UNIVERSITY OF MUMBAI No. UG/112-of 2016-17

CIRCULAR:-

A reference is invited to the Syllabi relating to the B.Sc. degree course, vide this office Circular No. UG/04 of 2011, dated 12th January, 2011 and the Principals of affiliated Colleges in Science are hereby informed that the recommendation made by 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. 4.84 and that in accordance therewith, the revised syllabus as per the Choice Based Credit System for S.Y. B.Sc. Forensic Science (Sem.III & IV), 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/4.84/24.06.2016

No. UG/112-A of 2016

MUMBAI-400 032

25 October, 2016

Copy forwarded with Compliments for information to:-

1) The Deans, faculties of Science,

2) The chairman, Ad-hoc Board of Studies 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 S.Y.B.Sc. **Program : B.Sc. Course : Forensic Science** (Credit Based Semester and Grading System with effect from the Academic Year 2016-2017)

S.Y.B.Sc. (Forensic Science) (Semester III) Credits To be implemented from Academic Year 2016-2017

Class		Class Room Instruction Face to		e to Fa	ce		50 Hou	ırs = 1 Credit		lit		
S V.	Title	Per V	Veek	15 W (Per \$	eeks Sem)	Per (Ho	Sem ours)	Noti (Hot	onal urs)	Cree	lits	Total
Sem. I		L (50 Min)	P (50 Min)	L	Р	L	Р	L	Р	L	Р	Credits
USFS 301	Forensic Science – III	3		45		36		100		2		2
USFS 302	Chemical Science - III	3		45		36		100		2		2
USFS 303	Physical Science – III	3		45		36		100		2		2
USFS 304	Biological Science – III	3		45		36		100		2		2
USFS 305	Psychology – III	3		45		36		100		2		2
USFS 306	Computer Science – III	3		45		36		100		2		2
USFS 307	Law - III	3		45		36		100		2		2
USFS 3P1	Forensic Science and Chemical Science Practical		6		90		72		100		2	2
USFS 3P2	Physical Science and Biological Science Practical		6		90		72		100		2	2
USFS 3P3	Psychology and Computer Science Practical		6		90		72		100		2	2
Total		21	18	315	270	252	216	700	300	14	6	20

Semester III - Theory

Course Code		Title	Credits		
USFS			2		
301		Forensic Science – III	2		
	1				
Unit No.	~ •	Contents of Unit			
Unit I	Crim	e Reconstruction (CR)			
	1 1		·		
	1.1	Introduction and difference between Police Investigation and Sc	ientific		
	1.0	Investigation, Role of Scientist at Crime Scene			
	1.2	Science of Crime Reconstruction, Methods of Crime Reconstruc	ction, Role		
	1.0	of Evidence in Reconstruction			
	1.3	Evidence Dynamics, Factors Affecting Evidence during Pre-dise	covery:		
		Role of Offender/Victim, Weather/Climate, Decomposition, Insect			
		Activity, Animal Predation, Fire			
	1.4 Post-discovery: Failure to Search Recovery, Premature Scene Cleanup,				
	Packaging, Transportation, Storage and Chain of Custody				
	1.5	Trace Evidences: Fingerprint, Blood, Semen, Hair, Fibers, Paint	, Glass,		
		Soil, Dust, Footwear and Tire Traces, GSR, Tool Marks, Project	tile		
		Wipes, Explosive Residues, Trace Evidence Transfer and Interp	retation in		
TT 1 / TT		CR.			
Unit II	Quest	tioned Document			
	0.1		C		
	2.1	Questioned Document: Nature, Scope, Significance, Handling o	I		
		Documents, Integrity of Documents, Guidelines for Preservation	1.		
	2.2	2.2 Classification and Types of Document: Financial, Academic, Personal,			
		Historical, Official and Non-official Records, Government Doct	iments,		
	2.2	Service Documents and Certificates			
	2.3	Preliminary Examination of Document			
	2.4	Handwriting, Development of Handwriting			
	2.5	Principles of Handwriting Identification, Natural Variation in			
	2.6	Handwriting, General and Individual Characteristic of Handwrit	ing		
	2.6	Standard Documents: Specimen writing, Admitted writing, Ma	rking of		
	0.7	Document			
T T 1 / TT	2.7	Instruments for Examination of Document			
Unit III	Finge	erprint			
	3.1	Definition, History and Development			
	3.2	Dermatoglyphics, Embryology: Primary and Secondary Ridge F	Formation,		
		Morphology and Anatomy of Dermal Skin.			

3.3	Theories of Pattern Formation, Basic Fingerprint Patterns, Ridge
	Counting, Ridge Tracing
3.4	Classification System in Fingerprints: Henry, Single Digit: Battley
3.5	Recording of Fingerprints: Requirements, Procedure, Precautions,
	Purpose, Plain Print, Rolled Print and Palm Print. Post-mortem
	Fingerprinting: Fresh Corpus, Rigor Mortis, Mutilated, Decomposed,
	Drowned, Burned
3.6	Conditions affecting Latent Prints, Search Method for Fingerprints on
	Crime Scene

Course		Title	Credits
Code			
USFS		Chemical Science – III	2
302			
TT A NT	1		
Unit No.	D 1	Contents of Unit	
Unit I	Bond	ing and Structures of Organic Compounds	
	1.1	Allotropy of Carbon : Structure and properties of diamond, grap fullerenes and carbon nanotube	hite,
	1.2	Electronic Effect :Dipole moment, polarizability, inductive effect resonance effect, hyperconjugation	et,
	1.3	Hydrogen Bond : Nature, effect on melting point and boiling po solubility in water, vader waals forces	int,
	1.4	Structures of Common Functional Groups :Geometry, electronic and their reactivity.	structure
Unit II	Study	v of Carbonyl Compounds and their Derivatives	
	2.1	Aldehydes : Preparation, physical properties and chemical prope	erties
	2.2	Ketones : Preparation, physical properties and chemical properti	ies
	2.3	Acids : Preparation, physical properties and chemical properties	•
	2.4	Esters : Preparation, physical properties and chemical properties	5.
	2.5	Amides : Preparation, physical properties and chemical propertie	es.
Unit III	Study	v of Aromaticity and N-containing Compounds	
	3.1	Aromaticity : Characteristic properties of aromatic compounds	, Huckel
	3.2	Aromatic Hydrocarbon : Benzonoide Hydrocarbons : Benzene, naphthalene, anthracene and phenanthrene	
	3.3	Amines (Aliphatic / Aromatic) : Preparation, physical properties chemical properties.	s and
	3.4	Nitro Compounds : Preparation, physical properties and chemica properties.	al

Course Code	Title	Credits				
USFS 303	Physical Science – III 2					
Unit No.	Contents of Unit					
Unit I	Spectroscopy					
	 Introduction Electromagnetic Spectrum Sources of Radiations Conventional Sources for UV, Visible and IR Rays Shorter Wavelength Radiation (X-ray Tube) Interaction of Radiation with Matter : Reflection, Absorption, Transmission, Fluorescence, Phosphorescence 					
Unit II	Instrumentation Electronics					
	 2.1 Introduction to Electronic Components 2.1.1 Passive Component : Resisters, its types and Identification Capacitors and its Classification. Inductors and its types, Transformers and its types 2.1.2 Active component : Diodes and its Identifications, Zener Transistors, FET, UJT 2.2 Electronics Circuits and Digital Electronics :Basics of LR, CR, I Circuits, Rectifier Circuits, Transistor and its Characteristics, Int to OPAM, Logic Gates and Their Applications 2.3 CRO : Construction, Working, Applications 	on, Diode, LCR croduction				
Unit III	Fire Arms					
	 3.1 History : Early Hand Cannons, The Matchlock, The Wheel Lock Flint Locks, The Snapehaunce 3.2 Firing System : The Pin Fire, Rim Dire, Dreyse Needle, C system 	k, The Centre fire				
	 3.3 Weapon Types and Operation : Single Shot, Revolving Pist Loading Pistols, Rifles - Types and Operations 3.4 Proof Marks : Introduction Types 	stols, Self				
	3.4 Proof Marks : Introduction, Types					

Course Code		Title	Credits
USFS			
304		Biological Science – III	2
Unit			
No		Contents of Unit	
<u> </u>	Biolog	gical Evidence Collection and Documentation	
Chit I	DIOIO	great Difference Concerton and Documentation	
	1.1	Recognition of biological evidences encountered in vario	ous cases
	1.2	Protection of biological evidences (blood, hair, semen, sa	liva, urine,
		fecal matter, menstrual blood etc.) at the crime scene	
	1.3	Search and collection of biological evidences	
	1.4	Packaging & Transportation of biological evidences	
	1.5	Documentation of biological evidences	
	1.6	Chain of custody	
Unit II	Immu	unological Concepts and Techniques	
	2.1	Antigen, Antibodies	
	2.2	Polyclonal antibodies	
	2.3	Monoclonal antibodies	
	2.4	Antigen Antibody interaction: precipitation, agglutination	n, zone of
		equivalence	
	2.5	Immunological Techniques :	
		2.5.1 Electrophoretic methods: Agarose gel, SDS Natu	red /
		Denatured	
		2.5.2 ELISA, Western Blotting, Hemagglutination, cor	nplement
		fixation	
		2.5.3 Immunochromatography	
		2.5.4 Immunodiffusion assays	
		2.5.5 Immunoelectrophoresis assays	
		2.5.6 Immunoprecipitation assays.	
Unit III	Gene	tics	
	2.1		
	3.1	Structure and properties of Chromosomes	
	3.2	Heterochromatin and Euchromatin	
	3.3	DNA: Structure, Properties, Types	NT 1'
	3.4	DNA: Coding region (genes: housekeeping, regulatory),	Non-coding
	25	regions: 1 andem repeats, interspersed repeats, 1 ransposa	ble elements
	5.5	DNA conder turing	Ionariai
	36	DNA sytraction · Basic principles Method of DNA Extern	action (from
	5.0	biological fluid and bono)	
	27	DNA Quantification · Slot Plot Assay, Southarn Martha	n Blotting
	5.1 20	DNA Qualitication By Dolymoroso Chain Deastion	n biouilig
	3.0	DNA Electrophoresis	
	3.7	DNA data basing	
	3.10	DINA data-dasing	

Course Code	Title	Credits
USFS 305	Psychology – III	2
		
Unit No.	Contents of Unit	
Unit I	Domains of Psychology – I	
	 Social Psychology : Introduction to social psychology, attitude, attitud and attitude change, attribution, aggression, social interaction and infl social norms on behavior, non-verbal communication, interpersonal relationship (Interpersonal attraction), group psychology Biological Psychology : Neurons, Sensory system, Development and p the brain, brain damage and recovery, Psychoactive drugs and addicti- hormones. Biology of emotions fear stress anyiety depression 	e formation uence of blasticity of on,
∐nit II	Research Methods in Psychology	
	 2.1 Introduction to Research methods in Psychology : Importance, g and types of research 2.2 Quantitative methods : Experimental and Non-experimental methos psychology, Descriptive Statistics (Mean, Median, Mode, Freque Normal distribution, Central Tendency, Hypothesis testing, Prob T-tests, Chi-Square, Correlation) Inferential Statistics (Analysis variance, regression analysis, factor analysis) 2.3 Qualitative methods : Philosophy and Conceptual Foundations M analysis, Textual Methods (Conversation analysis, Discourse A thematic analysis, Narrative Analysis), Field methods (Grounded Observation and Interview Inquiry) 	oals, need hods in ency, bability, of Methods for analysis, d Theory,
Unit III	Psychological Assessment	
	 3.1 Introduction : Definition and purpose, Types of tests, Application 3.2 Overview of Psychological tests : Administration, Scoring and Interpretation of tests, Steps in Test Construction, characteristics test, reliability, validity 3.3 Assessment of Cognitive abilities (Intelligence tests), Personality (Measurement of interests, values and attitudes), Aptitude and Achievement test (Distinguishing between Aptitude and Achiever 	ns s of a good y ement tests

Course		Title	Credits
USFS 306		Computer Science – III	2
Unit No.		Contonta of Unit	
		Contents of Unit	
Unit I	HTM	L	
	1 1		
	1.1	Introduction of H I ML	
	1.2	How web Browser Works	
	1.3	HIML Tags : HIML, HEAD, IIILE, BODY	
	1.4	HIML Lags: B, U, I, H, BK	
	1.5	Undered and Unordered Lists	
	1.0	Links and Images	
	1./		
	1.8	Form	
TT .º. TT	1.9 I	Style	
Unit II	Javas	script	
	2.1	Introduction to JavaScript , Adding JavaScript to UTML Decum	ont
	2.1	History and Use of IsvaScript	lem,
	2.2	Instory and Use of JavaScript	ntral
	2.2	Statement Loops Inputs and Output in JavaScript	IIIIOI
	23	Operators Expression and Statements	
Init III	2.3 PHP	Operators Expression and Statements	
	1 111		
	31	Introduction to PHP · How PHP Works on Web Server	
	3.2	Variable Operators and Expressions · Data Types Variable Con	nstants
	5.2	Operators	istants,
	3.3	Control Statements : If. '?' Operator Switch Loops	
	3.4	Date. String Operations	
	3.5	Session, Cookies	

Course Code		Title	Credits
USFS		· ····	•
307		Law – 111	2
	1		
Unit		Contonts of Unit	
No.		Contents of Unit	
Unit I	Offen	ce Affecting Human Body	
	1.1	Culpable Homicide and Murder	
	1.2	Dowry Death	
	1.3	Attempt to Murder	
	1.4	Causing Miscarriage, Causing Miscarriage without Woman's C	Consent
	1.5	Hurt and Grievous Hurt	
	1.6	Wrongful Restraint and Wrongful Confinement	
	1.7	Force, Criminal Force and Assault	
	1.8	Assault or Criminal Force to Women with Intent to Outrage her	· Modesty
	1.9	Kidnapping and Abduction	
	1.10	Sexual Offence and Rape	
	1.11	Unnatural Offence	
	1.12	Cruelty by Husband or Relative of Husband	
Unit II	Offen	ce Against Property	
	2.1	That Durishment for That That is Duralling Hauss ato	
	2.1	Theft, her Clark an Constant of Departure in December of Master	
	2.2	Function and Dunishment for Extertion	
	2.5	Extortion and Punishment for Extortion	
	2.4	Robbery and Dacony Dunishment for Deherry and Despity	
	2.5	Dishonest Misenpropriation of Property	
	2.0	Criminal Breach of Trust and its Punishment	
	$\frac{2.7}{2.8}$	Stolen Property	
	2.8	Cheating and Punishment for Cheating	
I Init III	2.) Offen	ce Relating to Document	
	Onen	te Relating to Document	
	3.1	Forgery, Making a False Document and Punishment for Forger	v
	3.2	Forgery of Record of Court or of Public Register)
	3.3	Forgery of Valuable Security, Will, etc.	
	3.4	Forgery for Purpose of Cheating	
	3.5	Forgery for Purpose of Harming Reputation	
	3.6	Forged Document or Electronic Record	
	3.7	Using as Genuine a Forged Document or Electronic Record	
	3.8	Counterfeiting Currency-Notes or Bank-Notes, Using as Genuin	ne, Forged
		or Counterfeit Currency-Note or Bank Notes	. 0
	3.9	Possession of Forged or Counterfeit Currency Notes or Bank N	otes
	3.10	Making or Possessing Instruments or Materials for Forging or	
		Counterfeiting Currency-Notes or Bank Notes	
	3.11	Making or Using Documents Resembling Currency-Note or Ba	nk- note

Semester III – 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 3P1	Forensic Science and Chemical Science Practical	2
	·	
Practical No.	Title of the Practical	No. of Practical
	Forensic Science Practical	
1	Reconstruct the Crime Scene (Homicide, Suicide, Theft, Robbery, Sexual Assault, Firearms Cases)	1
2	Collection and Identification of Hair (Trace Evidence), Determination of Medullary Index of Human Hair and Animal Hair	1
3	Examination of the Cross-section Characteristics of Various Body Hair	1
4	Determination of Scale Count and Scale Index of Body Hair	1
5	Identification of Hair Subjected to Chemical Process (Dyes and Bleach)	1
6	Recording of Rolled and Plain Fingerprint for Ten Digit Classification	1
7	Collection and Identification of Fingerprint Pattern	1
8	Study of Palm Prints and Characteristic Features	1
9	Examination of Paint Chips by Stereo Microscope	1
10	Collection and Examination of Blood Stain	1
11	To Study Crime Scene Reconstruction Methods	1
12	To Perform Rough/Final Sketch of Crime Scene	1
13	Study the Effect of Various Conditions on the Development of Latent Prints	1
14	Collection, Handling and Preservation of Documents	1
15	To Perform Preliminary Examination of Document	
16	To Study Natural Variation of Handwriting	1
17	Examination and Identification of General and Individual Characteristics of Handwriting	1
	Chemical Science Practical	
1	Systematic Identification of Organic Compounds.(8 compounds)	08
2	Preparation of Organic derivatives. (4 Derivatives)	04
3	Organic Estimation.(3 Estimation)	03

urse Code	Title	Credits
USFS 3P2	Physical Science and Biological Science Practical	2
Practical No.	Title of the Practical	No. of Practical
	Physical Science Practical	1
1	Investigations of fake documents using UV light.	1
2	Thermal Analysis of given sample using DSC/TGA	1
3	Gravimetric analysis (density measurement of given samples)	1
4	Testing of Electronic/Electrical components/parts	1
5	Testing of Electronic/Electrical circuits	1
6	LDR characteristics and Photosensitive relay using LDR	1
7	LCR series resonance	1
8	Bridge rectifier (to study load regulation)	1
9	Transistor (CE) characteristics	1
10	De'Morgan's Theorems	1
11	Ex-or gate, NAND and NOR as universal building blocks	1
12	Study of absorption coefficient of given Sample	1
13	Study of transmission coefficient of given Sample	1
14	Examination of Fire Arm according to Arms Act	1
15	Dismantling and assembling of firearms	1
16	Use of CRO	
	Biological Science Practical	
1	Collection and packaging biological evidences	1
2	To determine titre of antisera.	1
3	To perform Immunodiffusion test for species of origin.	2
	a. Ouchterlony assay	
	b. Radial immunodiffusion assay	
4	To perform electrophoresis for separation of various polymorphic enzymes.	1
5	Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption inhibition, Absorption-elution and mixed agglutination technique, determination of Secretor/non secretor status	3
6	 Extraction and isolation of DNA from a. From blood b. From saliva c. From hair d. From Plant source 	4

Course Code	Title	Credits
USFS 3P3	Psychology and Computer Science Practical	2
Practical No.	Title of the Practical	No. of Practical
	Psychology Practical	
1	Social Psychology (T-P Leadership questionnaire, Rosenberg Self- esteem scale, Assertiveness scale, Social Distance Scale, FIRO- B(interpersonal relationship orientation), Sodhi's Attitude Scale, Effect of competition on performance, Thurston's Interest Schedule)	3
2	Developmental Psychology (Adjustment of elderly people, Scholastic aptitude test, Embedded figures test)	2
3	Apperception test	1
4	Practical based on Qualitative Research Method (Survey, Interview, Observation, Projective/Semi Projective Tests)	2
5	 Practical based on Quantitative Research Method a. Descriptive Statistics (Mean, Median, Mode, Frequency, Normal distribution, Central Tendency, Hypothesis testing, Probability, T-tests, Chi-Square, Correlation b. Inferential Statistics (Analysis of variance, regression analysis, factor analysis) 	3
6	Psychological Testing and Assessment (NEO-FFI/MMPI, WAIS/WISC)	2
	Computer Science Practical	
1	HTML Programming – Basic	1
2	HTML Programming - Links and Image	2
3	HTML Programming – Forms	2
4	JavaScript Programming – Basic	1
5	JavaScript Programming - Conditions and Loops	2
6	JavaScript - User Interaction	2
7	PHP Programming – Basic	1
8	PHP Programming - Variables, Conditions, Loops	2
9	PHP Programming - Catching Data from HTML Form	2

Semester III – References

USFS 301: Forensic Science – III

Sr. No.	Reference Books
1	The Forensic Laboratory Handbook procedure and practice Ashraf Mozayani, Carla
	Noziglia.
2	Crime reconstruction W. Jerry Chisum, Brent E. Turvey.
3	Practical Crime Scene Analysis and Reconstruction Ross M. Gadner and tom Bevel.
4	Fundamental of Forensic Science Max M. Houck and Jay A. Siegel
5	Introduction to Criminalistics Barry A.J. Fisher. WilliamJ.Tilstone.
6	Crime scene to the court the essential of forensic science, Peter White.
7	Technique of crime scene investigation by Barry A J Fisher, David R. Fisher.
8	Crime scene management scene specific methods by Raul Sutton, Keith Trueman.
9	Crime scene investigation by Jaqueline T fish, Larry S. Miller.
10	Henry lee's crime scene Handbook by Henry C Lee.
11	Suspect document, Wilson R. Harrison
12	Scientific examination of questioned documents by Jan Seaman Kelly.
13	Questioned document by Albert S. Osborn.
14	Handwriting Forensic, By Dr. B. R. Sharma.
15	Forensic document examination principle and practices by Katherine M. Koppenhaber.
16	Introduction to Criminalistics by Richard Saferstein.
17	Handwriting and fingerprint analysis in criminal trail and investigation by B L Bansal
	and Rajiv Raheja
18	Forensic science in criminal investigation and trail by B R Sharma.
19	Forensic Handwriting Identification fundamental concept and principle by Ron N
	Morris.
20	Advances in fingerprint technology, 2nd edition, Henry C Lee and R E Gaensslen.
21	Fingerprint analysis and understanding, by Mark R Hawthorne.
22	Fingerprint revolutionized with illustration by F Brewster.
23	Firearms and fingerprint by Edward Hueske.
24	Fingerprint identification by SurinderNath.
25	Forensic science and its related issues by V N Sehgal and Surinder Nath

USFS 302 : Chemical Science – III

Sr. No.	Reference Books
1	Organic Chemistry by Morrison and Boyd.
2	Organic Chemistry by John McMurry VthEdn. 1999.
3	Organic Chemistry by Graham Solomans.
4	Organic Chemistry by I.L.FinarVol.II VthEdn.
5	Organic Chemistry, 2 nd Edition by Marye Anne Fox, James, K Whitesell
6	Organic Recation Simplicity and Logic by Pierre Laszol
7	Advanced Organic Chemistry Part-A, 5 th Edition by Francis A. Cary and Richard J.
	Sundberg.
8	Vogel's Text book of Practical Organic Chemistry, 5 th Edition

USFS 303 : Physical Science – II	USFS 303	: Phy	vsical	Science	– III
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Sr. No.	Reference Books
1	Modern Spectroscopy, Fourth Edition, J. Michael Hollas
2	Modern Physics – Concepts and Applications, Sanjiv Puri
3	Practical Approach to Electronic Circuit Design By D. S. Mantri and G.P. Jian.
4	Electronic Principles By Albert Malvino and D. J. Bates.
5	OP-Amp and Linear Integrated Circuits By Ramakant Gaikwad.
6	Electronic Instrumentations By H. C. Kalsi.
7	Measurements, Instrumentation and Experiment Design in Physics and Engineering By
	Michel Sayer.
9	Digital Electronics by Malnino
10	Digital Electronics by Flloyd
11	Principle of Electronic by V.K. Gupta
12	Engineering Physics by Gaur and Gupta
13	Criminalistics – An Introduction to Forensic Science By Richard Saferstein.
14	Handbook of Firearms and Ballistics Examination and Interpreting Forensic Evidence
	by Brain J Heard.
15	Firearm in criminal investigation and trials by B.R.Sharma

Sr.	Reference Books
1	Forensic Biology – Richard I i
2	Practical Skills in Forensic Science – Alan Langford, John Dean et al
3	Fundamentals of Forensic DNA Typing – John M. Butler
4.	Scientific & Legal Applications of Bloodstain Pattern Interpretation – Stuart H. James
	Molecular & cell biology by Lodish.
5.	Cell biology by Bruce Alberts
6.	Cell by Cooper
7.	Cell & Molecular biology by Karp
8.	Cell Biology by C.B. Powar
9.	Genetics by Gardner
10.	Genetics by Russel
11.	Genetics by Klug et al
12.	Genetics by Strickberger
13.	Molecular Biology by David Friefilder
14.	Molecular Biology by Clark
15.	Molecular Biology of Gene by Watson
16.	Molecular biology by T.A. Brown
17.	Lehninger Biochemistry by Nelson & Cox
18.	Biochemistry by Stryer
19.	Biochemistry by Zubay
20.	Biochemistry by Satyanarayan
21.	Immunology by Kuby
22.	Immunology by Riott
23.	Immunology by Tizard
24.	Microbiology by Prescott
25.	Microbiology by Tortora
26.	Microbiology by Pelzcar
27.	Microbial forensics-Roger G . Breeze
28.	Forensic medicine-Umadethan
29.	Forensic Anthropology-Angi M christenseng
30.	Forensic entomology, 2ndedtn: Jason H Byrd, James L Castner, CRC press
31.	The science of forensic entomology –David B. Rivers
32.	Forensic entomology-Dorothy Gennard

USFS 304 : Biological Science – III

USFS 305 : Psychology – III

Sr. No.	Reference Books
1	Baron. R.A., Byrne, D.& Bhardwaj. G (2010).Social Psychology(12thEd).New Delhi: Pearson
2	Deaux.K & Wrightsman, L. (2001).Social Psychology. California: Cole Publishing
3	Misra, G. (1990) .Applied Social Psychology. New Delhi: Sage.
4	Misra, G. (2009). Psychology in India, Volume 4: Theoretical and Methodological
	Developments (ICSSR survey of advances in research). New Delhi: Pearson.
5	Alcock, J. E., Carment, D. N., Sadava, S.N., Collins, J. E. & Green J. M. (1998). A
	textbook of social psychology. Scarborough, Canada: PrenticeHall.
6	Aronson, E., Wilson, T. D., & Akert, R. M. (2010). Social Psychology(7thEd.). Upper
	Saddle River, NJ: Prentice Hall.
7	Taylor, S.E., Peplau, L.A. & Sears, D.O. (2006). Social Psychology (12th Ed). New
	Delhi: Pearson
8	Baumeister, R. F., & Bushman, B. J. (2008). Social Psychology and Human Nature.
0	International student edition, Thomson Wadsworth USA.
9	Delamater, J. D., & Myers, D. J. (2007). Social Psychology(6 th edi.),
10	I nomson. Wadsworth International student edition, USA
10	Franzoi, S. L. (2003). Social Psychology. (3rd ed.). New York McGraw Hill co.
11	Interaction (4 th adi) Deerson Education Allyn and Pason Poston
12	Aron A Aron E N & Couns E I (2007) Statistics for Psychology (4Th Ed)India:
12	Pearson Education, Prentice Hall.
13	King, B.M. & Minium, E.W. (2007). Statistical Reasoning in the Behavioral Sciences.
	(5 th Ed.) USA: John Wiley.
14	Coakes, S. J., Steed, L., & Ong, C. (2009). SPSS: Analysis Without Anguish Using
	Version 16.0 for Windows.Milton,QLD: Wiley Students Edition.
15	Field, A. (2009). Discovering Statistics using SPSS (3 rd Ed).New Delhi :Sage
16	Breakwell, G. M., Hammon, S, Fife-Shaw, C., & Smith, J. (2006). Research methods in
17	psychology (3 rd edition). London: Sage.
1/	Hasiam, S. A., & McGarty, C. (2003). Research methods and statistics in psychology.
10	London: Sage. Aikan L. D. & Croth Marrat C. (2000). Developsical testing and accomment (12^{th})
10	Alkeli, L. K., & Gloth-Mathel, G. (2009). Psychological testing and assessment (12 Ed.) New Delbi: Dearson Education
10	Gregory R. I. (2005). Psychological testing: History, principles, and applications (5 th
17	edition) New Delhi: Pearson Education
20	Howell, D. C. (2010). Statistical methods for psychology. Belmont: Wadsworth.
21	Kaplan, R. M., & Saccuzzo, D. P. (2005). Psychological testing: Principles.
	applications and issues. New Delhi: Cengage.
22	Singh, A. K.(2008). Tests, measurement research methods in behavioural sciences.
	Patna: Bharti Bhawan.

USFS 306 : Computer Science - III

Sr. No.	Reference Books
1	HTML and CSS Design and Build Websites, Jon Duckett, Wiley Publication, ISBN
	978-1-118-00818-8
2	Javascript 2.0 - The Complete Reference. Thomas Powell, Mc-Graw Hill
	Publication,
3	Core PHP Programming, Third Edition, Leon A Tkinson, Prentice Hall PTR, ISBN
	0-13-046346-9

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
8	Introduction to Computer by Rammohan Joshi
9	Basics of Computer by P. K. Singh
10	Computer Basics by Micheal Miller
11	Internet by John Hamilton
12	The Internet Basics by Jason Whittaker
13	Basic Electronics by V. K. Mehta
14	Digital Electronics by R. K. Jain
15	Introduction to Networking by Charles Severance
16	Python for Informatics – Exploring Information – Version 2.7.2 by Charles Severance

USFS 307 : Law - III

Sr.	Reference Book	Referred	Referred
No.		Units	Pages
1	K. D. Gaur, The Indian Penal Code	Unit I, II and III	1 to 914

Sr. No.	Additional References
1	Ratanlal and Dhirajlal, The Indian Penal Code, Wadhwa and Co., New Delhi
2	Justice M. R. Malik, Criminal Manual (Criminal Major Acts), Professional Books
	Publishers, 2014
3	S.C Sarkar, The Indian Penal Code, Dwivedi Law Agency, New Delhi
4	The Indian Penal Code (Bare Act), Universal Law Publishers Co., New Delhi
5	Batuk Lal, Commentary on The Indian Penal Code, Orient publishing Company, New
	Delhi

S.Y.B.Sc. (Forensic Science) (Semester IV) Credits To be implemented from Academic Year 2016-2017

Class		Cla	ss Room	Instruct	tion Fac	e to Fa	ce		50 Hou	rs = 1	Cred	lit	
S.Y.	Title	Per V	Veek	15 Weeks (Per Sem)		Per Sem (Hours)		Notional (Hours)		Credits		Total	
Sem. IV	Sem. IV		L (50 Min)	P (50 Min)	L	Р	L	Р	L	Р	L	Р	Credits
USFS 401	Forensic Science – IV	3		45		36		100		2		2	
USFS 402	Chemical Science - IV	3		45		36		100		2		2	
USFS 403	Physical Science – IV	3		45		36		100		2		2	
USFS 404	Biological Science – IV	3		45		36		100		2		2	
USFS 405	JSFS 405 Psychology – IV			45		36		100		2		2	
USFS 406	Computer Science – IV	3		45		36		100		2		2	
USFS 407	Environmental Studies	3		45		36		100		2		2	
USFS 4P1	Forensic Science and Chemical Science Practical		6		90		72		100		2	2	
USFS 4P2	Physical Science and Biological Science Practical		6		90		72		100		2	2	
USFS 4P3	Psychology and Computer Science69072Practical69072		72		100		2	2					
Total		21	18	315	270	252	216	700	300	14	6	20	

Semester IV - Theory

Course Code	Title										
USFS		Forensic Science – IV									
401											
Unit No.		Contents of Unit									
Unit I	Crim	Crime Scene Reconstruction (CSR)									
	1.1	1.1 Role of Police officers, Forensic Scientists and Forensic Pathologists at									
		the Crime Scene									
	1.2	Resolving Significant Investigative Questions in CSR, Role of P Reconstruction	rotocol in								
	13	Bloodstain Pattern Analysis to Crime Scene Reconstruction									
	1.5	Reconstruction using Bloodstain Evidences									
	1.4	Role of Forensic Pathologist/Medico-legal Expert. Body Examin	nation at								
		the Crime Scene. Collection of Biological Fluids, Scene Reconst	truction.								
		Medical Autopsy and Examination of Traumatic Injury, Inquest	Report by								
		Police.	1 5								
	1.5	1.5 Reconstruction of Various Crime Scenes (Vehicular Accidents, Bomb									
		Blast Cases, Arson Cases, Bride Burning Cases)									
	1.6	1.6 Collection of Data: Videography, Photography, Measurements, Analysis									
	1.7	1.7 Writing of CSR Reports Court Room Testimony									
Unit II	Impr	Impression evidences									
0											
	2.1	2.1 Poroscopy: Individuality, Variation and Reliability of Pores. Method of									
		Collection and Recording of Pores; Edgeoscopy : Examination a	und								
		Significance									
	2.2	Palm prints: Volar pads, Thenar, Eminence, Hypothenar, Longit	udinal								
		Crease, Proximal and Distal Transverse Crease									
	2.3	Gait pattern: Significance and Analysis, Parameters in Gait: Dire	ection								
		Line, Walking Line, Foot Line, Foot Angle, Step Length, Step E	Breadth,								
		Principle Angle, Examination and Determination of Age, Sex, S	tature,								
		Physical State									
	2.4	Chelioscopy: Significance, Morphology and Anatomy of Lip, Ta	suchi-								
	hashi Classification, Methods of Collection and Recording of Lip Print										
Unit III	Finge	erprint Development									
	2 1	Eincommint at Chima Samer Change Detert Distingend I.									
	3.1	Morphology and Anotogy of Sweet Clark Francisc Clark Frances									
1	3.2 Morphology and Anatomy of Sweat Gland: Eccrine Gland, Sebaceous										

	Gland, Apocrine Gland; Chemical Constituents of Sweat Gland: Water,
	Inorganic, Organic, Metallic and Drugs etc.
3.3	Fingerprint Development-Physical Methods: Fingerprint Powders,
	Luminescent Powders (Fluorescent and Phosphorescent), Metallic
	Fingerprint powders
3.4	Chemical Fuming and Enhancement (Iodine Fuming, Iodine Solution
	Method, Cyanoacrylate, Super Glue, Ninhydrin Method, DFO Method,
	Silver Nitrate Method)
3.5	Instrumental (Laser), Digital Finger Print Identification, Automated
	Fingerprint Identification System
3.6	Legal Aspects of Fingerprint Evidence and Court Testimony

Course Code		Title	Credits	
USFS 402		Chemical Science – IV	2	
Unit No.		Contents of Unit		
Unit I	Intro	duction to Analytical Chemistry		
	11	Introduction chamical analysis application of chamical analysis		
	1.1	Sampling : Methods of Sampling, common techniques, ins	, strumental	
		methods, other techniques and factors affecting on choice of met	thods	
	1.3 Qualitative Analysis : Introduction, Errors, Accuracy, Precision, method			
	of expressing accuracy and precision			
	1.4 Classification of Errors, significant figures and computations, distributio			
	1.5 Types of Qualitative Analysis : Macroanalysis Semimicro analysis		veis	
	Microanalysis Ultramicro analysis			
Unit II	Inorganic Qualitative Analysis			
	_			
	2.1	Introduction and basic principle		
	2.2	2.2 Common Ion Effect : Introduction, Definition, Applications of		
	0.0	common ion effect		
	2.3	solubility product : Introduction, Definition, factor affecting of solubility product and applications of solubility Product	1	
	24	Buffer Solution : Definition Types and Applications		
Unit III	Ouali	tative and Quantitative Analysis of Organic Compounds		
	3.1	Qualitative Analysis : Types of Organic compounds, Characte	ristic tests	
		and Classification, Reactions of different functional groups, A	nalysis of	
		binary mixtures.		
	3.2	Quantitative Analysis : Estimation of C,H,(O) by combus	tion tube,	
		betection of Mitogen, Suphui, Halogens and Flosphorus by		
	3.3	Estimation of Nitrogen Sulphur and Phosphate · Estimation	of "N" by	
		Duma's, Kjeldahl's Method, estimation of halogens, sul	phur and	
		Phosphate by Carious Method.	•	
	3.4	Determination of Empirical and Molecular Formula and Numer	ical	
		Problems		

Course Code	Title		
USFS			
403	Physical Science – IV 2		
Unit	Contents of Unit		
No.			
Unit I	Electronic Circuits		
	 1.1 Wave form Generators :Working Principle of oscillators, W generators; sine, square, triangular, saw tooth 1.2 Modulation and Demodulation : Introduction to Fourier Amplitude Modulation; Principle, Modulation Index and I modulation, Side-bands and frequency domain, Amplitude r circuits, amplitude demodulations. Frequency modulation; Phase modulations, side-bands modulation Index, Frequency m 	Vave form transform, Percentage nodulation Principles, odulations	
	 and demodulation circuit, Difference between AM and FM 1.3 Active Filters : Low pass, High pass, Band pass, All pass filters 1.4 Signal Converters : ADC, DAC and counters 1.5 Wave Shaping Circuits : Wave Clipping, Clamping circuits a circuits 	and Timer	
Unit II	Ammunitions		
	 2.1 Rim fire 2.2 Centre fire 2.3 Case less 2.4 Blank ammunition 2.5 Tear gas 2.6 Grenade launcher 2.7 Dummy 2.8 Primer cap types 2.9 Berdan primer 2.10 Boxer primer 2.11 Cartridge cases : Rimless, semi-rimmed, rimmed, belted 2.12 Bullet and its types 2.13 Shotgun ammunition : Shotgun slugs 		
Unit III	Ballistics		
	 3.1 Introduction to Ballistics 3.2 Types of ballistics : internal, external and terminal Ballistics 3.3 Velocity recoil 3.4 Theory of recoil 3.5 Barrel pressure measurement 3.6 Ballistic coefficient 3.7 Angle of elevation of the barrel 		

Course Code		Title	Credits
USFS 404		Biological Science – IV	2
Unit		Contents of Unit	
No.		contents of emt	
Unit I	Intro	oduction to Forensic Anthropology	
	1 1	Analysis of Skalatal Ramains	
	1.1	Forensic Anthropology	
	1.2	1.2.1 Skeletal system and hone formation	
		1.2.1 Skeletal System and bone formation 1.2.2 Estimation of Age. Say and race	
		1.2.2 Estimation of time since death	
		1.2.5 Estimation of time since death	
	13	Facial Reconstruction	
	1.5 Facial Reconstruction		
	1.4 FOICHISIC OUDITIOIOgy		
		1.4.2 Estimation of Age Sex and Rac	
		1.4.2 Estimation of Age, Sex and Kac	
IInit II	Microbial Forensics		
	2.1 Microbial organisms of forensic significance : <i>Bacillus athracis</i>		
	<i>Clostridium botulinum</i>		
	2.2	Understanding Bioterrorism : Types of biological agents	– Category
		A. B. C	earegory
	2.3	Planning and response to bioterrorism : Preparedness.	
		Biosurveillance. Biodefence	
	2.4	Epidemiology of Bioterrorism, Punishments for Bioterror	rism act
		under Prevention of Terrorism Act, 2002.	
Unit III	Fore	nsic Entomology	
	3.1	Forensic entomology :Introduction, history and developm	nent
	3.2	Post Mortem Interval : role of entomology in determina	tion of
		PMI	
	3.3	Introduction of forensically important insects : Necropha	igous
		Species (Sarcosaprophages {Calliphoridae, Sarcophagida	e, Muscidae,
		and Dermestidae} Coprophages {Scarabaeidae and Muse	cidae}
		Dermatophages {Dermestidae, Tineidae.}) Necrophagous	S
		Predaceous Species: (Ants (Formicidae), Silphid beetle	es, Clerid
		beetles) predaceous Species (Histeridae, Staphylinidae.)	Parasitic
		Species (endoparasitic wasps)	

Curse Code	Title	Credits	
USFS 405	Psychology – IV	2	
Unit No.	Contents of Unit		
Unit I	Domains of Psychology – II		
	1.1 Cognitive Psychology- Introduction-Nature, theme and introduct Cognitive Psychology, mental imagery, verbal learning, languag comprehension and production, problem solving, reasoning and making	tion to e decision	
	1.2 Individual Differences- Introduction and history of individual dif Identification and measurement, characteristics of Intelligence te types, emotional quotient, gender differences	fference, ests and its	
Unit II	Introduction to Forensic Psychology		
	2.1 History		
	2.2 Introduction to Forensic Psychology - Definition, Importance and scope of		
	Forensic Psychology		
	2.5 Various roles, duties and services provided by Forensic Psychologists 2.4 Bigly Assessment within Ecremaia Psychology		
	2.4 Kisk Assessment within Forensic Psychology.		
	2.5 FOIEIISIC PSychology III IIIIIa 2.6 Psychological Assessment Tests which are used in Forensic		
	2.0 F sychological Assessment Antitude and Achievement Tests		
	Neuronsychological Tests		
	2.7 Difference between Forensic Evaluation and Clinical Psychologi	ical	
	Assessment.		
Unit III	Psychology of Violence and Sexual Offending		
	3.1 Violence- Definition, Nature of Violence- Self directed, Interper	sonal,	
	family and community interpersonal and collective		
	3.2 Types- Physical, Sexual, emotional, psychological, spiritual and	cultural.	
	3.3 Theories of sexual offending		
	3.4 Working with sexual offenders		
	3.5 Relationship between sexual offending and mental disorders		
	3.6 Psychological impacts of violence and sexual offences, Post-trau stress disorder, Family violence and victimization.	imatic	

Course		Title	Credits
USFS 406		Computer Science – IV	2
	1		
Unit No.		Contents of Unit	
Unit I	Basi	c Python Programming	
	1.1	Variable, Expression, Statements	
	1.2	Conditional Execution	
	1.3	Iterations	
	1.4	Functions	
	1.5	Strings	
Unit II	Adva	anced Python Programming	
	2.1	File Handling	
	2.2	Dictionaries	
	2.3	Regular Expressions	
	2.4	Accessing Web Content	
Unit III	Intro	oduction to DBMS and SQL	
	3.1	Introduction to Database Systems	
	3.2	Entity Relationship Model, Normalization	
	3.3	SQL Basics : Statements, Names, Data Types, Null Values, But	ilt in
		Function.	
	3.4	Simple Queries : Selecting Columns, Duplicate Rows, Row Se	lection,
		Comparison Operators, Sorting Data	,
	3.5	Multi-Table Queries : Simple Joins, Outer Join	
	3.6	Summary Queries : Column Function, Grouped Queries, Havin	g Clause

Course Code	Title	Credits
USFS 407	Environmental Studies	2
Unit No.	Contents of Unit	No. of Lectures
Unit I	Multidisciplinary Nature of Environmental Studies	2
	1.1 Definition	
	1.2 Scope and importance	
Unit II	1.5 Need for public awareness	8
Omt n	Natural Resources	0
	2.1 Renewable and non-renewable resources : Natural resources	
	and associated problems	
	2.1.1 Forest resources : Use and over-exploitation,	
	deforestation, case studies. Timber extraction,	
	mining, dams and their effects on forest and tribal	
	people	
	2.1.2 Water resources : Use and over-utilization of surface	
	and ground water, floods, drought, conflicts over	
	water, dams-benefits and problems.	
	2.1.5 Milleral resources . Use and exploitation, environmental effects of extracting and using	
	mineral resources case studies	
	2.1.4 Food resources : World food problems, changes	
	caused by agriculture and over-grazing, effects of	
	modern agriculture, fertilizer-pesticide problems,	
	water logging, salinity, case studies.	
	2.1.5 Energy resources : Growing energy needs, renewable	
	and non renewable energy sources, use of alternate	
	energy sources. Case studies.	
	2.1.6 Land resources : Land as a resource, land	
	degradation, man induced landslides, soil erosion	
	2.2 Pole of an individual in conservation of natural resources	
	2.2 Role of an individual in conservation of natural resources. 2.3 Fauitable use of resources for sustainable lifestyles	
Unit III	Ecosystems	6
	3.1 Concept of an ecosystem.	
	3.2 Structure and function of an ecosystem.	
	3.3 Producers, consumers and decomposers.	
	3.4 Energy flow in the ecosystem.	
	3.5 Ecological succession.	
	5.6 Food chains, food webs and ecological pyramids.	
	5.7 Introduction, types, characteristic leatures, structure and function of the following ecosystems:	
	3.7.1 Forest ecosystem	

	3.7.2 Grassland ecosystem	
	3.7.3 Desert ecosystem	
	3.7.4 Aquatic ecosystems (ponds, streams, lakes, rivers,	
	oceans. estuaries)	
Unit IV	Biodiversity and its conservation	8
	4.1 Introduction - Definition : genetic, species and ecosystem	
	diversity.	
	4.2 Biogeographical classification of India	
	4.3 Value of biodiversity : consumptive use, productive use,	
	social, ethical, aesthetic and option values	
	4.4 Biodiversity at global, National and local levels.	
	4.5 Inida as a mega-diversity nation	
	4.6 Hot-sports of biodiversity.	
	4.7 Threats to biodiversity : habitat loss, poaching of wildlife,	
	man-wildlife conflicts.	
	4.8 Endangered and endemic species of India	
	4.9 Conservation of biodiversity : In-situ and Ex-situ	
	conservation of biodiversity.	
Unit V	Environmental Pollution	8
	5.1 Definition	
	5.2 Cause, effects and control measures of :	
	5.2.1 Air pollution	
	5.2.2 Water pollution	
	5.2.3 Soil pollution	
	5.2.4 Marine pollution	
	5.2.5 Noise pollution	
	5.2.6 Thermal pollution	
	5.2.7 Nuclear hazards	
	5.3 Solid waste Management : Causes, effects and control	
	measures of urban and industrial wastes.	
	5.4 Role of an individual in prevention of pollution.	
	5.5 Pollution case studies.	
	5.6 Disaster Management : floods, earthquake, cyclone and	
	landslides.	
Unit VI	Social Issues and the Environment	7
	6.1 From Unsustainable to Sustainable development	
	6.2 Urban problems related to energy	
	6.3 Water conservation, rain water harvesting, watershed	
	management	
	6.4 Resettlement and rahabilitation of people; its problems and	
	concerns. Case Studies	
	6.5 Environmental ethics : Issues and possible solutions.	
	0.0 Climate change, global warming, acid rain, ozone layer	
	depletion, nuclear accidents and holocaust. Case Studies.	
	6. / Wasteland reclamation.	
	6.8 Consumerism and waste products.	
	6.9 Environment Protection Act.	

	6.10	Air (Prevention and Control of Pollution) Act.	
	6.11	Water (Prevention and control of Pollution) Act	
	6.12	Wildlife Protection Act	
	6.13	Forest Conservation Act	
	6.14	Issues involved in enforcement of environmental legislation.	
	6.15	Public awareness.	
Unit VII	Huma	an Population and the Environment	6
	7.1	Population growth, variation among nations.	
	7.2	Population explosion - Family Welfare Programme.	
	7.3	Environment and human health.	
	7.4	Human Rights.	
	7.5	Value Education.	
	7.6	HIV/AIDS.	
	7.7	Women and Child Welfare.	
	7.8	Role of Information Technology in Environment and human	
		health.	
	7.9	Case Studies.	
Unit VIII	Field	work	5
	8.1	Visit to a local area to document environmental assets	
		river/forest/grassland/hill/mountain	
	8.2	Visit to a local polluted site	
		Urban/Rural/Industrial/Agricultural	
	8.3	Study of common plants, insects, birds.	
	8.4	Study of simple ecosystems-pond, river, hill slopes, etc.	
		(Field work Equal to 5 lecture hours)	

Semester IV – 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 4P1	Forensic Science and Chemical Science Practical	2
Duritur		
Practical No.	Title of the Practical	No. of Practicals
	Forensic Science Practical	
1	Reconstruction of Crime Scene Based on Case Studies	1
2	Examination of Blood Stain Patterns	1
3	Development of Fingerprint using Physical Methods	1
4	Development of Fingerprint using Iodine/Ninhydrin/Silver	1
	Nitrate/Cyanoacrylate Methods	
5	Examination of Plastic Prints	1
6	Photography of Fingerprints	1
7	Examination of Lip Prints	1
8	Gait Pattern Analysis	1
9	Tracing Bare Foot Print using Transparent Plastic Sheet	1
10	Casting of Footwear using POP	1
11	Study the Effect of Various Conditions on Latent Prints and their	1
	Development	
	Chemical Science Practical	L
1	Estimation of Ca and Mg in dolamite ore	1
2	Talcum powder analysis	1
3	Estimation of strength of sodium thiosulfate by iodometryusing starch indicator	1
4	Permangnetometry :To determine the strength of commercial hydrogen peroxide using $KMnO_4$ as an oxidant	1
5	Dichromatometry : Simultaneous estimation of Fe(II) and Fe(III)	1
	in a solution using $K_2Cr_2O_7$ as an oxidant	
6	Iodimetry :To estimate the amount of Vitamin-C in a given Vitamin-C tablet (Celin)	1
7	Iodometry ·	2
	a. To estimate the amount of Cu(II) present in the	_
	given solution of CuSO ₄	
	b. To determine the available chlorine in the	
	commercial sample of bleaching powder.	
8	Complexometry : To determine the amount of Ca(II) present in the commercial milk powder using EDTA as a chelating titrant.	1

9	Gravimetry :	2
	a. To determine the amount of Ni present in the sample of	
	steel as [Ni(DMG) ₂]	
	b. To determine the amount of Pb present in the sample of	
	solder alloy as PbCrO ₄ .	
10	Colorimetry :To determine the amount of Iron present in an Iron	1
	tablet, Fefol, using SCN ⁻ as complexing agent	
11	Solubility measurements : To determine the solubility of Benzoic	1
	acid in water at room temperature, by alkalimetry	
12	To estimate the acid neutralising capacity of an antacid	1
	(tablet/syrup) using standard alkali solution	
13	To estimate the amount of aniline or its derivative by bromination	1
	followed by iodometry	
14	To determine the molecular weight of the given organic	1
	compound by Rast's Camphor method by exploiting depression in	
	freezing point of camphor	

Course	Title	Credits
Code		
USFS	Physical Science and Biological Science Practical	2
4P2		
	1	
Practical	Title of the Practical	No. of
No.		Practical's
	Physical Science Practical	
1	Classification and measurements of bullets	1
2	Waveform generator	1
3	Study of AM modulation	1
4	Study of FM modulation	1
5	Study of low pass Active filters	1
6	Study of High pass Active filters	1
7	Analog to Digital Convertor	1
8	Digital to Analog Convertor	1
9	Wave clipping using diodes	1
10	Wave Clamping using diodes	1
	Biological Science Practical	
1	Determination of age from skull sutures	1
2	Determination of sex from skull	1
3	Determination of sex from Pelvis	1
4	Determination of age from dentition	1
5	DNA extraction from microbial source	1
6	Isolation of microorganisms of forensic significance using Plating	1
	techniques	
7	Collection ,packaging and preservation of entomological evidence	3
8	Identification of orders of insects and other arthropods of forensic	1
	significance	
9	Mounting of mouth parts & legs of Insects of forensic importance	1

Course Code	Title	Credits
USFS 4P3	Psychology and Computer Science Practical	
Practical No.	Title of the Practical	
Psychology Practical		
1	Cognitive Psychology (Memory process, Test on creativity, Strategies in Problem Solving/Nine Dot Problem)	3
2	Correlation Coefficient on Raven's Standard Progressive Matrices (SPM) and Abstract Reasoning (AR)	3
3	Emotional Intelligence Test	1
4	Bhatia's Battery of Intelligence	1
5	Kohs Block test	1
6	Reaction Time	1
7	Aggression test- C.G.Pati	1
8	Medico Psychological Questionnaire- J.Bharatraj	1
	Computer Science Practical	
1	Python Programming – Basic	1
2	Python Programming - Simple Arithmetic	1
3	Python Programming - Conditions, Loops	2
4	Python Programming - File Handling	2
5	Python Programming - Web Content Accessing	1
6	Python Programming - Use of Regular Expressions	2
7	SQL – DDL and DML	2
8	SQL – Select	1
9	SQL - Advanced	3

Semester IV – References

USFS 401: Forensic Science – IV

Sr. No.	Reference Books	
1	The Forensic Laboratory Handbook procedure and practice Ashraf Mozavani, Carla	
_	Noziglia.	
2	Crime reconstruction W. Jerry Chisum, Brent E. Turvey.	
3	Practical Crime Scene Analysis and Reconstruction Ross M. Gadner and tom Bevel.	
4	Fundamental of Forensic Science Max M. Houck and Jay A. Siegel	
5	Introduction to Criminalistics Barry A.J. Fisher. WilliamJ.Tilstone.	
6	Crime scene to the court the essential of forensic science, Peter White.	
7	Technique of crime scene investigation by Barry A J Fisher, David R. Fisher.	
8	Crime scene management scene specific methods by Raul Sutton, Keith Trueman.	
9	Crime scene investigation by Jaqueline T fish, Larry S. Miller.	
10	Henry lee's crime scene Handbook by Henry C Lee.	
11	Suspect document, Wilson R. Harrison	
12	Scientific examination of questioned documents by Jan Seaman Kelly.	
13	Questioned document by Albert S. Osborn.	
14	Handwriting Forensic, By Dr. B. R. Sharma.	
15	Forensic document examination principle and practices by Katherine M. Koppenhaber.	
16	Introduction to Criminalistics by Richard Saferstein.	
17	Handwriting and fingerprint analysis in criminal trail and investigation by B L Bansal	
	and Rajiv Raheja	
18	Forensic science in criminal investigation and trail by B R Sharma.	
19	Forensic Handwriting Identification fundamental concept and principle by Ron N	
	Morris.	
20	Advances in fingerprint technology, 2nd edition, Henry C Lee and R E Gaensslen.	
21	Fingerprint analysis and understanding, by Mark R Hawthorne.	
22	Fingerprint revolutionized with illustration by F Brewster.	
23	Firearms and fingerprint by Edward Hueske.	
24	Fingerprint identification by SurinderNath.	
25	Forensic science and its related issues by V N Sehgal and Surinder Nath	
26	Forensic medicine and jurisprudence by S K Singhal	
27	The Essentials of Forensic Medicine and Toxicology – Dr. KSN Reddy	

USFS 402 : Chemical Science – IV

Sr. No.	Reference Books
1	Vogel's Text book of Quantitative Analysis sixth edition.
2	Text book of Macro and Semi micro Qualitative Analysis by A.J.Vogel, fifth edition.
3	Analytical Chemistry by G.D.Christian, sixth edition.
4	Quantitative Organic Analysis ,fourth edition A.J. Vogel, ELBS.
5	Analytical Chemistry by Skoog.
6	Instrumental Methods of Chemical Analysis- 6th edition Willard, Merritt, Dean and
	Settle
7	Analytical Chemistry by PCB's, 2 nd Edition, Mitchell D. Erickson
8	Analytical Chemistry for Technicians, 3 rd Edition, John Kenkel
9	Vogel's Qualitative Ingorganic Analysis, 7 th Edition

USFS 403 : Physical Science – IV

Sr. No.	Reference Books
1	Principle of Electronics by V.K. Gupta
2	Digital Electronics by Malnino
3	Digital Electronics by Flloyd
4	Handbook of Firearms and Ballistics Examination and Interpreting Forensic Evidence
	by Brain J Heard
5	Firearms by B.R.Sharma

USFS 404 : Biological Science – IV

Sr.	Reference Books
No.	
1	Forensic Biology – Richard Li
2	Practical Skills in Forensic Science – Alan Langford, John Dean et al
3	Fundamentals of Forensic DNA Typing – John M. Butler
4	Scientific & Legal Applications of Bloodstain Pattern Interpretation – Stuart H. James
	Molecular & cell biology by Lodish.
5	Cell biology by Bruce Alberts
6	Cell by Cooper
7	Cell & Molecular biology by Karp
8	Cell Biology by C.B. Powar
9	Genetics by Gardner
10	Genetics by Russel
11	Genetics by Klug et al
12	Genetics by Strickberger
13	Molecular Biology by David Friefilder
14	Molecular Biology by Clark
15	Molecular Biology of Gene by Watson
16	Molecular biology by T.A. Brown
17	Lehninger Biochemistry by Nelson & Cox
18	Biochemistry by Stryer
19	Biochemistry by Zubay
20	Biochemistry by Satyanarayan
21	Immunology by Kuby
22	Immunology by Riott
23	Immunology by Tizard
24	Microbiology by Prescott
25	Microbiology by Tortora
26	Microbiology by Pelzcar
27	Microbial forensics-Roger G . Breeze
28	Forensic medicine-Umadethan
29	Forensic Anthropology-Angi M christenseng
30	Forensic entomology, 2ndedtn: Jason H Byrd, James L Castner, CRC press
31	The science of forensic entomology –David B. Rivers
32	Forensic entomology-Dorothy Gennard

USFS 405 : Psychology – IV

Sr. No.	Reference Books		
1	Matlin, M.W. (2008). Cognition(7 th Ed.). CA: John Wiley & Sons.		
2	Riegler, B. R., & Riegler, G. R. (2008). Cognitive psychology Applying the science of		
	the mind (2 nd Ed.). New Delhi: Dorling Kindersley		
3	Sternberg, R. J. (2009). Cognitive psychology(4 th Ed.). Wadworth, Cengage Learning		
4	Solso, R L. (2004). Cognitive psychology(6 th Ed). New Delhi: Pearson Education		
5	Schiffman, H.R. (2000). Sensation and perception: An integrated approach. New York		
	John Wiley		
6	Bartol, C. & Bartol, A., (2001). Introduction to Forensic Psychology, Research and		
	Application 3rdEdition		
7	Bartol, C. & Bartol, A., (2008). Current Perspectives in Forensic Psychology and		
	Criminal Behavior		
8	Blackburn, R., (1993) The psychology of criminal conduct: Theory research and		
	practice.Chichester: Wiley & Sons		
9	Dhanda, A. (2000) Legal order and mental disorder. New Delhi: Sage		
10	Harari, L. (1981) Forensic psychology. London: Batsford Academic.		
11	Clark, H.H., & Chase, W.G.(1972) on the process of sentences against pictures.		
	Cognitive Psychology,3, 472-571		
12	Galotti, K.M.(2004) Cognitive Psychology: In and out of the laboratory. (3 rd ed.)		
	Wadsworth/ Thomson Learning.		
13	Underwood. B.J.(1968). Experimental Psychology: An Introduction. NewYork:		
	Appleton Century Croft Ltd.		
14	Anastasi, A.& Urbina, S. (1997) Psychological Testing(7 th ed.) International edition,		
	Prentice Hall International, Inc.		
15	Garret, H.E. (1973). Statistics in Psychology and Education. (6 th ed.) Bombay: Vakils,		
1.6	Feffer and Simons Pvt.Ltd.		
16	Surprenant, A.M., Francis, G., & Neath, I.(2005) . Cog lab Reader. Thomson		
17	Wadsworth		
17	Criminology by Larry Siegel		
18	Handbook of Forensic Psychology by Dr. Vimala Veerraghavan		
19	Van Hasselt, V.B & Herson, M. (Eds). (2000). Aggression and Violence: An		
	introductory Text. Needham Heights, MA:Allyn & Bacon		

USFS 406 : Computer Science - IV

Sr. No.	Reference Books
1	Python for Informatics, Charles Severance, //Open source
	creative license.
2	SQL the Complete Reference, Third Edition, James R . Groff,
	Mc-Graw Hill Publications

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

USFS 407 : Environmental Studies

Sr. No.	Reference Book	Referred Units	Referred Pages
1	(eBook) - Text Book for Environmental Studies for	I toVIII	1 to 270
	Undergraduate Courses of All Branches of Higher Education,		
	Erach Bharucha for University Grant Commission		