UNIVERSITY OF MUMBAI
No. UG/111 of 2016-17

CIRCULAR:-

A reference is invited to the Syllabi relating to the B.Sc. degree course , **vide** this office Circular No. UG/139 of 2011, dated 14th June, 2011 and the Principals of affiliated Colleges in Science are hereby informed that the recommendation made by Ad-hoc Board of Studies in Forensic Science at its meeting held on 30th May, 2016 has been accepted by the Academic Council meeting held on 24th June, 2016 **vide** item No. 4.83 and that in accordance therewith, the revised syllabus as per the Choice Based Credit System for F.Y. B.Sc. Forensic Science (Sem. I & II), which are available on the University's web site (www.mu.ac.in) and that the same has been brought into force with effect from the academic year 2016-17.

MUMBAI – 400 032
October, 2016

(Dr.M.A.Khan)
REGISTRAR

To,

The Principals of the affiliated Colleges in Science.

A.C/4.83/24.06.2016

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No. UG/111 -A of 2016 MUMBAI-400 032 4th October, 2016

Copy forwarded with Compliments for information to:-

1) The Deans, faculties of Science,
2) The Convener, Ad-hoc-Committee in Forensic Science,
3) The Professor-cum-Director, Institute of Distance & Open Learning (IDOL)
4) The Director, Board of College and University Development,
5) The Co-Ordinator, University Computerization Centre,
6) The Controller of Examinations.

(Dr.M.A.Khan)
REGISTRAR

PTO..

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				
F.Y. Sem. I		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	3		45		36		100		2		2
USFS 103	Physical Science – I	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	Law – I	3		45		36		100		2		2
USFS 1P1	Forensic Science and Chemical Science Practical		6		90		72		100		2	2
USFS 1P2	Physical Science and Biological Science Practical		6		90		72		100		2	2
USFS 1P3	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**	
Unit I	**Fundamentals of Forensic Science** 1.1 Definition and Origin of Term *"forensis"* 1.2 Nature, Need and Function of Forensic Science 1.3 Principles and Laws of Forensic Science 1.4 Tools and Techniques of Forensic Science 1.5 Problems of Proof (Scientific Evidence and Proof, Investigation Problems, Scientific Aspects, Legal Problems) 1.6 Expert Testimony (The Expert, Illustrations, Language, Defense Counsel, The Court, The Element) 1.7 Laws Governing Expert Evidence (Enacted Law, Case Law, Court Conventions, Court Craft) 1.8 Reports Admissible under Cr.P.C 1.9 Death Penalty, Case Law Binding, Presumption of Innocence 1.10 The Evidence, Corpus Delicti, Insufficient Evidence, Improper Identity 1.11 Third Degree Methods, Police Padding, Stock Witness, Circumstantial Evidences, Economic Offences 1.12 Time Element, Testimonial Compulsion, Minority Judgment, Voluntary Confession 1.13 Investigating Officer, Expert, Prosecution 1.14 The Court, Sanctions	
Unit II	**History and Development of Forensic Science** 2.1 Forensic in Pre-historic Era 2.2 Global Development of Forensic Science 2.3 Sir Edmond Locard and His Contribution 2.4 Forensic Science in India 2.5 Chemical Examiner's Laboratory 2.6 Anthropometric Bureau 2.7 Fingerprint Bureau 2.8 Department of Explosives 2.9 Central Detective Training School, National Crime Record Bureau, Bureau of Police Research and Development 2.10 Central and State Forensic Science Laboratories	

	2.11 Organizational Set up of Maharashtra Forensic Laboratories 2.12 International and National Academic Institutes and Universities Imparting Forensic Science Education 2.13 Central and State Police Academies Teaching Forensic Science and Scientific Aids to Crime Detection
Unit III	**Functional Forensic Science** 3.1 Forensic Science Laboratories: Divisions and Facilities Provided 3.2 Chemistry Division (Narcotics, Explosives, Adulteration, Petroleum Products, 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, Morphing of Photos and Videos) 3.5 Questioned Documents Division (Stylistics, Linguistics, Counterfeit) 3.6 Cyber Division 3.7 Fingerprint Division (Prints and other Impressions) 3.8 Psychology (Criminal Profiling, Polygraph, Narco Analysis, Brain Mapping) 3.9 Forensic Medicine (Pathology, Odontology, Anthropology, Entomology, Radiology, Psychiatry, Nursing) 3.10 Forensic Archeology, Forensic Paleontology, Forensic Geology, Forensic Botany, Forensic Ornithology

Course Code	Title	Credits
USFS 102	**Chemical Science – I**	**2**

Unit No.	**Contents of Unit**
Unit I	**Periodic Table and Acid, Bases** 1.1 Introduction and History of Periodic Table 1.1.1 Study of Modern Periodic Table 1.1.2 Periodic properties –Atomic radius, ionization potential, electron affinity, electro negativity, metallic and Non-metallic characters and magnetic properties 1.1.3 Diagonal Relationship in S and P block element 1.2 Acids and Bases 1.2.1 Definition of acids and bases 1.2.2 Arrhenius theory of acid and bases 1.2.3 Lowry –Bronsted theory of acid and bases 1.2.4 Lewis concept of acid and bases 1.2.5 Lux-Flood theory of acid and bases 1.2.6 Strength of acids and bases - trends in the strength of hydracids and oxyacid's 1.2.7 Concept of Soft and Hard Acid Base(SHAB)
Unit II	**Colligative Properties of Solution** 2.1 Colligative Properties and types of properties. 2.2 Lowering of vapour Pressure and Raoult's law. 2.3 Elevation in boiling point. 2.4 Osmosis and osmotic pressure. 2.5 Problems based on all coligative properties.
Unit III	**Chemical Bonding** 3.1 Nature of chemical bond and it's Types (Ionic, Covalent, Co-ordinate and Metallic) 3.2 Types of Atomic and molecular orbitals , overlaps of atomic orbitals - s-s, p-p, s-p, p-d, d-d and their examples 3.3 Formation of sigma and pi bonds 3.4 Theories of bonding- a) valance bond theory, b) Heitler London theory and c) Pauling Slater theory 3.5 Concept of hybridization: Definition and need of hybridization, steps involved in hybridization, explanation of covalency of atoms in the moles based on hybridization. 3.6 Types Of hybridization involving s, p, and d orbitals

Course Code	Title	Credits
USFS 103	**Physical Science – I**	**2**

Unit No.	**Contents of Unit**
Unit I	**Optics and Interference** 1.1 Optics 1.1.1 Reflection and Refraction 1.1.2 Total internal reflection 1.1.3 Lens Combination 1.1.4 Equivalent focal length of thin lenses 1.1.5 Magnification: lateral, longitudinal and angular 1.2 Interference 1.2.1 Concept and conditions 1.2.2 Thin film interference 1.2.3 Newton's Rings 1.2.4 Interference due to wedge shaped film 1.2.5 Applications : Thickness of thin film coating, Anti- reflecting coating, Interference filters
Unit II	**Polarization and Diffraction** 2.1 Polarization 2.1.1 Introduction and types of Polarization. 2.1.2 Brewster's Law 2.1.3 Law of Malus 2.1.4 Production of polarized light: Linear, Circular, Elliptical 2.1.5 Polarizer and Analyzer 2.2 Diffraction 2.2.1 Introduction 2.2.2 Types of diffraction : Idea about Fresnel and Fraunhofer 2.2.3 Difference between interference and diffraction 2.2.4 Diffraction due to plane transmission gratings 2.2.5 Resolving Power : Raleigh's criteria, Resolving power of microscope
Unit III	**Lasers and Fiber optics** 3.1 Lasers 3.1.1 Interaction of light with matter and quantum processes 3.1.2 Pumping process and population inversion 3.1.3 Spontaneous and stimulated emission 3.1.4 Types of laser : Solid state, Gas and semiconductor laser 3.1.5 Laser beam characteristics 3.1.6 Applications of laser : Holography, Medical 3.2 Fiber optics 3.2.1 Structure of optical fibre

	3.2.2 Classification of optical fibre 3.2.3 Propagation of light through fibre 3.2.4 Idea about the losses in optical fibre 3.2.5 Application of optical fibre

Course Code	Title	Credits
USFS 104	**Biological Science – I**	**2**
Unit No.	**Contents of Unit**	
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, Membranelipids, proteins and carbohydrates 1.6 Cell cycle - An overview of cell cycle; Programmed cell death (Apoptosis), intrinsic and extrinsic pathways of cell death	
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	
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	

Course Code	Title	Credits
USFS 105	**Psychology – I**	**2**

Unit No.	**Contents of Unit**
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
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
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

Course Code	Title	Credits
USFS 106	**Computer Science – I**	**2**

Unit No.	**Contents of Unit**
Unit I	**Introduction to Computer Components** 1.1 Memory 1.1.1 Primary Memory : RAM, SRAM, DRAM, ROM, EPROM 1.1.2 Secondary Memory : Magnetic Floppy, Hard Disk 1.1.3 Optical Memory : CDROM, WORM, Concept of Virtual Memory, Concept of Cache and their need, Memory hierarchy 1.2 Input/output Devices : Input/output Devices, Input/output Interface, Asynchronous Data Transfer, Modes of Data Transfer 1.3 Number System
Unit II	**Fundamentals of Programming** 2.1 Boolean Algebra : Basic Identities of Boolean Algebra, Boolean Function 2.2 Logic Gates : AND, OR, NOT, NOR, NAND, EX-OR, EX-NOR Operations and their Truth Tables 2.3 Fundamentals of Algorithms: Notion of an Algorithm, Pseudo-Code Conventions like Assignment Statements and Basic Control Structures 2.4 Flow-chart
Unit III	**Introduction to C programming** 3.1 Introduction 3.2 Data Types and Variables 3.3 Simple Program Structure 3.4 Simple Input and Output 3.5 Simple and Compound Conditions(Branching) 3.6 Looping (For, While, Do..While)

Course Code	Title	Credits
USFS 107	**Law – I**	**2**

Unit No.	**Contents of Unit**
Unit I	**Criminology : Concept and Schools/Theories** 1.1 Definition, Scope and Nature of Criminology 1.2 Schools of Criminology 1.3 Classical and Neo Classical Schools 1.4 Lombroso Theory/Positive School 1.5 Typological School 1.6 Socialistic School 1.7 Sociological School 1.8 Anthropological School 1.9 Multiple Factors Theory 1.10 Theory of Behavior 1.11 Constitutional Theories 1.12 Hereditary Theories 1.13 Traits Theories 1.14 Theories of Personality
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 Terrorism, Cyber Crimes 2.6 Environmental Crimes 2.7 Crime and Politics 2.8 White Collar Crimes and Organized Crimes 2.9 Juvenile Delinquency and Female Delinquency
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 3.6 Prison Systems: Traditional Prison, Open Air Prison, Pennsylvanian System etc. 3.7 Prison Reforms in India 3.8 Correctional Administrations 3.9 Probation and Parole 3.10 Recidivism/Victimology

B.Sc. (FORENSIC SCIENCE)

Semester I – Practical

Note : Every Department is advised to arrange maximum number of experiments from list provided or experiments based on theory syllabus having forensic relevance. However, minimum seven experiments should be reported in journal for the purpose of certification.

Course Code	Title	Credits
USFS 1P1	**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	Handling of Forensic Science Kits (Fingerprint kit, SOC Kit, Footwear Development Kit, etc.)	2
3	Handling of Various Scientific Apparatus/Instruments	2
4	Microscopic Examination of Various Physical Evidences	2
5	Preliminary Examination of Unknown Samples	2
6	Physical Comparison of Exhibits	1
7	Discussion of a Case in a Forum	2
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 1P2	**Physical Science and Biological Science Practical**	**2**
Practical No.	**Title of the Practical**	**No. of Practical's**
Physical Science Practical		
1	Standard operation procedure for Vernier caliper, micrometer screw and travelling microscope.	1
2	Determine the combined focal length of given lens system.	1
3	Determine the angle of prism using spectrometer.	1
4	Determine the refractive index of material of prism using spectrometer.	1
5	Determine the magnification of given microscopes.	1
6	Determine the resolving power of microscope.	1
7	Determine the radius of capillary using travelling microscope.	1
8	Determine the radius of curvature of plano convex lens by Newton's Rings.	1
9	Determine the thickness of thin foil using air wedge.	1
10	Study I V characteristics of Solar cell.	1
11	Measure the divergence of given laser.	1
12	Determine the wavelength of light using plane transmission gratings.	1
13	Determine the numerical aperture of optical fibre.	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 1P3	**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	Study of Boolean algebra	2
2	Study of logic Gates	2
3	C Programming for Basic program	1
4	C programming for Variable	2
5	C programming for Mathematical Operations	2
6	C programming for Condition	2
7	C programming for Compound condition	2
8	C programming for Loop	2

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 21st 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. 7th 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 Indroduction to Scientific and Investigative Techniqes 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 – I

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, Raymand 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 – I

Sr. No.	Additional References
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
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
3	Optics – Ajoy Ghatak (3rd Ed) Mc. Graw Hill Co.
4	Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication.
5	Principles of Optics – B. K. Mathur and T. P. Pandya (3rd Ed.) 1981, McGraw Hill International.
6	Fundamentals of Optics – Khanna and Gulati (1994), S. Chand.
7	Optics – C. L. Arora, S. Cand and Co. Ltd (2001)
9	Fundamentals of Physics-Resnik, Halliday and Walker, John Wiley Publication.
10	Fundamentals of Optics – Jenkins and White. (4th Ed) McGraw Hill International.
11	Optics – Ajoy Ghatak (2nd Ed.) Tata McGraw Hill.
12	Electronic Communication System and Device – Kennedy. (4th Ed) Tata McGraw Hill.
13	Fibre Optics – Kaiser, McGraw Hill.

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, 6th edn 2007.
2.	Alberts, B. et al. Essential Cell Biology, Garland, 3rd edn 2009.
3.	Karp, G. Cell and Molecular Biology: Concepts and Experiments. Wiley, 6th edn 2010.
4.	Morgan, David O. The Cell Cycle. OUP 2006
5.	Hancock, J.T., Cell Signalling. 3rd 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, 1st edn, 1951
11.	Drake R.L., Vogl A.W., Gray's Anatomy, Elsevier, 2nd 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, Saundra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	**I**	2-41
2	Psychology, Saundra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	**II**	50-84
3	Psychology, Saundra Ciccarelli and Glenn Meyer, Pearson Longman, 2008	**III**	116-120 136-171

Sr. No.	Additional References
1	Psychology, Sixth Edition, Henry Glietman, 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
1	Computer Organization and Architecture Designing for Performance, Eight Edition, William Stallings, Pearson Publication
2	Computer System Architecture, M. Morris Mano, PHI Publications
3	Introduction to Algorithms, Cormen, Leiserson, Rivest, Stein
4	Let us C, Yashwant Kanetkar

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 Jahnson
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 : Law - I

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

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

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				
F.Y. Sem. II		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	3		45		36		100		2		2
USFS 202	Chemical Science – II	3		45		36		100		2		2
USFS 203	Physical Science – II	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 – II	3		45		36		100		2		2
USFS 2P1	Forensic Science and Chemical Science Practical		6		90		72		100		2	2
USFS 2P2	Physical Science and Biological Science Practical		6		90		72		100		2	2
USFS 2P3	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**	**2**
Unit No.	**Contents of Unit**	
Unit I	**Scene of Crime Occurrence** 1.1 Crime Scene: Importance, Problems, Location and Nature 1.2 Types of Crime Scene (with and without Corpse, Indoor, Outdoor, Drowning case, Primary and Secondary) 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 Documentation of Crime Scene (Photography, Videography, Note-making) 1.6 Sketching (Rough and Final using Conventional Symbols) 1.7 Methods of Sketching (Base line, Cross projection, Co-ordinate, Extended Co-ordinate, Polar Method and Mix Method) Searching (Zonal, Spiral, Strip, Cross-Hatch and Circular Method) 1.8 Crime Scene Photography, Evidence Photography, Method of Evidential Photography (using Highlighter, Scale, Evidence Number, Handling of Camera for Still Photography), Long range, Medium range, Close range (with scale) 1.9 Documentation of Evidence (List Making and Log Maintenance)	
Unit II	**Physical Evidences** 2.1 Definition, Importance, Utility and Sources of Physical Evidence 2.2 Types of Physical Evidence 2.3 Biological Evidence/Body Fluids: Blood, Semen, Urine, Saliva, Mammary Gland Secretions, Vaginal Secretion, Sputum, Vomit, Purge, Vitreous Humor, Pus, Sweat etc. 2.4 Various types of Questioned Documents (Burnt Documents, Currency, Passports, Tickets, Licenses, Suicide Note, Manuscripts, Secret Writing etc.) Erasures, Alterations, Additions, Deletions 2.5 Explosive: Exploded Products, Fuses, Tins, Explosive Device, Electronic Fragments, Search near Crater for Traces of Chemicals and other Artifacts for Chemical Traces 2.6 Trace Evidence: Hair, Fibers, Strings, Ropes, Thread, Clothes, Rags and	

	Wood 2.7 Fingerprints, Firearms Evidences 2.8 Searching, Collection, Packaging and Forwarding of Physical Evidences 2.9 Chain of Custody, Transportation and Storage
Unit III	**Crime Scene Reconstruction** 3.1 Forensic Evidence at Laboratory (Reception, Forwarding to the Respective Departments based on their Nature and Priority) 3.2 Preliminary Examination, Interpretation of Results, Report Writing 3.3 Introduction, Importance of Crime Scene Reconstruction, Formulation of Hypothesis, Nature of Reconstruction 3.4 Types of Reconstruction 3.5 Stages in Reconstruction 3.6 Writing a Reconstruction Report 3.7 Case Studies

Course Code	Title	Credits
USFS 202	**Chemical Science – II**	**2**

Unit No.	**Contents of Unit**
Unit I	**Thermodynamics** 1.1 Definition of Thermodynamic terms (system, Surrounding etc.) 1.2 Types of system ,intensive and extensive properties ,state and path functions and their differentials 1.3 Thermodynamic process, concept of heat and work. 1.4 First law of Thermodynamics, Statement, Definition of internal energy and enthalpy, heat capacity at constant volume and pressure and their relationship. 1.5 Joules law, Joule-Thomson experiment and calculation of coefficient and inversion temperature. 1.6 Calculation of W ,q, ΔE, ΔH For expansion of an ideal gases under thermal and adiabatic conditions for reversible process. 1.7 Second law of thermodynamics, need for the law, different Statement of the law. 1.8 Carnot cycle and it's efficiency
Unit II	**Kinetics of Homogeneous Reactions** 2.1 Introduction, concept of molecularity,o rder and rate law. 2.2 First order reactions and its characteristics 2.3 Second order reactions (with equal and unequal initial concentrations) and its characteristics 2.4 Third order reactions (with equal initial concentrations) and its characteristics 2.5 Pseudo molecular reactions 2.6 Zero order reaction 2.7 Effect of temperature on rate of reaction 2.8 The energy of activation 2.9 Theories of reaction rate
Unit III	**Electrochemistry** 3.1 Redox Reaction, Oxidation and reduction Potential. 3.2 Half cell ,cell potential ,Cell constant, specific conductance and molar conductance 3.3 Variation of specific and equivalent conductance with dilution for strong and weak electrolytes 3.4 Kohlrausch's law of independent migration of ions, ion conductance and ionic mobility

	3.5	Equivalent and molar conductance at infinite dilution and their determination for strong and weak electrolytes
	3.6	Application of conductance measurement (determination of solubility product and ionic product of water)
	3.7	Conductometric titrations
	3.8	Types of electrochemical cells and examples, cell reactions, emf .
	3.9	Standard cells, different types of electrodes (with examples)
	3.10	Standard electrode potential.
	3.11	Types of concentration cells
	3.12	Liquid junction potential and its minimization
	3.13	Glass electrode and determination of pH of a solution

Course Code	Title	Credits
USFS 203	**Physical Science – II**	**2**

Unit No.	**Contents of Unit**
Unit I	**Nuclear Physics** 1.1 Isotopes 1.2 Nuclear Forces 1.3 Atomic Mass Unit, Binding Energy, Mass Defect 1.4 Nuclear reactions (Fission and Fusion) 1.5 Nuclear reactors 1.6 Radioactivity, Half-life, Mean life 1.7 Successive radioactive transformation ABC type, radioactive equilibrium (transient and secular) 1.8 Carbon dating
Unit II	**Forensic Photography** 2.1 Introduction 2.2 35 mm Film / Digital SLR camera 2.3 Digital Versus Film 2.4 Lenses, Lens filters and Attachments 2.5 Tripod and Other Camera Supports 2.6 Identification Markers 2.7 Electronic and Strobe Flashes 2.8 Cable Release 2.9 Lens Attachments 2.10 Hard Cases, Soft Cases and Backpacks 2.11 Basic Exposure: Proper Exposure Triangle 2.12 Shutter Speed and Motion Control 2.13 Reciprocal Exposure 2.14 ISO number 2.15 Exposure Index 2.16 Focus and Depth of Field and Lenses 2.17 Crime Scene Photography
Unit III	**Mechanics, Fluid dynamics and Ultrasonic** 3.1 Mechanics 3.1.1 Newton's laws of motion 3.1.2 Important points applying for Newton's law 3.1.3 Conservative and non-conservative forces 3.1.4 Pseudo forces 3.1.5 Speed and velocity 3.1.6 Acceleration: equation of uniformly accelerated motion, speed time graph, equation of motion for freely falling bodies, distance covered by the body in n^{th} second 3.1.7 Collision 3.1.8 Coefflcient of restitution

	3.1.9 M.I. of flywheel 3.1.10 Bending of beam 3.1.11 Bending of moment of beam 3.1.12 Cantilever loaded at the free end 3.1.13 Cantilever supported at its ends and loaded in the middle 3.1.14 Determination of Y by bending of beam 3.2 Fluid Dynamics 3.2.1 Viscosity and coefficient of viscosity 3.2.2 Stoke's law and terminal velocity 3.2.3 Determination of coefficient of viscosity by falling sphere method and Poiseulli's method 3.3 Ultrasonic 3.3.1 Production of ultrasonic waves 3.3.2 Detection of ultrasonic waves 3.3.3 Properties and applications of ultrasonic waves

Course code	Title	Credits
USFS 204	**Biological Science – II**	**2**

Unit No.	Contents of Unit
Unit I	**Biochemistry** 1.1 Basic chemistry of biomolecules : Carbohydrates, Lipids, Proteins and Nucleic acids 1.2 Amino acids : Classification, properties and biological significance 1.3 Proteins 1.3.1 Classification based on structure and functions, structural organization of proteins (primary, secondary, tertiary and quaternary structures) 1.3.1 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) 1.4 Carbohydrates metabolism : Glycolysis, Kreb's Cycle and oxidative phosphorylation, Gluconeogenesis, Pentose phosphate pathway, Glyoxylate cycle 1.5 Lipids : Structure, properties, classification and functions, lipid metabolism 1.6 Vitamins : Chemistry, biological significance, deficiencies 1.7 Enzymology 1.7.1 Structure and types of enzymes Enzyme kinetics : Enzyme cofactors, Chemical kinetics, Michaelis-Menten equation, Effect of pH and temperature on enzyme activity, Enzyme inhibition (Reversible and Irreversible)
Unit II	**Wildlife Flora** 2.1 Classification : Outline of the important systems of classification Bentham and Hooker's system, Hutchinson system 2.2 Plant parts and products of Forensic significance 2.2.1 Pollen (Palynology) : nature, structure, types of pollination, identification, significance (case studies) 2.2.2 Spore : structure, identification, significance 2.2.3 Plant fluids : Identification and collection of sap, gum 2.2.4 Wood (Dendrochronology) : Properties, Wood types, Identification of wood, study of tree rings, dating 2.2.5 Fibres : Cotton, jute, flax, hemp. 2.3 Plants of Forensic significance: ornamental plants, common poisonous plants and plant parts, narcotic plants, endangered plants 2.4 Role of algal diversity in forensics

	2.5 Role of fungi in Forensics Study of diatoms(Limnology) : structure, identification, significance (case studies)
Unit III	**Wildlife Fauna** 3.1 Classification : Outline of the Five kingdom system 3.2 Animal parts of forensic importance: Antlers, horns, shahtoosh hair, hides of leopards, tigers and reptiles, bearbile, ivory, claws, meat, mongoose hair, fur 3.3 Poisonous animals : venomous snakes, scorpions, cantharides 3.4 Endangered animals according to the Red Data List 3.5 Role of insects in forensics (Entomology): Study of life cycle of insects (blowfly), significance (cases of entomology) 3.6 Role of birds in Forensics (Ornithology): Feather structure, types of feathers, forensic significance

Course Code	Title	Credits
USFS 205	**Psychology – II**	**2**

Unit No.	**Contents of Unit**
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
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
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

Course Code	Title	Credits
USFS 206	**Computer Science – II**	**2**

Unit No.	**Contents of Unit**
Unit I	**Introduction to Networking** 1.1 Introduction : Data Communication, Networks, Internet, Intranet, Protocols, OSI and TCP/IP Models, Addressing 1.2 Multiplexing : FDM, WDM, Synchronous TDM (Time Slots and Frames, Interleaving, Data Rate Management) 1.3 Connecting Devices : Repeaters, Hubs, Bridges, Spanning Tree algorithm, Two and Three layer Switches, Routers, Gateways, Backbone networks, Concept of VLAN 1.4 Network Layer : Logical addressing, IPv4 Addresses, Classful and Classless addresses, NAT, IPv6 Addressing Protocols (ARP, RARP, DHCP, FTP, HTTP, TCP, UDP)
Unit II	**Operating System and Windows** 2.1 Introduction to Operating system: Introduction, Types of O.S. 2.2 Windows System : History, Features 2.3 Understanding File System : Understanding Boot Sequence, Understanding Disk Drives 2.4 Understanding Windows registry 2.5 Understanding Windows start up tasks. 2.6 Windows Commands.
Unit III	**Linux** 3.1 Linux System : History, Design Principles, File System. 3.2 Linux Basics: Looking into the Linux Kernel, GNU Utilities, Desktop Environments, the Linux Console, the Unix/Linux architecture, Features of Unix/Linux. 3.3 Basic Bash Shell Commands : Starting the shell, Shell Prompt, File System Navigation, File and Directory Listing, File Handling, Directory Handling, Viewing File Contents 3.4 More Bash Shell Commands : Monitoring programs, Monitoring Disk Space 3.5 Working with Data Files: Sorting, Searching, Compressing, Archiving 3.6 Understanding Linux File permission : Linux Security, Using Linux Groups, Decoding File Permissions, Changing Security Settings, Sharing files

Course Code	Title	Credits
USFS 207	**Law – II**	**2**

Unit No.	**Contents of Unit**
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 1.5 Bailable and Non-Bailable Offence 1.6 Compoundable and Non Compoundable Offences 1.7 Complaint, FIR, Arrest, Custody and Bail 1.8 Expert Testimony 1.9 Fundamental Rights under the Constitution
Unit II	**General Exceptions** 2.1 Mistake of Facts 2.2 Mistake of Law 2.3 Privileged Acts and 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
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

B.Sc. (FORENSIC SCIENCE)

Semester II – Practical

Note : Every Department is advised to arrange maximum number of experiments from list provided or experiments based on theory syllabus having forensic relevance. However, minimum seven experiments should be reported in journal for the purpose of certification.

Course Code	Title	Credits
USFS 2P1	**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 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. Evidence Photography with and without Light Sources	2
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	2
6	Searching of Evidence on Scene of Crime: a. Evidence Search using Traditional Method of Searching b. Evidence searching using Light Sources and Modern Technology	2
7	Dealing with Physical Evidence on the Scene of Crime a. Collection of Evidence at Scene of Crime (Physical, Chemical, Biological, Document, Fingerprint, Ballistics, 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	1

	viscometer (Four liquids)	
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_2SO_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_2HPO_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 $Fe2^+$/ $Fe3^+$ 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 2P2	**Physical Science and Biological Science Practical**	**2**
Practical No.	**Title of the Practical**	**No. of Practical's**
Physical Science Practical		
1	Sample calculations of radioactive dating to determine time of death.	1
2	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.	1
3	35 mm digital SLR Camera A. Understanding Parts, Functions and Operation. B. Understanding Close Up/Mid-Range/Overall Photographs.	1
4	Evidence photography by Digital camera.	1
5	MI of flywheel	1
6	Sample calculations- application of collision theory to accidental cases.	1
7	Sample calculations- velocity of freely falling bodies in air and ponds.	1
8	Y by bending.	1
9	Determination of coefficient of viscosity by Poiseulli's method.	1
10	Demonstration of terminal velocity and coefficient of viscosity by falling sphere.	1
11	Ultrasonic interferometer	1
12	Sound intensity measurement	1
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-Ciocalteau 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	1

	wood.	
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 2P3	**Psychology and Computer Science Practical**	**2**
Practical No.	**Title of the Practical**	**No. of Practicals**
Psychology Practical		
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	Study of Networking Devices	2
2	Windows – Demonstration	1
3	Windows – Installation	2
4	Windows - Basic commands	1
5	Windows - Network Configuration	2
6	Linux – Demonstration	1
7	Linux – Installation	2
8	Linux - Basic Commands	1
9	Linux- Advanced Commands	2

B.Sc. (FORENSIC SCIENCE)

Semester II – References

USFS 201 : Forensic Science – II

Sr. No.	Reference Book	Referred Units	Referred Pages
1	Forensic Science and Crime Investigation, Third Edition, B. S. Nabar, Asia Law House, Hyderabad.	**II**	18-28 46-79 94-154 174-200
2	Forensic Science, Third Edition, Stuart H James and Jon. J Nordby, Academic Press	**I**	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	**I**	15-50
6	Forensic Science in Criminal Investigation and Trials, B. R. Sharma, Fourth Edition, Universal Law Publishing Co. Ltd.	**I**	133-179 1147-1243
7	Crime Scene Handbook , Henry Lee and Elsevier, Academic Press	**II** **I** **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

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, WieleyIndia .
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

Sr. No.	Additional References
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
2	Engineering Physics R.K. Gaur and S.L. Gupta, Dhanpat Rai Publication
3	Advanced Crime Scene Photography Christopher D. Duncan, 2010, CRC Press ISBN 978-1-4200-8789-5
4	Crime Scene Photography, 2010, Elsevier, Edward M. Robinson, ISBN 978-0-12-375728-9
5	Perspective of modern Physics by Arthur Beiser
6	Atomic and nuclear Physics by Gupta and Ghosh, 2nd Edition
7	Introduction to Atomic and Nuclear Physics by H. Semat and Albrought
9	Modern Physics by H.E. White New York, NY : McGraw-Hill, 1934

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
2	Harper's Illustrated Biochemistry, Robert K. Murray
3	Berg, J. M., Tymoczko, J. L. and Stryer, L. Biochemistry. Freeman, 7th edn, 2011.
4	Voet, D. &Voet, J. G. Biochemistry. 4th edn, 2010
5	Nelson, D. L. & Cox, M. M. Lehninger Principles of Biochemistry. Freeman, 5th edn, 2008
6	Huffman. J. Wallace. J, Wildlife Forensics- Methods and Applications, Wiley-Blackwell
7	Cooper. J, Cooper. M, Wildlife Forensic Investigation: Principles and Practice, CRC Press
8	Gennard. D, Forensic Entomology: An Introduction, Wiley
9	Proctoi. N, Manual of Ornithology: Avian structure and Function, Elsevier
10	Prescott, Textbook of Microbiology.
11	Hall D, Practical guide to Forensic Botany.
12	Balle J., Hilton-Taylor C., Stuart S.N., 2204 IUCN Red list of Threatened Species: A Global Assessment
13	Miller H., Forensic Botany Principles.
14	Satyanarayan, Biochemistry.
15	Powar C.B., Cell Biology.
16	Manual for Wildlife species in trade, Wildlife Crime control bureau

USFS 205 : Psychology - II

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

Sr. No.	Additional References
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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
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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

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