DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Syllabus

Of

B.Sc. (Forensic Science)
First Year

SEMESTER SYSTEM

FIRST/SECOND SEMESTER

Effective from Academic Year

20013-2014 onwards

B.Sc. First Year

Forensic Science

Semester I & II

OBJECTIVE

This course is planned to acquaint the student with

i) Use of basic sciences like Biology, Chemistry and Physics in detection of crime.

ii) Detection of crime with scientific aid.

iii) Use of Forensic Psychology in interrogation of suspects.

iv) Extracting information and data from computer storage media in cybercrimes.

v) To create awareness of techno crimes and use of new emerging techniques in crime detection.

vi) Role of forensic science in crime detection

vii) To make them aware about starting private detective agencies in future.

B.Sc. FORENSIC SCIENCE EXAMINATION

Eligibility:

A candidate shall be admitted to the first year of B.Sc. Forensic Science degree course only if he/she satisfies the following conditions.

- He must have passed the 12^{th} Science examinationconducted by H.S.C. Examination Board of Government of Maharashtra or an examination recognized as equivalent there to with Physics, Chemistry, Biology subjects along with other subjects

Curriculum structure and marking scheme for Theory paper

Semester - I			
Course code	**Paper No.**	**Title of Paper**	**Marks**
BFS-1T1	**I**	Basic of Forensic Science	**50**
BFS-1T2	**II**	Basic of Forensic Chemistry	**50**
BFS-1T3	**III**	Basic of Forensic Physics	**50**
BFS-1T4	**IV**	Basic of Forensic Biology	**50**
BFS-1T5	**V**	Basic of Forensic Psychology	**50**
BFS-1T6	**VI**	Basic of Digital and Cyber Forensics	**50**
BFS-1T7	**VII**	Communication skill/Criminology	**50**
BFS-1T8	**VIII**	Indian penal code	**50**
		Total	**400**
Semester II			
Course code	**Paper No.**	**Title of Paper**	**Marks**
BFS-2T1	**I**	Basic of Forensic Science	**50**
BFS-2T2	**II**	Basic of Forensic Chemistry	**50**
BFS-2T3	**III**	Basic of Forensic Physics	**50**
BFS-2T4	**IV**	Basic of Forensic Biology	**50**
BFS-2T5	**V**	Basic of Forensic Psychology	**50**
BFS-2T6	**VI**	Basic of Digital and Cyber Forensics	**50**
BFS-2T7	**VII**	Communication skill/Criminology	**50**
BFS-2T8	**VIII**	Indian penal code	**50**
		Total	**400**

Curriculum structure and marking scheme for Practical papers*

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Semester - I			
Course code	**Paper No.**	**Title of Paper**	**Marks**
BFS-1P1	**I**	Basic of Forensic Science	**25**
BFS-1P2	**II**	Basic of Forensic Chemistry	**25**
BFS-1P3	**III**	Basic of Forensic Physics	**25**
BFS-1P4	**IV**	Basic of Forensic Biology	**25**
BFS-1P5	**V**	Basic of Forensic Psychology	**25**
BFS-1P6	**VI**	Basic of Digital and Cyber Forensics	**25**
		Total	**150**
Semester II			
Course code	**Paper No.**	**Title of Paper**	**Marks**
BFS-2P1	**I**	Basic of Forensic Science	**25**
BFS-2P2	**II**	Basic of Forensic Chemistry	**25**
BFS-2P3	**III**	Basic of Forensic Physics	**25**
BFS-2P4	**IV**	Basic of Forensic Biology	**25**
BFS-2P5	**V**	Basic of Forensic Psychology	**25**
BFS-2P6	**VI**	Basic of Digital and Cyber Forensics	**25**
		Total	**150**

General curriculum Pattern of the course

Paper	Title of Paper	Marks				Work load Period/Week	
		Semester		Practical (Sem I+ Sem II)	Total	Theory	Practical/ batch
		I	II	(Annually)			
I	Basic of Forensic Science	50	50	50	150	3	3
II	Basic of Forensic Chemistry	50	50	50	150	3	3
III	Basic of Forensic Physics	50	50	50	150	3	3
IV	Basic of Forensic Biology	50	50	50	150	3	3
V	Basic of Forensic Psychology	50	50	50	150	3	3
VI	Basic of Digital and Cyber Forensics	50	50	50	150	3	3
VII	Communication skill/Criminology	50	50	---	100	3	---
VIII	Indian penal code	50	50	---	100	3	---
Total		**400**	**400**	**300**	**1100**		

R. 1741:- Examination pattern for theory and practical

The course of study for the B.Sc. Forensic Science examination is divided in six semesters. Semester I, II, III, IV will have eight theory papers each of 50 marks. There will be one practical paper for papers I to VI to be completed in a year and the examination of practical paper will be conducted at the end of even semesters. Each practical paper will carry 50 marks.

Theory examination will be of 2 hours duration and practical examination will be of 3 hours duration.

R 1742:- Structure of class and practical examination

Maximum number of students in a class for theory shall be 50.

Maximum number of students in a batch for practical at the First year shall consist

of 16 students.

R 1743:-Standard of Passing and Award of Division

(a) A candidate who secures minimum 40% of the marks in each subject/paper will be declared to have passed the examination.

(b) A candidate who secures 50% or more but less than 60% of the aggregate marks prescribed for all the semester (i.e. six semesters) shall be awarded a second Division.

(c) A candidate who secures an aggregate of 60% but less than 70% marks on the whole shall be declared to have passed the examination in first class.

(d) A candidate who secures an aggregate of 70% and above marks on the whole shall be declared to have passed the examinations with Distinction.

(e) ATKT Rules: - A Candidate who has failed in not more than seven papers (theory and practical of semester I and II taken together) at the first year examination shall be allowed to keep terms for the second year. He shall be permitted to clear those papers before or along second year examination.

Semester - I

Paper-I (BFS-1T1): Basics of Forensic Science

Marks: - 50 **Hrs./ Week -03**

Sr. No.	Topic
Unit-I	**Crime:** Definition of crime, history and development, victimology, criminological perspective, characteristics of crime, classification of crimes: atrocity, seriousness, motive, statistical, situational & systematic. White collar crime, professional crime, organized crime, present scenario of crime in India. **Criminal and Criminology**: Definition of criminal, classification of criminals. Definition of criminology, growth of criminology in India, conservative criminology, liberal criminology, radial criminology.

	History and development of Forensic Science- Specific contribution of scientists in the field of Forensic Science. Development of Forensic Science in India. National and international scenario of teaching and research institution in Forensic Science
Unit-II	**Basic of Forensic Science:**Introduction, Definition, need, signification and scope of Forensic Science. Principles of Forensic Science, multi professional and multi personal aspects of forensic science. Domains in Forensic Science: Forensic Biology, Forensic Medicine, Forensic Toxicology, Forensic Osteology and Odontology, Forensic Physics, Forensic Photography, Ballistics, Fingerprint, Questioned Documents, Forensic Psychology, Forensic Anthropology, Wild life Forensic, DNA profiling, Computer Forensic etc., Functions of Forensic Scientist, Police officers, Prosecution , Judicial Officers and Medico legal expert etc. Problem of proof in Forensic Science, corpus delicti, modus operandi. Ethical issue in Forensic Science: Definition of ethics, professional standards for practice of Criminalistics, sanction against expert for unethical conduct.
Unit- III	Organization set up of Forensic Science Laboratory: Structure and function of State and regional Forensic Science Laboratory, Central Forensic Science Laboratory and facility provided, Mobile Forensic Science Laboratory. Directorate of Forensic Science Service. Police and Forensic scientist relationship, role of FSL in criminal investigation, relationship between forensic expert and judiciary officer, Importance of FSL, National and International scenario of FSL, facilities provided in forensic science laboratory. Ethical issue in FSL. **Criminal behavior:** Introduction of criminal behavior, theories of criminal behavior: classical and non-classical theories, biological theories, physiological theories, psychogenic theory, economic theory, geographical theories, and sociological theories

Practical paper I: (BFS-1P1): Basics of Forensic Science

(Minimum 06 experiments should be conducted)

Sr. No.	Name of experiment	No. of expt.
1.	Identification and morphological examination of Toxic plants	5

2.	To determine specific gravity of petroleum products	5
3.	Collection, preservation, handling, physical evidence method of different Crime	5
4.	To compare physical evidence (Cloth, Thread)	2
5.	Examination of Bomb Blast Scene	2

Semester - II

Paper-I (BFS-2T1): Basics of Forensic Science

Marks: - 50 **Hrs./ Week -03**

Sr. No.	Topic
Unit-I	**Crime detection agency :** Organization set up and functioning of Government Examine of Questioned Document, Central Forensic Institute, Fingerprint Bureau, National Crime record Bureau, National Institute of Criminology and Forensic science, Crime Investigation department, Central Bureau of Investigation, National Police Academy, National Investigation Agency , World Anti-Doping Agency, National Drug Testing Laboratory, Centre for Cellular and Molecular Biology, Intelligence Bureau, Research Analysis Wing, Bureau of Police Research & Development, Defense Research and Development Organization, Central Police Organization, Central Detective Training School, Fingerprint Bureau Investigation, Crime Investigation Agency, Crime Scene Investigation, Drug Enforcement Administrator & Interpol, OCTOPUS etc.
Unit-II	**Crime scene investigation:** Definition of crime scene, crimes without scene. Classification of crime scene: indoor & outdoor, primary & secondary, macroscopic & microscopic crime scene. Significance of crime scene, argument and ethics of crime scene. Definition of physical evidence, classification of physical evidence, types of physical evidences, sources of physical evidence, signification and value of physical evidence, linkage between crime scene, victim and criminal, study of some special crime scene such as mass disaster, terror attack, geological scene and explosive etc.
Unit- III	**Crime scene management:** Introduction to crime scene management, duties of first responding officer at the scene of crime, duties of crime scene investigator, specialized personnel at the crime scene: biological or chemical terrorist crime scene, processing of scene of crime: plan of action, protection of scene of crime, photography and video recording of

	crime scene, sketching of crime scene, searching, collection, preservation, packing of physical evidence, documentation of crime scene, forwarding or dispatch of exhibit in to the laboratory, chain of custody, collection of standard/reference samples.

Practical paper I: (BFS-2P1): Basics of Forensic Science

(Minimum 06 experiments should be conducted)

Sr. No.	Name of experiment	No. of expt.
1.	To compare and calculate diameter of given bangle piece	1
2.	To collect and compare physical evidence of Hit and run crime scene Samples.	1
3.	Collection and Handling of arson scene Samples	1
4.	Packaging and forwarding of physical evidences.	5
5.	Collection of special evidences.	5

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Suggested reading:

1. Henry Lee's Crime Scene Handbook**:**Henry C Lee
2. Forensic Biology**:**Shrikant H. Lade
3. Crime Scene Processing and Laboratory Work Book **:** Patric Jones
4. Forensic Science: An Introduction to Scientific and Investigative Techniques 3rd ed. **:** Stuart H. James
5. Criminalistics: An Introduction to Forensic Science, 9th edn.**:** Richard Saferstein
6. Computer Crime and Computer Forensic**:**Dr. R.K. Tiwari
7. Criminal Profiling: An Introduction to a Behavioral Evidence Analysis, 3rd edn. **:** Brent E. Turvey
8. Forensic Science in Criminal Investigation and Trial, 4th edn.**:** B.R. Sharma
9. Handbook of Forensic Psychology**:** Dr. Veerraghavan

10. Crime Scene Management with Special Emphasis on National level Crime Cases **:** Dr. Rukmani Krishnamurthy under publishing
11. Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology**:** Parikh C.K.
12. The Identification of Firearms and Forensic ballistics **:** Barrard and Gerald

Semester - I

Paper-II (BFS-1T2): Basics of Forensic Chemistry

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topic
Unit-I	**Liquid state**: Free volume of liquid and density measurement, physical properties of liquid, Vapor pressure, surface tension surfactants, viscosity, molar refraction, optical activity structure of liquid, determination of surface tension by stalagnometer method (drop number method), viscosity by Ostwald's viscometer method and refractive index by Abbe's refractometer method. Effect of temperature on surface tension viscosity and refractive index Applications of surface tension, viscosity and refractive index. Numerical problems.

	Solutions: Method of exploring concentration of solutions, binary liquids, vapor pressure, composite diagram of binary liquids and solutions, distillation, fractional distillations, vacuum distillations. Conductance, conductometry, electro motive force, potentiometry
Unit-II	**Thermochemistry**: Change in internal energy, enthalpy of reaction, relation between ΔH and ΔE, different types of thermochemical equations, energy change during transition or phase change, bond energy. **Kinetics**: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Simple chemical reactions - zero order, first order, second order, and pseudo order reaction, Half-life and mean life, Examples of first and second order reactions namely decomposition of H_2O_2, hydrolysis of methyl acetate, inversion of cane sugar, saponification of ethyl acetate.
Unit-III	**Periodic Properties**: Atomic radii, ionization potential, electron affinity, electronegativity, metallic characters, non-metallic characters and magnetic properties, d-block elements, transition series (3d) elements with respect to electronic configuration, size, ionization energy, metallic nature, oxidation states, magnetic properties, color of salts, catalytic properties, complex formation behavior.

Practical paper II: (BFS-1P2): Basics of Forensic Chemistry

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. no.	Name of experiment	No. of expt.
1.	Introduction to Forensic Chemistry lab apparatus and instruments	1
2.	To study the hydrolysis of methyl acetate catalyzed by acid.	2
3.	To study saponification of ethyl acetate with NaOH.	1
	To study kinetically the reaction rate of decomposition of iodide by H_2O_2.	1

5.	To determine the relative viscosity of given liquid by using Ostwald's Viscometer.	2
6.	To determine percentage composition of a given mixture of liquids by viscosity method.	1
7.	To determine surface tension of the given liquid by using stalagmometer.	2
8.	Standardization of given liquid by primary standard	2
9.	TLC/paper chromatography: Qualitative separation of mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).	1
10.	Chromatographic separation of 2, 4 DNP derivative of acetone and butanone-2 using toluene-petroleum ether (40:60).	1

Semester - II

Paper-II (BFS-2T2): Basics of Forensic Chemistry

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topic
Unit- I	**Gravimetric analysis:** Precipitation, digestion, filtration, washing, incineration, with reference to estimation of barium sulphate, volumetric analysis- standard solution, types of titrations- Acid-base or neutralisation titration, complexometric titrations, redox titration, double titration method, chromatographic separation- definition and classification of chromatographic techniques, liquid chromatography, Thermal methods, introduction and principals.
Unit -II	**Chemical Bonding:** Types of chemical bond-Covalent bond - definition, directional Characteristic, hybridization, various types of hybridization and shapes of simple molecules, bond strength and bond energy, Ionic bonds - definitions, factors affecting ionic bond formation, Hydrogen bonding, Van-der-Waals forces, coordination bond, Metallic bond and its free electron concept. Empirical and molecular formulae, IUPAC nomenclature of alkanes, alkenes, haloalkanes, alcohol ether aldehydes, ketones, carboxylic acids, nitro compounds, nitrites including aromatic compounds.Chemical reactions of alkenes - mechanisms involved in hydrogenation,

	electrophilic and free radical additions, Markownikoff's rule.
Unit-III	**Petroleum products**: Composition and Classification, definition of flash Point and fire Point, knocking, octane number, aniline Point. Refining of Petroleum- cracking, thermal & catalytic cracking. **Heterocycles:** Introduction, 5 and 6-membered heterocycles, orbital picture of pyrrole, furan, thiophene and pyridine. **Dyes**: Classification of dyes on the basis of structures, and on the basis of mode of application. **Polymers:** Introduction, types of polymers, addition and condensation polymers, introduction to natural products, insecticides and pesticides.

Practical paper II: (BFS-2P2): Basics of Forensic Chemistry

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. no.	Name of experiment	No. of expt.
1.	To determine the strength of the given acid conductometrically using standard alkali solution.	1
2.	To determine strength of given acid	2
3.	Determination of alkali content in antacid tablet using HCl.	1
4.	Estimation of hardness of water by EDTA.	1
5.	Inorganic micro / semi micro qualitative analysis	2
6.	Identification of organic compound	3
7.	Acetylation of aniline : preparation of acetanilide.	1
8.	Benzoylation of aniline : preparation of benzanilide.	1

9.	Preparation of iodoform from ethanol or acetone Preparation of benzoic acid from benzamide	2
10.	Heat of neutralization of strong acid and strong base	1

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Suggested reading for theory:

1. Thermodynamics for Chemists by S, Glasstone.
2. Principles of Physical Chemistry and Puri, Sharma and Pathania.
3. Advanced Inorganic Chemistry Vol II by Madan , Malik and Tuli.
4. Concise Inorganic Chemistry Fifth Edition by J. D. Lee.
5. Organic Chemistry by Moris and Boyed
6. Heterocyclic Chemistry by Gupta and Kumar Vol I and Vol II
7. Chemistry of Natural Products by S.V. Bhat, B. A. Nagaswampagi, M. Shivshankar.
8. Instrumental Analysis by Skoog, Holler and Crouch.
9. Essential of Physical Chemistry by Bahl, Bahl and Tuli.
10. Text book of organic chemistry by ArunBahl and B. S. Bahl.
11. Basic Concept of Analytical Chemistry by S. M. Khopkar, Third Edition, New Age International Publication.
12. Analytical Chemistry by G. R. Chatwal, Himalaya Publication.
13. Instrumental Methods of Analysis, Seventh Edition by Willard, Merrit, Dean and Settle.
14. Analytical Chemistry by Dr. Alka Gupta.
15. Instrumental Method of Analysis by G. R. Chatwal and S. K. Anand, Himalaya Publication.

Suggested reading for Practical:

1. Physical Chemistry Practical's by J. B. Yadav
2. Qualitative Analysis by Vogel
3. A Concise Book of Practical Chemistry by Dr. A. B. Dumir, Dr. A. S. Munde, Prof. S. Umar, Prof. A. R. Muley.

Semester – I

Paper-III (BFS 1T3): Basics of Forensic Physics

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topic
Unit -I	Interpretation and applications of Newton's laws of motion, Collisions, types of collisions and conservation laws in collisions. Pseudo forces, Elastic properties of matter, elastic constants and their interrelations. Bending of beams and it's bending moment. Fluid dynamics, Equation of continuity, Bernoulli's equation, Stream line and turbulent flow, Lines of flow in air foil, Posseuille's equation
Unit -II	Velocity of sound, noise and sound Intensity measurement, echo, reverberation, Sabine's Formula, absorption coefficient and it's measurement, sound absorbing materials, transmission of sound and transmission loss, Musical sounds and their characteristics, Consonance and Dissonance, Acoustics of buildings and factors affecting Architectural Acoustics, Sound distribution in an auditorium, Introduction to ultrasonic, Production of ultrasonic waves, Applications of ultrasonic.
Unit-III	Refraction through thin layers, thick lens, thick lens and lens combinations, Aberrations, Interference in thin films, fringes in wedge shaped films, Newton's rings, Simple table spectrometer, total internal reflection. Resolving power of optical instruments, Diffraction due to straight edge. Polarization, Birefringence, Huygen's&Ramsden's Eye-pieces & their comparison.

Practical paper III: (BFS-1P3): Basics of Forensic Physics

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. no.	Name of experiment
1.	Fly wheel
2.	Y by vibration
3.	Study of law of motion
4.	η of Posseuille's Method
5.	Ultrasonic interferometer
6.	Sound Intensity measurement
7.	Spectrotometer (determination of angle of prism A)
8.	Combination of lenses
9.	Newton's rings
10.	Wedge shaped film

Semester - II

Paper-III (BFS 2T3): Basics of Forensic Physics

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topic
Unit -I	Induced absorption, Spontaneous and stimulated emission, Population inversion, pumping process, Condition for lasing action, Active medium, Production of LASER, Important types and working of LASER, Properties of Laser light, applications of LASER, Holography and it's applications. Optical fibers, Propagation of light through optical fiber, Angle of acceptance and numerical aperture, losses, Solar cells.
Unit-II	Review of nuclear composition, nuclear properties and half-life, Radioactive decay schemes, , Nuclear reactions, Conservation laws in nuclear reactions, Q- value of Nuclear reaction. Applications of Radio Isotopes, Radiometric dating, Radiation hazards, Radiation levels of safety, Biological effects of nuclear radiation, Radiation protection methods, Nuclear disasters, Nuclear waste disposal, Radiation damage, Roentgen and Roentgen equivalent physical (rep) and man (rem), Radiation dose.
Unit-III	Basics of LR, CR, LCR circuits, Rectifier circuits, Timer circuits, Transistor and its

	characteristics, Introduction to OPAM, remote sensing and controlling, Photo-sensors, Number system and codes: Decimal, Binary and their inter conversions, Hexadecimal – Binary and Binary – Hexadecimal conversions, BCD numbers, Logic gates and their applications, Flip-flops and counters. CRO and its uses.

Practical paper III: (BFS-2P3): Basics of Forensic Physics

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. no.	Name of experiment
1.	Refractive index of liquid by using LASER
2.	Laser parameters
3.	Solar cell
4.	Frequency of AC mains,
5.	LDR characteristics
6.	LCR series resonance
7.	Bridge rectifier(to study load regulation)
8.	Transistor(CE) characteristics
9.	D-Morgan's Theorems
10.	Ex-or gate, NAND and NOR as universal building block.
11.	Use of CRO
12.	Study of counter

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Suggested reading:

1. Engineering mechanics**:**R. K. Bansal, Laxmi Publications (P) Ltd.
2. Engineering Mechanics**:** D.P Sharma et. Al. , Pearson
3. Engineering Physics**:** R. K. Gaur & S. L. Gupta, DhanpatRai Publications
4. Engineering Physics**:** A. S. Vasudeva, S- Chand
5. University Physics**:** J. C. Upadhyaya, Himalaya Publications
6. Modern Physics**:** R. Murugeshanet. All. , S Chand Co Ltd.
7. Mechanics and Properties of Matter**:** J. C. Upadhyaya
8. Optics**:** P. K. Srivastava, CBS Publication

9. Optics**:** Khandelwal D. P.
10. Lasers **:** Theory and Application- Thyagrajan
11. Lasers and Non- Linear Optics**:** B. B. Laud, Wiley Easter Ltd.
12. Optoelectronics Devices and Circuits- Amar K. Ganguly, Narosa Publication
13. Atomic and Nuclear Physics **:**N. Subrahmanyam et.al. , S- chand company Ltd
14. Nuclear Physics**:** S. B. Patel,John Wiley & Sons
15. Digital Computer Electronics**:** Malvino, Brown, Tata McGrawhills
16. Principle of Electronics**:** V. K. Mehta, S Chand
17. Op-Amps and Linear Integrated Circuits : RamakantA.Gayakwad
18. Electronic Principles **:** Albert Malvino&Devid J. Bates, Tata McGraw Hill

Semester- I

Paper – IV (BFS 1T4): Basics of Forensic Biology

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-I	**Cell biology**: Origin of life and theories of evolution, geological time scale, Discovery of cell, The cell theory, Ultra structure of prokaryotic & eukaryotic cell-(both plant and animal cells), Structural organization and functions of plasma membrane and cell wall of prokaryotes & eukaryotes. Cellular Organelles and Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments). **Biochemistry:**Amino acids, proteins, enzymes, nucleic acid carbohydrates , lipids, vitamins,
Unit-II	**Plant physiology:** Plant anatomy, morphology of leaves, stem, flowers, roots, classification and taxonomy and system of classification of angiosperms (Bentham and Hooker) and Gymnosperms (chamberlain) scale. Mechanical and conducting tissue systems in plants **Introduction to Insect biology**: types of insects and their forensic significance
Unit -III	**Basic instrumentation**:Beer and Lambert's law, colorimetry and spectrophotometry (UV & IR), principle, methods and application of chromatography, Basics of PCR, electrophoresis, centrifugation, Gel documentation, and its forensic applications

Practical paper IV: (BFS-1P4): Basics of Forensic Biology

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. No.	Name of experiment	No. of expt.
1	Study of instruments: Microscope, Autoclave, Hot air oven, incubator, pH meter, colorimeter, centrifuge, Laminar air flow	1
2	Qualitative analysis of sugar, proteins, lipids and nucleic acids	2
3	Study of Enzyme(Amylase), study the effect of substrate concentration on enzyme activity	1
4	Estimation of protein by Folinlowry method	1
5	Estimation of DNA by DPA method & RNA by orcinol method	1
6	Staining Techniques, Simple, Negative staining, Gram Staining,	2
7	Study of aseptic techniques-preparation of cotton plugs for test tubes and pipettes, wrapping of petri- plates and pipettes, transfer of media and inoculum. Staining of bacteria : a) Simple staining b) Gram's staining c)cell wall/ endospore/ capsule staining	3
8	Study of beer-lamberts law using colorimeter	1
9	Study of conducting tissue, -xylem and phloem elements in angiosperms and Gymnosperms as seen in L.S. and R.C.S.	2

Semester- II

Paper – IV (BFS 2T4): Basics of Forensic Biology

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-I	**Basics of microbiology**: Concept of pure culture technique, stains and staining techniques, Control of Microorganisms: Physical & Chemical methods of control, microscopy principle and types of Microscopy, Broad classification of microorganisms **Immunity**: Definition, types-natural, acquired, active, passive. Antigens-Definition, types of antigens, Factors influencing antigenicity; Antibody-Definition, structure, types, properties and functions of Immunoglobulin,Agglutination, Precipitation
Unit-II	**Basic concepts of genetics**: Genetic material – Discovery, experiments, composition and structure of DNA and RNA, organization of DNA in chromosomes, DNA replication, genetic code, protein synthesis, Mendelian principles, sex linkage and sex determination systems, Introduction to recombinant DNA technology, its applications in health, agriculture, industries & forensics.
Unit-III	**Human physiology**: Introduction to Nervous system, respiratory system, digestive system, circulatory system, endocrine system, blood and its function, composition of blood, formation of blood cells, types of blood cells, and blood groups **Introduction to osteology and odontology**: Human skeletal system, Formation of bones, different types of bones, ossification, Dental structure of humans, types of teeth and arrangement.

Practical paper IV: (BFS-2P4): Basics of Forensic Biology

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. No.	Name of experiment	No. of expt.
10	Preparation of blood smear, staining and identification of different wbc's	1
11	Study of mitosis using onion root tip	1
12	To study anatomy of cockroach/dipteran flies and dissection to study digestive system/reproductive system	2
13	Isolate air microflora from different areas using air sampler	1
14	Ouchterlony's double diffusion method	1
15	Isolation of chromosomal DNA	1
16	Haemagglutination (Blood grouping)	1
17	Chromatography- separation of Amino acids, sugars, lipids using paper chromatography and thin layer chromatography, determination of RF values	2
18.	Study of human skeletal system and dental structure	1

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Suggested reading:

1. LehningerPrinciples of Biochemistry5th ed.(2005)**:** Nelson and Cox, W.H Freeman
2. Harper's Illustrated Biochemistry(2009)**:** Murray et.al McGraw Hill professional,
3. Cell and molecular biology 3rd ed.**:** P.K Gupta, Rastogi publications
4. Modern Spectroscopy 4th ed.(2004)**:** J. Michael Hollas John, Wiley and sons.
5. Analytical Biochemistry (1998)**:**Holme,Longman
6. Understanding enzymes4th ed.(1995)**:** Trevor Palmer, Prentice Hall/Ellis Horwood
7. Enzyme Kinetics (1971)**:** Kent Plownan, McGraw-Hill
8. Enzyme Structure and Mechanism(1977)**:**AFersht, W.H Freeman and Company
9. Biophysical Chemistry(2010)**:**Upadhyay&Nath, Himalaya Publishing house
10. Biochemistry (2008)3rd ed.**:** Satyanarayan, Books and Allied (P) ltd.
11. Microbiology(1993)**:** Pelczar, Tata McGraw-Hill Education
12. Practical Microbiology **:** Dubey and Maheshwari, S.Chand and company, New Delhi
13. Prescott, Harley Klein's Microbiology(2008)**:**Willey, Sherwood, Mc-Graw Hill
14. Cell Biology (1984)**:** C.BPowar, Himalaya Publications
15. Genetics a conceptual approach 4th ed.: Benjamin A Pierce, W.H Freeman and company New York
16. Principles of genetics (2006) 8th ed.**:** Gardner et.al, John Wiley and sons
17. igenetics- a molecular approach 3rd ed.**:** Peter Russel, Pearson
18. Molecular Biology of Gene 5thed. **:**Watson, Baker, et.al. Pearson

19. Genetics 2nd ed.: B.D Singh, Kalyani Publications
20. Gene Biotechonology 3rd ed.(2009): S.N Jogdand, Himalaya Publication
21. Genetics 2nd ed.: C B Powar,Vol.1 & 2, Himalaya publication
22. Fundamental Immunology 7thed.:William Paul, Lippincott,Williams and Wilkins
23. Kuby's Immunology 6th ed.: Goldsby, Kindt, Osborne, W.H Freeman and company, NewYork
24. Essential Immunology :Roitt
25. Textbook of medical physiology: Arthur Guyton
26. Textbook of applied entomology Vol. 1: K.P Shrivastav, Kalyani publication
27. General and applied entomology 2ndedtn.: B V David and Ananthkrishnan, Tata McGraw-Hill education pvt.ltd
28. Human biology 5th ed.: Daniel Chiras, Jones and Bartlett publishers
29. Human osteology: T.D White
30. Cell biology, Genetics, Molecular biology, evolution and ecology: P.S Verma, S.Chand and company
31. Introduction to taxonomy of Angiospersms (2011): B.K Verma, PHI-learning pvt.ltd. New Delhi
32. Gymnosperms :Chamberlein
33. Experimental biology: A laboratory manual:AbhijeetDutta, Narosa publishing house
34. Flora of Bentham :R. Hooker
35. Genes and Evolution :Jha
36. Plant Anatomy :Faha
37. Fundamentals of Ecology 5th ed.: Eugene Odum, Thomson-Brooks/Cole

Semester - I

Paper – V (BFS 1T5): Basics of Forensic Psychology

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-I	**The Science of Psychology [Perception]:** What is Psychology –Nature, Definition and its Goals, History of Psychology, Psychology: The Science, Early Schools of Psychology, Modern Perspectives, and Scientific Study Methods in Psychology- Naturalistic Observation, Experimental, Case Studies and Survey.
Unit-II	**Biological Perspectives of Behavior:** Neurons -structure and function, synapse, and neurotransmitters, Neuron and Nerves; Building the Network, Central Nervous System and Peripheral Nervous System, The Brain-structure and function, Glandular system. Sensation and Perception-Definition, Perceptual constancies, Gestalt Principle of Perception-perceptual organization and Grouping of Stimuli in Perceptual Organization, Depth Perception, Errors in Perception-Illusion, Hallucination,

	Individual Factors in Perception.
Unit-III	**Cognition and Intelligence:** Attention, Factors Influencing Attention, Types of Attention, Thinking-mental images, concepts, prototypes, Problem Solving and Decision Making, Problems with Problem Solving. Definition of Intelligence, Measuring Intelligence-concept in measuring intelligence (C.A., M.A., I.Q), Theories of Intelligence, Emotional intelligence, Individual Differences in Intelligence- mental retardation, giftedness, What is Psychological Tests?, Types of Tests,Characteristics of a good test.

Practical paper V: (BFS-1P5): Basics of Forensic Psychology

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. No.	Name of experiment
1	Serial Learning
2	Recall-Recognition
3	Bilateral Transfer
4	Maze learning
5	Span of Attention
6	Habit interference
7	Type A/B behavior patterns- UpinderDhar& Jain M
8	Sinha's Comprehensive Anxiety Test – A.K.P. Sinha& L.N.K. Sinha
9	Facial expression
10	Illusion (Muller-Lyre)

Semester - II

Paper – V (BFS 2T5): Basics of Forensic Psychology

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-IV	**Learning and Memory**: Definition of Learning, Types of Learning, Theories of Learning-Classical Conditioning, Operent Conditioning, Trial-Error Learning, Insight Learning, Cognitive Learning Theory-Tolman's Latent Learning, Bandura's Observation Learning Theory. Definition of Memory, Memory process, Models of Memory-Level Processing Model, Parallel Distribution Processing Model, Information Processing Model-sensory memory, short-term Memory and long-term memory, Retrieval Cues, Forgetting, Forgetting Curve, Causes of Forgetting.
Unit-V	**Motivation and Emotion**: Definition of Motivation, Types of Motives, Approaches of Motivation-instinct approach, drive-reduction approach, arousal approach, incentive approach, Humanistic approach; Maslow's hierarchy of needs, Frustration and Conflicts. Definition of Emotion, Elements of Emotion, Theories of Emotion- James-Lange's theory, Cannon-Bard's theory, Schachter-Singer's theory.
Unit-VI	**Personality:**Definition of Personality, Theories of Personality- Psychoanalytic Theory- Sigmund Freud, Jung and Adler, Behavioral Model, Social Cognitive model-Bandura's reciprocal determinism and self-efficacy, Humanistic Model-Carl Roger and self-concept, Trait theories of Personality- Allport's Theory, Cattell's Theory, The Big Five Model, Biological Model, Assessment of Personality.

Practical paper V: (BFS-2P5): Basics of Forensic Psychology

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. No.	Name of experiment

1.	Reaction time
2.	Locus of control
3.	Frustration test [Nairashyamaapa]- Chauhan N.S, Tiwari G.P.
4.	Assertiveness test- TasneemNaqvi
5.	Retention for meaningful & nonsense material
6.	Depth Perception
7.	Pass-along Test
8.	Emotional Intelligence
9.	Retroactive Inhibition
10.	Proactive Inhibition

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Suggested reading:

1. Psychology, (2006) Ciccarelli, S. K. & Meyer G. E. New Delhi; Perason Education
2. Introduction to Psychology, (1986) Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw-Hill Book Co.
3. Principles of General Psychology,3rd ed. Kimble G.A., Garmezy, , New York.
4. Psychology, (2001), Baran R.A. New Delhi; Person Education Pvt.Ltd.
5. Cognitive Psychology Mind and Brain', Edward E. Smith, Stephen M. Kosslyn, New Delhi, Pearson Education.
6. Invitation to Psychology, Parameswaran, E.G., BeenaC.Tata McGraw-Hil, New Delhi.
7. Manashatra-EkParichay, (2004), Dr. PadhyeV.S.Aurangabad; RenukaPrakashan.
8. Psychology-An Introduction, Thakkar P., Dr. Ambekar A.,

Semester - I

Paper – VI(BFS 1T6): Basics of Digital and cyber forensic

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-I	Basics of Computers: Computer organization, Input & Output devices, Central Processing Unit, types of Memory – RAM, ROM etc. Understanding working of internal and external Storage devices. Memory units, memory structure and management.
Unit-II	Software and hardware, understanding applications, data representations, integers, real, binary, octal, hexadecimal & their conversions. Logic gates – Negation, OR, AND, XOR etc. Introduction to C (basic programming)
Unit-III	Introduction to operating System, process management, concurrency, scheduling, synchronization, Examples of operating Systems – Windows & Dos, Linux. Types of software's, Internal and external parts of computers ex :- connectors, sockets etc., Types of computers

Practical paper VI: (BFS-1P6): Basics of Digital and Cyber Forensic

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. No.	Name of experiment
1	Finding results of different logic gates & their combinations.
2	Working with Windows
3	Working with Ms-office (word, excel, power-point)
4	Working with external storage devices, reading & Writing data on CD, DVD, and USB.
5	Understanding LAN – Client / Server, windows User creation, password protection.

6	Use of Internet – Visiting websites, searching information using search engine.
7	Understanding use of E –mail
8	Networking commands – like ping, IP-Config , etc. with various switches.
9	Tracing and analyzing E – mail senders IP Address of received e–mail
10	Understanding Firewall

Semester – II

Paper – VI (BFS 2T6): Basics of Digital and cyber forensic

Marks: - 50 **Hrs. / Week -03**

Sr. No.	**Topics**
Unit-IV	File Systems & Networking, FAT12, FAT16, FAT32, NTFS, Ext2, Ext3 & HFS.

	Learning extensions, File system management, Basics of Networking – Types of topologies, LAN, MAN, WAN, SAN, CAN etc. types of internet connections (dialup, DSL, Cable, broadband, leased line, satellite , Wi-Fi, 3G-4G) ISP , IP grouping.
Unit-V	Introduction to Internet web and cloud based application, World Wide Web, E-mails, Chat, Search Engines, types of portals, Networking Protocols. Network Security – Threats, Vulnerabilities, Access control, Virus, Trojans, Security plan and policies
Unit-VI	Cyber Crime & Digital Evidence, What is cybercrime?, conventional crime VS cybercrime, types of cybercrimes, precautions in cyberspace, electronic evidence, Digital Evidence, Digital Vs. Physical Evidence, Nature of digital evidence, Precautions while dealing with digital evidence

Practical paper VI: (BFS-2P6): Basics of Digital and Cyber Forensic

(Minimum 06 experiments should be conducted)

Hrs. / week/ Batch -03

Sr. No.	Name of experiment
1.	C Programming declaring and printing variable
2.	Calculate area and circumference of circle and rectangle
3.	finding greatest in 2 and 3 numbers

4.	Calculate electric bill
5.	Calculate Gross Salary
6.	Calculate sum of 5 subjects and percentage
7.	Reverse a number
8.	Convert temperature from degree centigrade to Fahrenheit
9.	Find factorial of a number
10.	Print table of (n) and square of (n) using function

*** Practical examination for Semester I and Semester II will be conducted annually for 50 marks.**

Suggested reading:

1. Introduction to C **:**Kanetkar
2. Introduction to ANSI C **:**Narain
3. Introduction to Computers **:**Rajmohanjoshi
4. Introduction to Computers **:**S. Vankatachalam
5. Basic of Computer **:**P K Singh
6. Computer basic **:** Michael miller
7. Basic operating system**:** Dr. R.C. Joshi
8. Computer networking **:** Wendell Odom
9. Data communication system **:**V. S. Bagad
10. Networking **:** Beasley
11. Internet **:** john Hamilton
12. The internet basic **:**Jason Whittaker
13. Cybercrime **:** Susan Banor
14. Cybercrime investigation **:** Robert More
15. Computer Forensics: Principles and Practices **:** Linda Volonino, Reynaldo
16. Digital Evidence and Computer Crime, 2nd ed. **:**Eoghan Casey

Semester - I

Paper – VII (BFS 1T7): Communication skills

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-I	Concept of communication skills:

	• Importance of communication • Effective communication • Verbal or oral communication • Nonverbal communication: Body language, • Soft Skills: Empathy• Intrapersonal skills • Interpersonal skills • Problem solving • Reflective thinking • Critical thinking • Negotiation skills • Barriers to Communication; Overcoming Strategies
Unit-II	Listening and speaking: • Active listening • Phonetics • Effective speaking • Effective presentation strategies • Group discussion Reading and writing: • Reading and interpretation • Technical writing
Unit-III	Vocabulary and grammar • Using dictionary and thesaurus • Word formation: prefixes and suffixes • Synonyms and antonyms • Idioms • Grammar: Nouns, verbs, gerunds, tenses, active and passive voice, adjectives and degrees of comparison, adverbs, conjunctions, prepositions, articles

Semester - II

Paper – VII (BFS 2T7): Criminology

Marks: - 50 **Hrs. / Week -03**

Sr.No	Topics
Unit-I	**Criminology:** Definition and scope of criminology, Relation of criminology with social science, Definition of crime: legal & social. Elements of crime as per IPC, Difference between crime and sin, immorality, vice, tort etc. Schools in criminology: Pre-classical, Classical, Neo-classical, Socialist, Geographical, Italian and body type (Typological) Psychological and Multiple Causation. Special Types of Crime: Professional crimes, Organized crimes, White collar crimes, Economic crimes, Political crime , Cybercrime, Environmental crime, and De-notified tribes; along with criminal tribes and ex-notified tribes. Types of Criminals: Violent criminals, Property offenders, Offenders of public morality, Career and occupational criminals.
Unit-II	**Etiology of Crime:** Biological factors, Psychological factors, Cultural areas as factors of crime, The home and family factors, Social institution and Public agencies of communication.Sociology of Crime and Deviance: Sociological concepts Community, Group, Institution, Committee, Socialization, Social Disorganization. Primary& Secondary group and crime: Crowd in family, Broken home, Illegal child, Orphanhood, Neighborhood, Family disorganization. Socio-economic factors and crime: Urbanization, Recreation, Poverty, Unemployment, Industrialization. Deviancy: Gambling, Alcoholism, Drug-Addiction, Prostitution, Beggary, Pornography.
Unit-III	**Biology & Psychology of Crime**: Heredity: XYY Syndrome and crime. Heredity and crime: Study of family Genealogy, study of twins, Endocrine glands and crime, Heredity against ecology. Biogenic Theories: Evolutionary Atavism theory – Lombroso, Goring's theory - Charles Goring, Hooton's theory – Hooton, and Physiological make up theory – Sheldon. Psychogenetic theories: Psychological theory – Gaddard,Psychiatric theory - William Healy, Psychoanalytical theory - Freud, Adler, Abraham's etc. Mental Problems: Conflict - Definition and Types, Frustration - Reactions, Relations, Effect, adjustment. Feeble mindedness, Psychopathic personality.

Suggested reading:

1. Communication skills: B.V Pathak , Niraliprakashan
2. Technical communication Principles and practice, 2nd edition: Meenakshi Raman, Sangeeta Sharma, Oxford University press
3. Developing communication skills : Krishna Mohan and MeeraBanerji
4. A Practice Course in English Pronunciation Sethi, J & et al., Prentice Hall of India, New Delhi.
5. Communication Skills, Sen, Leena. Prentice Hall of India, New Delhi.
6. Communication Skills, Prasad, P. ,S.K. Kataria& Son

Semester - I

Paper – VIII(BFS 1T8): Indian penal code

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit-I	**Basic of Crime:** Definition of Crime, Nature of Crime, Essentials of Crime, Criminals and society Classification of crime, cognizable and non-cognizable offence, bailable and non-bailable offence, compoundable, non-compoundable offences and punishments.
Unit-II	**Various types of Crime:** Various types of crime under IPC, Crime against State, Crime against Army, Navy, and Air Force, Crime against public Tranquility, Crime relating to public servant, Offences relating to election, False evidence and offence against public justice, Offence relating to Coin and Government stamps, Offence relating to weight and measures, Offence relating to Religion**.**
Unit-III	**Offence affecting human body:** Culpable homicide, Murder, Dowry Death, Attempt to Murder, Causing Miscarriage, Causing Miscarriage without woman's consent ,Hurt, Grievous hurt, Wrongful restraint and wrongful confinement, Force, Criminal force, Assault, Assault or Criminal force to women with intent to outrage her modesty, Kidnapping , Abduction, Sexual offence, Rape, Unnatural offence, Cruelty by husband or relative of husband.

Semester - II

Paper – VIII (BFS 2T8): Indian penal code

Marks: - 50 **Hrs. / Week -03**

Sr. No.	Topics
Unit -I	**General exception**: Mistake of facts and mistake of law, Privileged Acts Judicial Acts, Accidental acts, Necessity, Incapability to commit a crime Triviality, Private defense, Abetment, Criminal Conspiracy,
Unit- II	**Offence against property :** Theft, Punishment for theft, Theft in dwelling house etc, Theft by clerk or servant of property in possession of master, Extortion Punishment for extortion, Robbery, Dacoity, Punishment for robbery, Punishment for dacoity, Dishonest misappropriation of property, Criminal breach of trust, Punishment for criminal breach of trust, Stolen property, Cheating, Punishment for cheating,
Unit - III	**Offence relating to document:** Forgery,Making a false document, Punishment of forgery, Forgery of record of Court or of public register, Forgery of valuable security, will, etc. Forgery for purpose of cheating, Forgery for purpose of harming reputation, Forged document or electronic record, Using as genuine a forged document or electronic record, Counterfeiting currency-notes or bank-notes, Using as genuine, forged or counterfeit currency-note or bank notes, Possession of forged or counterfeit currency-notes or bank notes, Making or possessing instruments or materials for forging or counterfeiting currency-notes or bank notes, Making or using documents resembling currency-note or bank- note.

Suggested reading:

1. The Constitution of India**:**J.N. Pandey
2. The Indian Penal Code**:** K.D. Gaur
3. The Indian Penal Code**:**Ratanlal and Dhirajlal

4. The Criminal Procedure Code**:** Takwani
5. The Criminal Procedure Code**:**Ratanlal and Dhirajlal
6. The Law of Evidence**:**Batuklal
7. Criminology and Penology**:**N.V. Paranjape