1

4	To determine the rate constant of base catalyzed ester hydrolysis	1
5	Partition coefficient of iodine between water and carbon tetrachloride	1
6	To compare the relative strength of HCl and H ₂ SO ₄ by studying the kinetics of Inversion of cane sugar using Polarimeter	1
7	To determine the molecular weight of a high polymer by using solutions of different concentrations	1
8	To study the effect of addition of salt on critical solution temperature of phenol water system	1
9	To determine the transport number of cation by moving boundary method	1
10	To prepare standard 0.2 M Na ₂ HPO ₄ and 0.1 M Citric acid solution, hence prepare four different buffer solutions using them. Determine the Pka value of these and unknown solutions by Potentiometry	1
11	To determine Pka value of given monobasic acid by Potentiometric titration	1
12	To determine the formal redox potential of Fe ²⁺ / Fe ³⁺ system Potentiometrically	1
13	To determine the amount of Cl ⁻ and Br ⁻ from the given halide mixture by titrating with silver nitrate solution by Potentiometry	1
14	To determine Pka value of given weak acid by pH-metric titration with strong base	1
15	To determine the dissociation constant of oxalic acid by pH-metric titration with strong base	1
16	To determine pH of various mixtures of sodium acetate and acetic acid in aqueous solution and hence to find the dissociation of acetic acid by pH-metry	1
17	To determine the cell constant of the given cell using 0.01 M KCl solution and hence determine dissociation constant of a given monobasic weak acid by Conductometry	1
18	To estimate the amount of lead present in given solution of lead nitrate by Conductometric titration with sodium sulphate	1
19	To investigate the Conductometric titration of any one of the following a) Strong acid against strong base b) Strong acid against weak base c) Strong base against weak acid d) Weak acid against weak base	1

Course Code	Title	Credits
USFS P5	Physical Science and Biological Science Practical	2
Practical No.	Title of the Practical	No. of Practical's
Physical Science Practical		
1.	Detection of radiation using GM counter	1
2.	Abbe Refractometer. A) To Find Refractive Index of given liquids and solids using Abbe Refractometer. B) Determination of critical micelle concentration.	2
3.	Laurent's Half Shade Polarimeter A) To find the Specific Rotation of given optical active substance viz., Sucrose/Glucose/Turpentine/Kerosene etc. B) To find the unknown concentration of given Sucrose/Glucose/Turpentine/Kerosene etc. C) To find the unknown substance from specific rotation.	3
4.	35 mm Film SLR Camera A) Understanding Parts, Functions and Operation. B) Understanding the concepts: Exposure, ISO, Shutter Speed, F-Stops, Depth of Field, and Focus. C) Development of Black and White Film D) Development of Colour Film	4
5.	35 mm digital SLR Camera A) Understanding Parts, Functions and Operation. B) Understanding Close Up/Mid-Range/Overall Photographs. C) Printing and Use of Photoshop Software of Image editing and enhancement.	3
6.	Identification of camera from film Negatives.	1
7.	Compound microscope A) Understanding Parts, Functions and Operation. B) Analysis of Glass fragments, Fibers, Soil, Paint chips, GSR etc.	2
8.	Stereo microscope A) Understanding Parts, Functions and Operation. B) Analysis of Glass fragments, Fibers, Soil, Paint chips, GSR, Coins etc.	2
9.	Comparison microscope A) Understanding Parts, Functions and Operation. B) Analysis of Bullets, Shots, Cartridge cases Glass fragments, Coins etc.	2
10.	Polarizing Microscope A) Understanding Parts, Functions and Operation. B) Analysis of rocks and petroleum products etc.	2
11.	UV-Vis Spectrophotometer A) Understanding Parts and their Functions. B) Sample Preparation and Standard Operating Procedure (SOP).	2

12.	FTIR Spectrophotometer A) Understanding Parts and their Functions B) Sample Preparation and Standard Operating Procedure (SOP).	2
13.	Raman Spectrophotometer A) Understanding Parts and their Functions B) Sample Preparation and Standard Operating Procedure (SOP).	2
Biological Science Practical		
1	Extraction of bacterial amylase/ yeast invertase and determination of its activity.	1
2	Separation and identification of amino acids by paper chromatography.	1
3	Separation and identification of lipids by thin layer chromatography.	1
4	Study of Beer-Lambert's law using colorimeter.	1
5	Quantitative estimation of proteins by Biuret/ Folin-Ciocalteu method using standard bovine serum albumin.	1
6	Quantitative estimation of glucose by Dinitrosalicylic acid method.	1
7	Protein fractionation by dialysis/ salting out. (Demonstration)	1
8	Estimation of total protein content by Kjeldahl method (Demonstration)	1
9	Analysis of transverse and longitudinal sections of stems.	1
10	Microscopic identification of pollen grains.	1
11	Microscopic identification of spores.	1
12	Microscopic examination of different plant fibres.	1
13	Examination of different macroscopic and microscopic features of wood.	1
14	Microscopic examination of different animal hair types.	1
15	Study of life-cycle of blowfly on chicken liver.	1
16	Isolation and identification of diatoms from fresh and marine water sources.	1

17	Study of different feather types.	1
18	Extraction of plant oils using Soxhlet apparatus (Demonstration)	1
19	Field Visit to BNHS to study wildlife flora and fauna	-

Course Code	Title	Credits
USFS P6	Psychology and Computer Science Practical	2
Psychology Practical		
Practical No.	Title of the Practical	No. of Practicals
1	Objective Personality test: Big five Personality traits test	3
2	Projective Personality test: Sacks Sentence Completion test	3
3	Attention : Measurement of Attention Span using Tachistoscope	3
Computer Science Practical		
1	Demonstration of Assembly Language Programming Editor	1
2	Advanced Assembly Level Programming – Formatted Display	1
3	Advanced Assembly Level Programming – Searching	1
4	Advanced Assembly Level Programming – Sorting	1
5	Advanced Assembly Level Programming – Moving Data	1
6	Demonstration of Windows	1
7	Windows – Installation	1
8	Windows - Repair, Backup, Restore	1
9	Windows - Network Configuration, Sharing	1
10	Windows – Firewall	1
11	Demonstration of Linux	1
12	Linux – Installation	1
13	Linux - Basic Commands	1
14	Linux – Network Configuration	1
15	Linux – Repair, Backup, Restore	1

B.Sc. (FORENSIC SCIENCE)

Semester II – References

USFS 201 : Forensic Science – II (Crime Scene Management)

Sr. No.	Reference Book	Referred Units	Referred Pages
1	Forensic Science and Crime Investigation, Third Edition, B. S. Nabar, Asia Law House, Hyderabad.	I	18-28 46-79 94-154 174-200
2	Forensic Science, Third Edition, Stuart H James and Jon. J Nordby, Academic Press	II	167-209
3	Fundamentals of Forensic Science, Max M. Houck and Jay A. Siegel, Second Edition, Academic Press.	III	29-49
4	Introduction to Criminalistics; Barry A.J. Fisher, Academic Press	III	3-16 17-129
5	Introduction to Criminalistics, Second Edition, Richard Saferstein, Pearson	II	15-50
6	Forensic Science in Criminal Investigation and Trials, B. R. Sharma, Fourth Edition, Universal Law Publishing Co. Ltd.	II	133-179 1147- 1243
7	Crime Scene Handbook , Henry Lee and Elsevier, Academic Press	I II III	1-16 19-45 49-70 73-104 113-128 131-181 233-252 271-319

Sr. No.	Additional References
1	Richard Saferstein, 2001, Criminalistic: An Introduction to Forensic Science. 7th edition Prentice-Hall, New Jersey.
2	L.J. Kaplan, 2001. A laboratory manual for the introduction to the Crime Lab. Williamstown, Massachusetts.
3	Moenseens, A.A., Starrs, J.E., Henderson, C.E. and Inabare, F.E., 1995. Scientific Evidence in Civil and Criminal cases, IV edition, Foundation Press, Westbury, New York.
4	Fisher, B.A.J., 2000. Techniques of Crime Scene Investigation. VI edition CRC Press, Boca Raton, 2000.
5	James, S.H. and Nordby J.J. Forensic Science : An introduction to Scientific and

	investigative techniques, CRC Press, USA, 2003.
6	Redsicker, 2000. The Practical Methodology of Forensic Photography
7	Henry Lee's Crime Scene Handbook by Henry C Lee
8	Crime Scene Processing and Laboratory Work Book by Patric Jones
9	Practical Crime Scene Analysis and Reconstruction by Ross M. Gardner and Tom Bevel.
10	Advanced Crime Scene Photography by C.D. Duncan.
11	Mordby, J Deed Reckoning; The Art of Forensic Detection, CRC Press LLC (2000)
12	Hckett, W.G and James S.H; Interpretation of Blood stains, Evidence of Crime scene, Elseiver Pub. NY (1989)
13	J.A. Seigel, R.J Sukoo and G.C Knupfer; Encyclopedia of Forensic Science, Vol. I, II and III, Acad Press (2000).
14	John, D. Deehan, Kirk's Fire Investigation, 5th Edn., Prentice Hall (2002) Turrey B;
15	Lyman M.D; Criminal Investigation- The art and the science, Prentice Hall (2002)

USFS 202 :Chemical Science – II (Physical Chemistry)

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Analytical Chemistry, Sixth Edition , G. D. Christian, Wiley Publication	I	298-302 775-800
2	Physical Chemistry, Fifth Edition, W.J. Moore, Pearson	I	229-247 254-258.
3	Principles of Physical Chemistry, Forty Fifth Edition, Puri, Sharma, Pathania, S. Chand Publication	II	966-1042
4	Principles of Physical Chemistry, Fourth Edition, S. H. Marron and C. F. Pruton, Macmillan New York	III	398-437 471-486 492-519

Sr. No.	Additional References
1	Physical Chemistry-P.W. Atkins ELBS, 5th edition
2	Physical Chemistry by S. Glasstone.
3	Physical Chemistry – SilbeyAlberty, Bawendi, WileleyIndia .
4	Quantum Chemistry – I. Levine, Fifth edition, Prentice Hall-1999
5	Essentials of Physical Chemistry – Bahl, Tuli., S. Chand and Company Ltd.
6	Physical Chemistry of Surfaces – A. W. Adamson, John Wiley and sons , 5th edition.
7	Mathematical preparation of Physical Chemistry by F. Daniel, McGraw Hill Publication
8	Physical Chemistry by D. Alberty 3rd edition.
9	University general Chemistry by C.N.R.Rao, McMillan
10	Elements of Physical Chemistry by G.M. Barrow, McGraw Hill Publication

USFS 203: Physical Science – II (Nuclear Physics and Optical Instrumentation)

Sr. No.	Name of Book	Referred Units	Referred Pages
1.	Engineering Physics Seventh Enlarged Revised Edition 2004 M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd. ISBN 81-219-0817-5	Unit-I	1.1: 341-349 and 421 to 455
2.	Engineering Physics R.K. Gaur and S.L. Gupta, Dhanpat Rai Publication.	Unit-I	1.1.: 59.1-59.5
3.	Instrumental Methods of Chemical Analysis, Gurdeep R Chatwal and Sham Anand, Himalaya Publishing House Reprint 2011	Unit-I Unit- III	1.2 : 2.449-2.457 1.3 : 2.458-2.467 3.1 : 2.107-2.135 3.2 : 2.29, 2.30, 2.31, 2.40, 2.51, 2.52, 2.58, 2.59, 2.60, 2.61, 2.75 3.3.: 2.83, 2.85, 2.86, 2.92, 2.98, 2.99
4.	Advanced Crime Scene Photography Christopher D. Duncan, 2010, CRC Press ISBN 978-1-4200-8789-5	Unit-II	2.1: 13-32
5.	Crime Scene Photography, 2010, Elsevier, Edward M. Robinson, ISBN 978-0-12-375728-9.	Unit-II	2.1.: 51-82, 305-336, 156-206
6.	Criminalistics-An Introduction to Forensic Science- Richard Saferstein Pearson Publication 2015, ISBN-10: 0133458822 , ISBN-13: 9780133458824	Unit-II	2.2.: 165-181

Sr. No.	Additional References
1	Perspective of modern Physics by Arthur Beiser.
2	Atomic and nuclear Physics by Gupta and Ghosh, 2 nd Edition.
3	Introduction to Atomic and Nuclear Physics by H. Semat and Albrought.
4	Modern Physics by H.E. White New York, NY : McGraw-Hill, 1934
5	Anthony R., “ The Identification of Cameras ”, The Police Journal, Vol. XVIII, No. 4, 1945, pp. 281
6	“ Laboratory Examination of Photo-Related Evidence ”, FBI Law Enforcement Bulletin, May 1972, pp. 10-15.
7	Schima K., “ Criminalistic Examination of Film Negatives ”, International Criminal Police Review, No. 309, 1977, pp. 189
9	Derek Fowkes, “ How a Picture can catch the Camera ”, International Criminal Police Review, No. 318, 1978, pp. 145
10	Gupta, S.K. et al., “ Photographic Negatives as Evidence ”
11	Ponnuswamy, P.K. and Kuppuswamy, R., “ Establishing the Identify of the Camera from a Study of Film Negative Exposed in it ” International Criminal Police Review, 1985, (384), pp. 18
12	Fundamentals Of Molecular Spectroscopy- Collin N. Banwell And Elaine M. Mccash
13	D.F.S.L. Lab Manual for Physical Sciences.
14	Advanced course in Practical Physics D. Chattopadhyaya, PC. Rakshit & B. Saha. (6 th Edition) Book & Allied Pvt. Ltd.

USFS 204: Biological Science - II

Sr. No.	Name of Book	Referred Units	Referred Pages
1	Lehninger's principles of Biochemistry, Second Edition, Albert Lehninger, Freeman	I	71-77 157-180 183-201 217-244 335,336 421-432 443-453 465-470 543-552
2	Essential Forensic Biology, Second Edition, Alan Gunn, Wiley-Blackwell, 2009	II	315-354
3	Wildlife Forensic Investigation : Principles and Practice, John Cooper and Margaret Cooper, CRC Press	III	32-39
4	Essential Forensic Biology, Second Edition, Alan Gunn, Wiley-Blackwell, 2009	III	243-281

Sr. No.	Additional References
1	Lehninger Principles of Biochemistry, Albert L. Lehninger
	Harper's Illustrated Biochemistry, Robert K. Murray
	Berg, J. M., Tymoczko, J. L. and Stryer, L. Biochemistry. Freeman, 7 th edn, 2011.
2	Voet, D. & Voet, J. G. Biochemistry. 4 th edn, 2010
3	Nelson, D. L. & Cox, M. M. Lehninger Principles of Biochemistry. Freeman, 5 th edn, 2008
1	Huffman. J. Wallace. J, Wildlife Forensics- Methods and Applications, Wiley-Blackwell
4.	Cooper. J, Cooper. M, Wildlife Forensic Investigation: Principles and Practice, CRC Press
5.	Gennard. D, Forensic Entomology: An Introduction, Wiley
6.	Proctoi. N, Manual of Ornithology: Avian structure and Function, Elsevier
7.	Prescott, Textbook of Microbiology.
8.	Hall D, Practical guide to Forensic Botany.
9.	Balle J., Hilton-Taylor C., Stuart S.N., 2204 IUCN Red list of Threatened Species: A Global Assessment
10.	Miller H., Forensic Botany Principles.
1	Satyanarayan, Biochemistry.
12.	Powar C.B., Cell Biology.
13.	Manual for Wildlife species in trade, Wildlife Crime control bureau

USFS 205 : Psychology - II

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Psychology, Sandra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	I	178-215 220-256
2	Psychology, Sandra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	II	312-349 356-389
3	Psychology, Sandra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	III	476-509

Sr. No.	Additional References
1	Psychology, Sixth Edition, Henry Glictman, Norton and Company, 2004
2	Psychology in Action, Fifth Edition, Huffman, Mark and Judith Vernoy, John Willey and Sons, 2000
3	Cognitive Psychology, Galotti and Wadsworth, Sangage Learning, 2004
4	Social Psycholgy, Baron, Pearson Education, 2010

USFS 206 : Computer Science - II

Sr. No.	Reference Books	Referred Units	Referred Pages
1	Computer Organization and Architecture Designing for Performance, Eight Edition, William Stallings, Pearson Publication, 2010, ISBN-13: 978-0-13-607373-4	I	110-140 158-179 184-212 259-293
2	Operating System : Internals and Design Principles, Seventh Edition, William Stallings, Pearson Publication,	II III	80-90 176-182 294-298 386-389 466-468 512-515 564-569 90-101 186-189 285-292 384-386 457-461 509-512 560-564

Sr. No.	Additional References
1	Computer Networking by Tanenbaum
2	Computer Security Basics by Rick Lehtines
3	Cyber Forensic by Mareculla Menendez
4	Computer Forensic by Newman
5	Data Communication and Networking by Forouzan
6	Network and System Security by John Vacca
7	Security Policies and Implementation Issue by Robert Jahson
9	Introduction to Computer by Rammohan Joshi
10	Basics of Computer by P. K. Singh
11	Computer Basics by Micheal Miller
12	Internet by John Hamilton
13	The Internet Basics by Jason Whittaker
14	Basic Electronics by V. K. Mehta
15	Digital Electronics by R. K. Jain

USFS 207 : Law – Indian Penal Code - I

Sr. No.	Reference Book	Referred Units	Referred Pages
1	Takwani Criminal Procedure Code, Third Edition, C. K. Thakkar and M. C. Thakkar, Lexis Nexis, 2013	Unit I	1 to 439
2	Principles of The Law of Evidence, Twentieth Edition, Dr. Avatar Singh, Central Law Publication, 2013	Unit I	241 to 263
3	The Constitutional Law of India, Fifth Edition, Dr. J. N. Pandey, Central Law Publication, 2013	Unit I	53 to 432
4	The Indian Penal Code, Fifth Edition, K.D. Gaur, Universal Law Publication, New Delhi, 2013	Unit II and Unit III	95 to 427

Sr. No.	Additional References
1	The Indian Penal Code/Ratanlal and Dhirajlal
2	Criminal Manual (Criminal Major Acts), Justice M.R.Malik, Professional Books Publishers, 2014
3	Indian Evidence Act, Batuklal
4	Indian Constitution, P.M.Bakshi
5	Criminal Procedure Code, Ratanlal Dheerajlal