ORDINANCE-H013

BACHELOR OF SCIENCE IN FORENSIC SCIENCES (BFS)

Notified on 12/09/2023

Established under Uttar Pradesh Private Universities Amendment Act 2023

UP Act No.10 of 2023

PREFACE

To ensure seamless education and to achieve academic excellence in the University rules and regulations for "BACHELOR OF SCIENCE IN FORENSIC SCIENCES (BFS)" course is published vide Ordinance 13. These regulations will be in addition to the norms set by the regulatory body from time to time.

Faculty of Paramedical Sciences

Ordinance for Bachelor of Science in Forensic Sciences (BFS)

Duration: (3 Years)

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Bachelor of Science in Forensic Sciences (BFS)

1.1 Objectives/Aim of the course:

The Bachelor of Science in Forensic Sciences program aims to provide students with a comprehensive understanding of the scientific principles and techniques used in the criminal justice system to solve crimes. It equips students with the knowledge and skills needed to apply various scientific methods in the investigation of crimes, collect and analyse evidence, and support legal proceedings. The program combines aspects of biology, chemistry, physics, and law to prepare graduates for careers in forensic laboratories, law enforcement agencies, legal institutions, and other sectors related to criminal justice.

- By the end of the course, students will be able to:
- Demonstrate proficiency in scientific techniques used in forensic investigations.
- Interpret and analyse forensic evidence within the context of criminal investigations.
- Understand the role of forensic science in the broader legal and criminal justice systems.
- Communicate findings and conclusions in a clear and scientifically accurate manner.
- Uphold ethical practices and standards in forensic investigations.

1.2 Programmed Specific Outcomes:

This program provides a balanced education in both the scientific and legal aspects of forensic science, preparing students to contribute meaningfully to solving crimes and ensuring justice.

2. Scope:

This ordinance shall apply to the program leading to Bachelor of Science in Forensic Sciences (B.FS.).

3. Admission Criteria:

A candidate seeking admission in Bachelor of Science in Forensic Sciences (B.FS.) course should have completed 17 years of age, as on 31st December of the year of admission.

4. Qualifying Examination:

4.1 A candidate seeking admission to the Bachelor of Science in Forensic Sciences program should have passed 10+2 examination or its equivalent conducted by Boards/Councils established by State Government/Central Government with Physics, Chemistry, Biology and English as subjects. The candidate must possess minimum 40% marks in the qualifying examination. 5% relaxation will be given to reserve category candidates.

4.2 Admission to Bachelor of Science in Forensic Sciences course will be made as per the rules prescribed by the competent authority of the university, from time to time, in following manner:

a. Direct admission based on merit of the eligible candidates
b. Based on merit in entrance test conducted by competent authority.

5. Duration of the Course:

5.1 Total duration of the B.FS. Course shall be 3 years, each year comprising of two semesters. Each semester shall have normally 90 working days, or as prescribed by the University from time to time.

5.2 Semester-An academic year consists of two semesters.
5.3 Odd Semester July to December.
5.4 Even Semester January to June.
5.5 The maximum period for completion of program successfully should not exceed six years (Nx2)

6. Medium of Instruction: English

7. Attendance:

A candidate is required to obtain minimum 75% attendance in theory, tutorials and seminars and 80% in practical of each subject individually to be eligible to appear in the university examination. However, a relaxation may be allowed on extreme compassionate grounds by competent authority.

8. Organization of the Program:

The degree of Bachelor of Science in Forensic Sciences (B.FS.) program of the university shall be conferred on the candidates who have pursed the prescribed course of study for not less than three years and have passed examination as prescribed under the relevant scheme.

9. Curriculum*:*

9.1 The 3-year curriculum has been divided into 6 semesters and shall include lectures, tutorials, practical, seminars, projects and case studies as defined in the scheme of instructions and examinations and executive instructions issued by the University from time to time.

9.2 The curriculum will also include other co-curricular and extracurricular activities as prescribed by the University from time to time.

10. Credit System:

Each Bachelor of Science in Forensic Sciences (B.FS.) program will have a curriculum in which every Subject (Course) will be assigned certain credits reflecting its weight and contact periods, as given below:

1 hour lecture/tutorial (L) per week	1 Credit
1 Tutorial period (T) per week	1 credit
1 Practical period (P) per week	0.5 credit

In addition to theory and laboratory courses, there may be other courses such as seminar, clinical training, projects etc., which will be assigned credits as per their contributions in the program without regards to contact periods.

11. Minimum Credit Requirements:

The minimum credit required for award of a B.FS. degree is 180. This is normally divided into Theory courses, tutorials, laboratory courses, seminars and projects in duration of six semesters. The credit is

distributed semester wise as shown in the structure and syllabus manual of each programme. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester wise schedule of courses given in the syllabus manual of respective programmes.

12. Curriculum Outline:

First Semester (0-6 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-101	Basics of Forensic Science	2	1	-	40	60	100	3
BFS-102	Biology-I	2	1	-	40	60	100	3
BFS-103	Physics-I	2	1	-	40	60	100	3
BFS-104	Criminal Law	2	1	-	40	60	100	3
BFS-105	General Chemistry-I	2	1	-	40	60	100	3
BFS-106	Basics of Professional Communication	2	1	-	40	60	100	3
BFS-107	Introduction to Computers	2	1	-	40	60	100	3
BFS-111	Biology-I-Lab	-	-	2	40	60	100	1
BFS-112	Physics-I-Lab	-	-	2	40	60	100	1
BFS-113	General Chemistry-I-Lab	-	-	2	40	60	100	1
Total		**14**	**07**	**06**	**400**	**600**	**1000**	**24**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

Second Semester (7-12 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-201	Biology-II	3	1	-	40	60	100	4
BFS-202	Crime Scene Investigation	3	1	-	40	60	100	4
BFS-203	Physics-II	3	1	-	40	60	100	4
BFS-204	Innovations in Forensic Science	2	1	-	40	60	100	3
BFS-205	General Chemistry-II	2	1	-	40	60	100	3
BFS-206	Advance Professional Communication	2	1	-	40	60	100	3
BFS-211	Biology-II-Lab	-	-	2	40	60	100	1
BFS-212	Crime Scene Investigation-Lab	-	-	2	40	60	100	1
BFS-213	Physics-II-Lab	-	-	2	40	60	100	1
BFS-214	General Chemistry-II-Lab	-	-	2	40	60	100	1
Total		**15**	**06**	**08**	**400**	**600**	**1000**	**25**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

Third Semester (13-18 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme		Total	CR
					Internal	External		
		L	T	P				
BFS-301	Forensic Medicine	3	1	-	40	60	100	4
BRS-302	Forensic Physics-I	3	1	-	40	60	100	4
BFS-303	Forensic Biology-I	3	1	-	40	60	100	4
BRS-304	Forensic Psychology	2	1	-	40	60	100	3
BFS-305	Forensic Chemistry-I	2	1	-	40	60	100	3
BFS-306	Environmental Study	2	1	-	40	60	100	3
BFS-311	Forensic Medicine-Lab	-	-	2	40	60	100	1
BFS-312	Forensic Physics-I-Lab	-	-	2	40	60	100	1
BFS-313	Forensic Biology-I-Lab	-	-	2	40	60	100	1
BFS-314	Forensic Chemistry-I-Lab	-	-	2	40	60	100	1
BFS-315	Forensic Psychology-Lab	-	-	2	40	60	100	1
Total		**15**	**06**	**08**	**440**	**660**	**1100**	**26**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

Fourth Semester (19-24 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme		Total	CR
					Internal	External		
		L	T	P				
BFS-401	Forensic Anthropology	3	1	-	40	60	100	4
BRS-402	Forensic Physics-II	3	1	-	40	60	100	4
BFS-403	Forensic Biology-II	3	1	-	40	60	100	4
BRS-404	Forensic Chemistry	3	1	-	40	60	100	4
BFS-405	Digital & Cyber Forensics-I	2	1	-	40	60	100	3
BFS-406	Quality Management in Laboratory	2	1	-	40	60	100	3
BFS-411	Forensic Anthropology-Lab	-	-	2	40	60	100	1
BFS-412	Forensic Physics-II-Lab	-	-	2	40	60	100	1
BFS-413	Forensic Biology-II-Lab	-	-	2	40	60	100	1
BFS-414	Forensic Chemistry-Lab	-	-	2	40	60	100	1
BFS-415	Digital & Cyber Forensics-I-Lab				40	60	100	
Total		**16**	**06**	**08**	**440**	**660**	**1100**	**26**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred

Fifth Semester (25-30 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-501	Forensic Toxicology	3	1	-	40	60	100	4
BFS-502	Forensic Ballistics	3	1	-	40	60	100	4
BFS-503	Digital & Cyber Forensics-II	3	1	-	40	60	100	4
BRS-504	Research Methodology	3	1	-	40	60	100	4
BFS-511	Forensic Toxicology-Lab	-	-	2	40	60	100	1
BFS-512	Forensic Ballistics-Lab	-	-	2	40	60	100	1
BFS-513	Digital & Cyber Forensics-II-Lab	-	-	2	40	60	100	1
BFS-514	Seminar	-	4	0	40	60	100	4
Total		**12**	**08**	**06**	**320**	**480**	**800**	**23**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

Sixth Semester (31-36 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-601	Questioned Document Examination	3	1	-	40	60	100	4
BFS-602	Explosives	2	1	-	40	60	100	4
BFS-603	Fingerprints & Impressions	3	1	-	40	60	100	4
BFS-604	Instrumental and Analytical Technique	3	1	-	40	60	100	4
BFS-611	Questioned Document Examination-Lab	-	-	2	40	60	100	1
BFS-612	Fingerprints & Impressions-Lab	-	-	2	40	60	100	1
BFS-613	Project Work/Dissertation	-	10	-	40	60	100	10
Total		**12**	**08**	**06**	**280**	**420**	**700**	**28**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

12.1 Other Details:

Course/Subject codes:

B. FS Program: In the syllabus manual of B FS, each subject is assigned a specific code. The subject code consists of six to seven digits. First four digits (letters) indicate the program of B. FS., next digit (letter) indicates course which is either core/compulsory /elective/ laboratory /seminar/Project or Clinical training.

A fifth digit (number) indicates semester of a program and six and seven digit (number) indicates serial number of course. An eighth digit (number) is only applicable for elective course which indicates the serial number of elective course in that group.

For example –

Core/compulsory course, Elective course, Foundation course, Laboratory course, Seminar, Project

******C101, ****E101, ****F101, ****L101, ****S301, ****P401**

Where,

First four digits (letters) ***: indicates program name Fourth digit (letter)

C: Indicates Core/Compulsory course
F: Indicate Foundation course
E: indicates Elective course
L: indicates laboratory course;
S: indicates Seminar
P: indicates Project

Fifth digit (number) 1/2/3/4: indicates year in which that course to be studied Sixth and Seventh digit (number) 01: indicates serial number of course.

Eighth digit (number) 1/2/3/4**:** indicates serial number of elective course in a group.

The first four letters used in coding of courses indicates respective programs.

13. Examination / assessment and grading:

13.1 Components of Evaluation:

Each subject will be evaluated out of 100 marks as under:	
a. Theory Subjects:	
i. Internal Assessment (IA)	40 marks
ii. End-Semester Examination (ESE)	60 marks
b. Practical Subjects including Seminar, Lab Posting, Project, etc.	
i. Internal Assessment (IA)	40 marks
ii. End-Semester Examination (ESE)	60 marks

13.2 Grading of Performance:

The letter grades and their equivalent grade point applicable for undergraduate programs are given below:

Percentage of Marks Obtained	Letter	Grade Points	Performance
85.0 and above	O	10	Outstanding
80.0 – 84.9	A	9	Excellent
75.0 – 79.9	B	8	Very Good
65.0 – 74.9	C	7	Good
60.0 – 64.9	D	6	Fair
55.0 – 59.9	E	5	Average
50.0 – 54.9	P	4	Pass
Less than 50.0	F	0	Fail

13.3 Computation of semester grade point average (SGPA) and cumulative grade point average (CGPA):

SPGA is the weighted average of the grade points obtained in all courses by the student during the semester (All courses excluding English and electives)

EX. SGPA COMPUTATION

Course Number	Credit/s	Letter grade	Grade point	Credit point (Credit × grade)
1	3 (C1)	A	8 (G1)	3 × 8 =24
2	4 (C2)	B+	7 (G2)	4 × 7 =28
3	3 (C3)	B	6 (G3)	3 × 6 =18

$$\text{SGPA} = \frac{C1G1 + C2G2 + C3G3}{C1 + C2 + C3}$$

$$= \frac{70}{10} = 7 \text{ (rounded off to two decimal points)}$$

13.4 Computation of CGPA:

a. CGPA is calculated with SGPA for all semesters to two decimal points and is indicated in final grade in marks card/transcript showing grades of all 8 semesters and their courses/subjects.
b. CGPA reflects the failed status in case of fail until the course/s are passed.

Semester I	Semester 2	Semester 3	Semester 4
Credit – Cr: 20	Cr: 22	Cr: 25	Cr: 26
SGPA: 6.5	SGPA: 7.0	SGPA: 5.5	SGPA: 6.0
Cr × SGPA = 20 × 6.5			

$$\text{CGPA} = \frac{20 \times 6.5 + 22 \times 7 + 25 \times 5.5 + 26 \times 6}{93}$$

$$= \frac{577.5}{93} = 6.2$$

14. Schedule of Examination:

On completion of each semester, a university examination will be conducted. Theory examinations will be of 3 hours as per university schedule followed by practical examination.

14.1 Supplementary Examination:

Supplementary Examination will be held along with forthcoming odd/even semester examination as applicable.

14.2 Internal Assessment (IA):

It shall be based on evaluation of periodic tests, assignments, clinical presentations, Viva, etc. Regular periodic examinations will be conducted throughout the course. There will be a minimum of two (2) internal examinations.

The break-up of IA (40 Marks) shall be as follows:

Theory Subjects:	
I. Average of Two Internal Examination	30 Marks
II. Teacher's Assessment	
a. Tutorial /Assignment /Quizzes	05 Marks
b. Attendance	05 Marks
Practical Subjects:	
I. One Mid-term viva –voce /tests	30 Marks
II. Teacher Assessment	
a. Lab Record	05 Marks
b. Attendance	05 Marks

a. Internal assessment of the subject shall be added to compute subject percentage.
b. The students may improve their internals assessment by appearing for "Improvement Sessional Examination.

15. Qualifying Standards:

15.1 Marks obtained in internal assessment of the Theory and Practical will be merged with the theory & practical marks of the University examination.

15.2 In an individual subject the minimum pass marks (including internal assessment) shall be 50% in theory and 50% in practical separately. The marks obtained in the University Examination and in the internal assessment of the subject shall be added to compute subject percentage.

16. Promotional Rules:

16.1 A student shall be declared pass in a semester when he/she is pass in all the theory and practical subjects.

16.2 A student failing to satisfy the passing standards of one or more subjects in the semester shall be permitted to pursue course of the next semester and clear the back paper in the subsequent odd/even semester examination.

16.3 Students shall be allowed to keep term for last semester if she/he passes in all heads of the previous semester i.e. Semester I, Semester II, Semester III, IV, V, VI and Semester VII and so on.

16.4 A student shall be eligible to undertake internship only when he/ she has cleared all the subjects of all the final and pre-final semester.

17. Grace Mark:

A student can be awarded 'Grace Marks' not exceeding a maximum 5 marks either in theory or practical, in not more than two subjects. The grace marks shall not be added to the aggregate marks.

18. Declaration of Result:

In an individual subject the minimum pass marks (including internal assessment) shall be 50% in theory and 50% in practical separately. The marks obtained in the University Examination and in the internal assessment of the subject shall be added to compute subject percentage.

19. Award of Division:

19.1 His/her division shall be awarded on the basis of all semester result.

19.2 If a candidate passes all examinations in first attempt without grace and secures 75% or more marks, he/she shall be placed in 'First Division with Honors.'

19.3 If a candidate passes all examinations in first attempt and secures 60% or more marks, he/she shall be placed in First Division.

20. Award of Rank:

On the basis of Final year result, the top three candidates shall be awarded rank according to their merit provided they pass all examinations in first attempt.

21. Award of Degree:

The student shall be eligible for award of Bachelor of Science in Forensic Sciences (B.FS.) degree on successful completion of prescribed course of study i.e. he/ she must have been declared pass in result.

22. Scrutiny and Re-evaluation:

Scrutiny and re-evaluation shall be as per university regulations.

23. Unfair means:

All cases regarding reported use of unfair means will be disposed as per university regulations.

24. Cancellation of admission:

The admission of a student at any stage of study shall be cancelled if he/she is not found qualified as per norms and guidelines or the eligibility criteria prescribed by the University

****

ANNEXURE - 1

SYLLABUS

Bachelor of Science in Forensic Sciences

First Semester (0-6 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-101	Basics of Forensic Science	2	1	-	40	60	100	3
BFS-102	Biology-I	2	1	-	40	60	100	3
BFS-103	Physics-I	2	1	-	40	60	100	3
BFS-104	Criminal Law	2	1	-	40	60	100	3
BFS-105	General Chemistry-I	2	1	-	40	60	100	3
BFS-106	Basics of Professional Communication	2	1	-	40	60	100	3
BFS-107	Introduction to Computers	2	1	-	40	60	100	3
BFS-111	Biology-I-Lab	-	-	2	40	60	100	1
BFS-112	Physics-I-Lab	-	-	2	40	60	100	1
BFS-113	General Chemistry-I-Lab	-	-	2	40	60	100	1
Total		**14**	**07**	**06**	**400**	**600**	**1000**	**24**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

SUBJECT- BASICS OF FORENSIC SCIENCES
SUBJECT CODE- BFS-101

LEARNING OBJECTIVE: The objective is to introduce the students to forensic sciences and give a brief idea about the history and developments of the field, related laws& ethics, and forensic science laboratories.

UNIT	CONTENT
1	**CRIME SCENARIO IN INDIA** 1. Introduction to crime and history, Sociological aspects of crime and criminals in society 2. Types of crime and its causes – property crimes, public order crimes, violent crimes, cyber-crimes, juvenile delinquency 3. Society-Criminal interaction and various types of crimes in India 4. Criminal behavior - Theories and literature studies, criminal inheritance, and factors responsible
2	**CRIMINOLOGY & LAW** 1. Definition of law, court, judge, Basic terminologies in law 2. Law to combat crime, classification of civil & criminal cases, the difference between civil & criminal cases 3. Essential elements of criminal law. 4. The object of punishment, kind of punishment
3	**DEVELOPMENTAL GROWTH OF FORENSIC SCIENCES** 1. Introduction to Forensic science – nature, need, and function 2. Laws and Principles, basics of Forensic Science 3. Historical development and scope of Forensic Science in India 4. Specific contribution of scientists in the field of forensic science
4.	**FORENSIC SCIENCE LABORATORIES AND FACILITIES** 1. Organizational setup of the forensic science lab and other national & international agencies: - FSL, CFSL, GEQD, NICFS, CID, CBI, Central Detective Training Schools, NCRB, NPA (National Police Academy) 2. Services and functionalities provided by various FSLs 3. Various divisions in the FSL – Ballistics, Biology, Chemistry Documents, Physics, Psychology, Serology, Toxicology
5	**FORENSIC ETHICS** Forensic Ethics- Introduction, Definition, Scope, Ethics in Forensic Sciences, Professionalism and ethics: Importance of professional ethics, the importance of professional ethics to science practitioners, development of code of conduct and code of ethics for Forensic Science; Application of codes and ethics, how ethical requirements impact the daily work of a forensic scientist; Ethical dilemmas and their resolution.

Recommended Books:

1. Mc Robbie DW, Moore EA, Graves MJ. MRI from Picture to B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty-First Century, Select Publishers, New Delhi (2001).
2. S.H. James and J.J. Nord by, Forensic Science: An Introduction to Scientific and investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005)
3. W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
4. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
5. W.J. Tilstone, M.L. Hastrup, and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC

SUBJECT- BIOLOGY-I
SUBJECT CODE- BFS-102

LEARNING OBJECTIVE: The objective is to introduce the students to the basic principles & concepts of biology, anatomy & physiology of humans, plant morphology & microbiology.

UNIT	CONTENT
1	**CELL BIOLOGY, ORGANIC AND BIOCHEMICAL COMPOUND** 1. Cell theory, Cell Structure and Function in Prokaryotes and Eukaryotes 2. Unicellular and Multicellular organisms 3. Composition of the blood, the study of blood components and their functions. 4. Properties, Classification, and function of carbohydrates, proteins, nucleic acids, and lipids
2	**PLANT MORPHOLOGY AND ANATOMY** 1. Principles of Taxonomy and systems of classification of angiosperms (Bentham and Hooker) and Gymnosperms (Chamberlain) 2. Mechanical and conducting tissue systems in plants 3. Morphology of root, leaf, stem, flowers, and their modifications. 4. Anatomy of mono and dicot roots, leaves, and stems - secondary growth, growth rings, calculation of life of the wood.
3	**HUMAN PHYSIOLOGY AND ANATOMY** 1. Nutrition - BMR, Calorie value, balanced diet, obesity, digestive system. 2. Skeletal Muscle physiology and Nervous System Physiology, coordination systems, brain functions, and receptor organs 3. Respiratory system physiology - exchange of gases, the process of pulmonary respiration 4. Mechanism of blood circulation, cardiac mechanism. 5. Morphological study of human body parts and regions - Gross and Microscopic, Microbe-Human interaction.
4.	**MICROBIOLOGY AND BIOTECHNOLOGY** 1. Microscopy - Principles and types 2. Historical introduction to microbiology 3. Basics of Microbiology and concepts of Pure culture techniques. 4. Broad classification of microorganisms 5. Recombinant DNA technology and its application, Western and Southern Blot techniques
5	**EVOLUTION AND GENETICS** 1. Origin of life and Geological time scale

	2. Theories and evidence of evolution - Darwinism, Lamarckism, fossil record, and biochemical evidence. 3. Origin and Concept of Species - specification and isolation, geographical and reproductive. 4. Genetic Materials - Structural organization and functions 5. Mendelian Principles, Mendels Laws and Ratio 6. Sex-linked inheritance, sex determination and crossing over – Karyotyping analysis, Chromosomal mapping, DNA and RNA structural types

Recommended Books:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wile & amp;
2. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular A roach. 5th
3. Dr. R. Krishnamurty- Forensic Biology
4. R. Li- Forensic Biology

SUBJECT- PHYSICS-I
SUBJECT CODE- BFS-103

LEARNING OBJECTIVE: The objective is to introduce the students to the basic principles & concepts of Physical science.

UNIT	CONTENT
1	**MECHANICS:** Force, conservative and non-conservative force, rotational motion of inertia, expression of M.I. of regular shaped bodies. Kepler's law. Acceleration due to gravity. Simple Harmonic motion and compound pendulum. Newton's law of motion.
2	**THERMAL PHYSICS:** concept of temperature, ideal gas equation, and its law. Vander Waal's equation, reversible and irreversible process, Zeroth law, first, the second and third law of thermodynamics. Carnot's cycle.
3	**ELECTROMAGNETISM:** Coulomb's law. Electric field, Magnetic field due to current, Gauss's theorem and its application, Ampere's law, Kirchhoff's law, and their applications.
4.	Wheat-stone bridge and its sensitivity. Rectifiers, Amplifiers, semiconductors, and their type of junction. Paramagnetic, diamagnetic, ferromagnetic materials and properties.
5	**Nuclear Physics** Nuclear forces, nuclear models (elementary idea): Concept of nuclear quantum number, magic numbers. Nuclear Reactions: Artificial radioactivity, transmutation of elements, fission, fusion Radio Activity Half-life Period, Nuclear Reactor.

Recommended Books:

1. Engineering Physics Seventh Enlarged, Revised Edition2004,
2. M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd. ISBN 81-219- 0817-5.
3. Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication.
4. A Textbook of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3rd edition)

SUBJECT- CRIMINAL LAW
SUBJECT CODE- BFS-104

LEARNING OBJECTIVE: The objective is to introduce the students to the law related to forensic science and the introduction of the police organization.

UNIT	CONTENT
1	**Definitions-** of Law, Court, Judge, Basic Terminology in Law, Introduction to Criminal Procedure Code, FIR, Difference between civil and Criminal Justice, Object of Punishment, Kinds of Punishment.
2	**Law to Combat Crime-** Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts. Criminal Procedure Code. Cognizable and non-cognizable offenses. Bailable and non-bailable offenses. Sentences which the court of Chief Judicial Magistrate may pass.
3	**Laws specific to Forensic Science:** Indian Penal Code: pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351,354, 359, 362.Sections 375 & 377 and their amendments. Indian Evidence Act– Evidence and rules of relevancy in brief. Expert witness. Cross-examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73,135, 136, 137, 138, 141. CrPC– Sections 291,291A, 292 & 293 in the code of criminal procedure.
4.	**Police science:** definition and scope- Police organization under central government: general information about their structure and function BPR&D, CBI, IB, RAW, NCRB, NICFS, NPA, UT Police Force. International Police Organization: INTERPOL- history, structure general and special notices. State Police organization: general organization of police at the state and range level. Police organization at the district level.
5	Acts Pertaining to Socio-economic and Environmental Crimes. Dowry Prohibition Act. Immoral Traffic Prevention Act. Wildlife Protection Act. Environment Protection Act. Untouchability Offences Act.

Recommended books:

1. D.A. Bronstein, Law for the Expert Witness, CRC Press, Boca Raton 4th edition (2011).
2. Vipa P. Sarthi, Law of Evidence, 6th Edition, Eastern Book Co., Lucknow (2006).
3. A.S. Pillai, Criminal Law, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).
4. R.C. Nigam, Law of Crimes in India, Volume I, Asia Publishing House, New Delhi (1965).
5. (Chief Justice) M. Monir, Law of Evidence, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002)

SUBJECT- GENERAL CHEMISTRY-I
SUBJECT CODE- BFS-105

LEARNING OBJECTIVE: The objective is to introduce the students to the basic principles & concepts of organic, inorganic, and physical chemistry.

UNIT	CONTENT
1	**INORGANIC CHEMISTRY** **Atomic Structure**: Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, the significance of Ψ and Ψ2, quantum numbers, radial, and angular wavefunctions and probability distribution curves, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements.
2	**Periodic Properties** Atomic and ionic radii, ionization energy, electron affinity, and electronegativity definition, effective nuclear charge, methods of determination or evaluation, trends in the periodic table, and applications in predicting and explaining the chemical behavior.
3	**ORGANIC CHEMISTRY** **Structure Bonding** Hybridization and its effect on bond length and bond angles, bond energy, localized and delocalized chemical bond, inductive, resonance, hyperconjugation, hydrogen bonding, van der Waals interactions
4.	**Mechanism of Organic reactions** Homolytic and heterolytic bond breaking. Types of reagents electrophiles and nucleophiles, Types of organic reactions. Energy considerations. Reactive intermediates-carbocations, carbanions, free radicals, carbenes, arynes, and nitrenes (with examples). Assigning formal charges in intermediates and other ionic species.
5	**PHYSICAL CHEMISTRY** **Gaseous State** Postulates of the kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state. Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, the relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state. Problems Molecular velocities: Root means square, average, and most probable velocities.

Suggested Readings-

1. M. Barrow: Physical Chemistry Tata McGraw Hill, 2007.
2. Cotton & G. Wilkinson: Basic Inorganic Chemistry,
3. John Wiley, Miessler, G. L. & amp; Donald, A. Tarry. Inorganic Chemistry 3rd Edition, Pearson, 2009 ISBN.

SUBJECT- BASICS OF PROFESSIONAL COMMUNICATION
SUBJECT CODE- BFS-106

LEARNING OBJECTIVE: The major objective of the course is to develop professional communication skills among the students.

UNIT	CONTENT
1	**PROFESSIONAL COMMUNICATION** a. Professional Communication: Meaning & importance b. Essentials of Effective Communication c. Barriers to Effective Communication
2	**LANGUAGE THROUGH LITERATURE** a. Essays: "The Effect of the Scientific Temper on Man" by Bertrand Russell "The Aims of Science and Humanities" by Moody E. Prior b. Short Stories: "The Meeting Pool" by Ruskin Bond "The Portrait of a Lady" by Khushwant Singh
3	**BASIC VOCABULARY** a. Euphemism, One-word Substitution, Synonyms, Antonyms b. Homophones, Idioms and Phrases, Common mistakes c. Confusable words and expressions
4.	**BASIC GRAMMAR** a. Articles, Prepositions, Tenses b. Concord (Subject-Verb agreement), Verbs: kinds & uses c. Degrees of Comparison
5	**BASIC COMPOSITION** a. Report writing: What is a report? Kinds and objectives of reports, writing reports b. Business Letter Writing: Introduction to business letters, types of business letters, Layout of business letters, Letter of Enquiry / Complaint

Recommended Books:

1. Lata, Pushp & Kumar, Sanjay. Communication Skills, Oxford University Press-2012
2. Quintanilla, Kelly M. & Wahl, Shawn T. Business and Professional Communication, Sage Publications India Pvt. Ltd-2011
3. Juneja, Om P & Mujumdar, Aarati. Business Communication: Techniques and Methods, Orient Black Swan-2010
4. Arora, V. N. & Chandra, Lakshmi. Improve Your Writing: From Comprehensive to Effective Writing, Oxford University Press-2010 (For the prescribed essays- "The Effect of the Scientific Temper on Man" by Bertrand Russell & "The Aims of Science and Humanities" by Moody E. Prior)

SUBJECT- INTRODUCTION TO COMPUTER
SUBJECT CODE- BFS-107

LEARNING OBJECTIVE: The main objective of the course is to provide fundamental knowledge of computers, windows, MS word, and Powerpoint.

UNIT	CONTENT
1	**COMPUTER FUNDAMENTALS** What is a computer? Components of a computer system. Classification of computers. Types of computers. A brief history of the evolution of computers and generation of computers. Computer hardware and software. Input/ Output devices.
2	**DOS** Elementary knowledge of DOS commands DIR, CLS, DATE, TIME, MD, CD, RD, RENAM, DEL, BACKUP, RESTORE, COPY, SCANDISK, CHKDSK.
3	**WINDOWS** Difference between windows and DOS. Basic Features - Date, Time, Time Zone, Display, Screen Saver, Fonts, Mouse, and mouse pointers. Using accessories such as a calculator, paintbrush, CD player, etc. Use of Windows Explorer for moving and copying files. Introduction to MS Office and its integrated nature.
4.	**MS-WORD** Starting Word, new documents, entering text, changing text, aligning, underlining, and justifying text. Use of tabs. Tables - creation, adding rows and columns, splitting, and combining cells, Borders. Saving, closing, and operating documents. Adding headers and footers. Print preview, and print a document. Mail merge: creating main document and data source. Adding and removing fields from the data source.
5	**POWERPOINT (PRESENTATION SOFTWARE)** The basic concept of presentation software. Standard, Formatting, and drawing toolbars in PowerPoint and their use. Creating and opening a presentation. Creating, deleting, opening, and copying slides. Closing and saving a presentation. Use of slide sorter, adding header/footer. Use of master slides and color box. Use of animation features. Inserting pictures, resizing pictures. Inserting organization chart. Use of auto content wizard.

Recommended Books:

1. A First Course in Computers: Saxena, Vikas Publishing House
2. Fundamentals of Computer science - M. Afshar Alam
3. Fundamental of Information Technology by D. S. Yadav- New age International

SUBJECT- BIOLOGY-I-LAB
SUBJECT CODE- BFS-111

LIST OF PRACTICALS:

1. Qualitative analysis of sugars, proteins, lipids, and nucleic acids
2. Demonstration of Unicellular & Multicellular Organisms.
3. Study of morphological types of red blood cells
4. Study of morphological plant parts with modification
5. Study of conducting tissue- Xylem and phloem elements in Angiosperms and Gymnosperms as seen in L.S. and R.L.S.
6. Study of anatomical features of secondary growth in angiosperms stem and root.
7. Demonstration of Skeletal Muscles
8. Demonstration of Nervous System
9. Demonstration of Respiratory System
10. Demonstration of Circular System
11. Preparation of media and sterilization

SUBJECT- BASICS OF PHYSICS-I-LAB
SUBJECT CODE- BFS-112

LIST OF PRACTICALS:

1. Standard operating procedures for using Vernier Caliper, Micrometer
2. Screw Gauge, Travelling Microscope.
3. To determine the value of „g" by a compound pendulum.
4. To determine the value of „g" by a Kater"s pendulum.
5. To find the Moment of Inertia of a flywheel about its axis of rotation
6. OR (To find angular.
7. Acceleration of a flywheel.
8. To verify Newton's law of cooling
9. To determine the Moment of Inertia of a given irregular body using a Torson pendulum

SUBJECT- GENERAL CHEMISTRY-I-LAB
SUBJECT CODE- BFS-113

LIST OF PRACTICALS:

1. Qualitative analysis of inorganic mixtures containing not more than four ionic species (excluding insoluble substances) out of the following radicals;
   a) Analysis of acid radicals: CO_3^{2-}, NO_2^-, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO_3^-, CH_3COO^-, F^-, Cl^-, Br^-, I^-, PO_4^{3-}, BO_3^{3-}, $C_2O_4^{2-}$

b) Analysis of basic radicals: NH_4^+, Ag^+, Hg_2^{2+}, Hg^+, Pb^{2+}, Bi^{3+}, Cu^{2+}, Cd^{2+}, Sn^{2+}, Fe^{3+}, Al^{3+}, Cr^{3+}, Co^{2+},Ni^{2+}, Mn^{2+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, K^+, Na^+

2. Purification of organic compounds by the following methods;
   - **a.** Crystallization
   - **b.** Distillation
   - **c.** Sublimation.

Second Semester (7-12 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-201	Biology-II	3	1	-	40	60	100	4
BRS-202	Crime Scene Investigation	3	1	-	40	60	100	4
BFS-203	Physics-II	3	1	-	40	60	100	4
BRS-204	Innovations in Forensic Science	2	1	-	40	60	100	3
BFS-205	General Chemistry-II	2	1	-	40	60	100	3
BFS-206	Advance Professional Communication	2	1	-	40	60	100	3
BFS-211	Biology-II-Lab	-	-	2	40	60	100	1
BFS-212	Crime Scene Investigation-Lab	-	-	2	40	60	100	1
BFS-213	Physics-II-Lab	-	-	2	40	60	100	1
BFS-214	General Chemistry-II-Lab	-	-	2	40	60	100	1
Total		**15**	**06**	**08**	**400**	**600**	**1000**	**25**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

SUBJECT- BIOLOGY-II
SUBJECT CODE- BFS-201

LEARNING OBJECTIVE: The objective is to introduce the students to the basic principles & concepts of biology, immunology, and genetics.

UNIT	CONTENT
1	**IMMUNOLOGY** • Immunity and Immune System • Cells and Organs of the Immune System • Types of Immunity: Humoral and Cellular Immunity • Virology and Bacteriology - structure, genetics, and diseases
2	• B cell / T cell development, diversity, and recognition • Antigen & Antibody- structure, transplantation and types, immune system disorders. • Various types of microbial cultures • Failures of Body defenses
3	**GENETICS** • Structure & properties of Chromosomes • Heterochromatin & Euchromatin • RNA: Structure & Types
4.	• DNA: Structure, Properties, Types. • Sources used as DNA Evidence • Role of DNA evidence in Forensic Science
5	• DNA Quantification: Slot Blot Assay, Southern Northern Blotting • DNA Amplification by Polymerase Chain Reaction • DNA Electrophoresis, DNA data-basing

Recommended Books:

1. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wile & amp; Sons. Inc.
2. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular A roach. 5th
3. Dr. R. Krishnamurty- Forensic Biology
4. R. Li- Forensic Biology

SUBJECT- CRIME SCENE INVESTIGATION
SUBJECT CODE- BFS-202

LEARNING OBJECTIVE: The objective of the course is to develop a basic understanding of crime scene and crime scene investigation.

UNIT	CONTENT
1	**CRIME** Definition & causation, types of crime, brief ideas about White collar crime, professional crime, organized crime, etc., modus operandi & Corpus Delicti, the present scenario of crime in India. Processing of crime scene.
2	**CRIME SCENE INVESTIGATION** Definition of Crime Scene. Classification of crime Scene: Indoor & Outdoor, Primary & Secondary, Macroscopic & Microscopic crime scene, Conveyance crime scene. Significance of crime Scene. Aim of scientific investigation. Argument and Ethics of Crime Scene.
3	**STAGES IN CSI** Protection of Crime Scene, Recognition of evidence, searching of evidence, Documentation of crime scene and evidence, Collection of evidence, Marking of Evidence, Packaging of Evidence, Analysis of evidence, Interpretation of result, Reporting of result & expert testimony.
4.	**PHYSICAL EVIDENCE** Definition, classification of physical evidence, types of physical evidence, sources of physical evidence, signification and value of physical evidence, and the linkage between crime scene, victim, and criminal. Protection, Sketching, and Photography: Collecting and Packing physical clues from the scene of the crime in case of Hit and Run, Burglary, Housebreaking, Road accident, Theft and Dacoity, arson, and shooting. Reconstruction and evaluation of the scene of the crime.
5	**INVESTIGATIVE TECHNIQUES** Criminals, Criminal behavior, Criminal profiling, Portrait parley, Polygraph analysis, Narco analysis, Brain Fingerprinting, Voice stress analysis & Speaker profiling.

Recommended Books:

1. McRobbie DW, Moore EA, Graves MJ. MRI from Picture to B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty-First Century, Select Publishers, New Delhi (2001).
2. M.K. Bhasin and S. Nath, Role of Forensic Science in the New Millennium, University of Delhi, Delhi (2002).
3. S.H. James and J.J. Nord by, Forensic Science: An Introduction to Scientific and investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005)
4. W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
5. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
6. W.J. Tilstone, M.L. Hastrup, and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC

SUBJECT- PHYSICS-II
SUBJECT CODE- BFS-203

LEARNING OBJECTIVE: The main objective of the course is to develop an understanding of sound, optics, laser, and electronic circuits.

UNIT	CONTENT
1	**STUDY OF SOUND** • Velocity of sound, noise and sound intensity measurement, echo, reverberation, Sabine's Formula, absorption coefficient, the acoustics of buildings, and factors affecting the acoustics of buildings • Sound distribution in an auditorium, introduction to ultrasonic, production of ultrasonic waves, applications of ultrasonic.
2	**OPTICS** • **Interference:** Coherent sources, conditions of interference, Fresnel's bi-prism experiment, interference in thin films, wedge-shaped film, Newton's ring. • **Diffraction:** Single slit and double slit diffraction, diffraction grating, Raleigh's criterion of the limit resolution, resolving power of telescope and microscope. • **Polarization:** Polarization of light, Brewster's law, Malus law, the phenomenon of double refraction, the geometry of calcite crystal, optic axis, principal section, ordinary and extraordinary rays, construction and working of Nicol prism. Plane circularly and elliptically polarized light, Their production, and analysis. Retardation Plates, optical activity, specific rotation, polarimeters.
3	**LASER & FIBER OPTICS** Production of LASER, Types of LASERS, Properties, and applications of LASER, Optical fibers, Propagation of light through optical fiber, Angle of acceptance and numerical aperture, losses, Solar cells.
4.	**X-Rays** Origin of X-rays, continuous and characteristic X-ray spectra, Mosley's law, absorption of X-rays, Diffraction of X-rays, Bragg's law, Bragg's spectrometer, practical applications of X-ray, X-ray Machine.
5	**ELECTRONICS CIRCUITS & DIGITAL ELECTRONICS** Basics of LR, CR, LCR circuits, Rectifier circuits, Timer circuits, Transistor and its characteristics, Introduction to OPAM, remote sensing and controlling, Photosensors, Logic gates, and their applications, Flip-flops and counters

Recommended Books:

5. Engineering Physics Seventh Enlarged, Revised Edition2004,
6. M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd. ISBN 81-219- 0817-5.
7. Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication.
8. A Textbook of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3rd edition)

SUBJECT- INNOVATION IN FORENSIC SCIENCES
SUBJECT CODE- BFS-204

Learning Objective: The Objective of this course is to introduce the students to recent trends and newly introduced technologies in the field of forensic science so that they can understand and fulfill the requirements of the field.

UNIT	CONTENT
1	**Digital Vehicle Forensics: -** Driverless cars, wealth of digital information, such as recent destinations, favorite locations, routes, and personal data (e.g., call logs, contact lists, SMS messages, pictures, and videos).
2	**Biosensors:** Introduction to biosensor technology, Prostate-specific antigen (PSA) detection in forensic samples: Miniaturization of Surface Plasmon Resonance (SPR) Immunosensors: Multi-Metal-Deposition Detection of, Microbial Biosensors: Chemical Sensors.
3	**Drone Forensic: -** Introduction to drone technology, Threats imposed by Drones, Electronic Configurations of Drones, Architectural Efficiency of Drones, Drone Controllers, Digital Evidence, Flight Log File Analysis, Data Storage Analysis, Case Study on Criminal Usage of Drones.
4.	**Block Chain-Based Solutions:** What are cryptocurrencies, Public vs. private block chain technology, Proof of work (vs. proof of scale), What is Bitcoin? vs Bitcoin cash? Cloud forensic, IOT. Types of Evidence in Cloud of Things.
5	**Immunochromatography:** Introduction, theory, Procedure and forensic application.

Recommended Books:

1. Pioneers in Forensic Science: Innovations and Issues in Practice Hardcover –10 August 2017 by Kelly M. Pyrek.
2. Biosensor Developments: Application in crime detection by Vijayata Singh.
3. Cloud Forensics: Challenges and Blockchain Based Solutions by Omi Akter
4. Drone Forensics: The Impact and Challenges by ATKINSON, S

SUBJECT- GENERAL CHEMISTRY-II
SUBJECT CODE- BFS-205

LEARNING OBJECTIVE: The objective of the course is to develop of understanding of Inorganic chemistry, Organic chemistry, and Physical chemistry.

UNIT	CONTENT
1	**Inorganic Chemistry** **Ionic Solids:** Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule. Metallic bond-free electron, valence bond, and band theories.
2	**Organic Chemistry** **Chemical Bonding:** Covalent Bond; Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization, and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH3, H3O+, SF4, ClF3, ICl2- and H2O. MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, bond strength, and bond energy, percentage ionic character from dipole moment, and electronegativity difference.
3	**Introduction to Stereochemistry of Organic Compounds:** Concept of isomerism. Optical isomers, enantiomers, and diastereomers, chiral and achiral molecules with two stereogenic centers, absolute configuration, sequences rules, D & L and R & S systems of nomenclature. Geometrical isomerism - E & Z system of nomenclature, in alkenes oximes and cyclopropane derivative compounds.
4.	**Physical Chemistry** **Colloidal State**: Definition of colloids, classification of colloids. Sols: properties -kinetic, optical, and electrical; stability of colloids, protective colloids, Hardy- Schulze rule, gold number. Emulsions: types of emulsions, preparation. Gels: classification, preparation, and properties
5	**Thermodynamics** The first law of thermodynamics: statement, the definition of internal energy and enthalpy, Heat capacity. Heat capacities at constant volume and pressure and their relationship. Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for a reversible process. Problems

SUBJECT- ADVANCE PROFESSIONAL COMMUNICATION
SUBJECT CODE- BFS-206

LEARNING OBJECTIVE: To comprehend and communicate in simple English.

UNIT	CONTENT
1	**READING & LISTENING COMPREHENSION** Ways to improve the Speed & Efficiency of Reading, Importance of Skim Reading, Listening Skills & Features of Effective Listening, Benefits of Effective Listening
2	**WRITING SKILLS** C V & Resume writing, Job Application letter/Covering letter, Precis: Principles of Condensation Paragraph writing, Development of Paragraph.
3	**GROUP DISCUSSION AND INTERVIEW SKILLS** Group Discussion: Meaning &Significance, how to prepare & practice for GD, Common Pitfalls in a GD Interview: Definition, Skills & Techniques, Preparation, Negative Interview Factors &Interview Tips
4.	**PRESENTATION SKILLS** Presentation Strategies: Purpose, Audience, and Locale, Organizing Contents, Audio Visual Aids, Nuances of Delivery, Body Language, Voice Dynamics.
5	**PROJECT WORK** At the commencement of the semester, the student would be assigned a topic by the Teacher/Instructor. They will research it & submit a duly documented report of about 20- 25pages by the end of the semester.

Recommended Books

1. Raman, Meenakshi & Sharma, Sangeeta. Technical Communication: Principles and Practice, Oxford University Press-201
2. Konar, Nira. Communication Skills for Professionals, PHI Learning Pvt. Ltd – 2011
3. Board of Editors. Written and Spoken Communication in English, University Press2007
4. Lata , Pushp& Kumar, Sanjay .Communicate or Collapse A Handbook of Effective Public Speaking, Group Discussions, and Interviews, PHI Learning Pvt. Ltd -2011
5. Duck, Steve & McMahan, David T. The Basics of Communication: A Relational Perspective, Sage Publication-2012
6. Laws, Anne- Presentations, Orient Black Swan-2011
7. O'Connor, J. D. Better English Pronunciation, Universal Books Stall-1991
8. Anderson, Marilyn, Nayar, Pramod K. &Sen, Madhuchhanda. Critical Thinking, Academic Writing and Presentation Skills, Pearson-2009.

SUBJECT- BIOLOGY-II-LAB

SUBJECT CODE- BFS-211

LIST OF PRACTICALS:

1. Antigen-Antibody reaction (Blood Groupings)
2. Study of body Cavity fluids (Physical & Chemical Examination)
3. Isolation of Chromosomal DNA
4. Chromatography- Separation of Amino acids, sugars, lipids using Paper chromatography and thin layer Chromatography. Determine RF values
5. Isolation of DNA From
    a. Bacterial Cells
    b. Animal Cells
    c. Plant Cells

SUBJECT- CRIME SCENE INVESTIGATION-LAB
SUBJECT CODE- BFS-212

LIST OF PRACTICALS:

1. To perform mock homicide crime scene investigation.
2. To perform mock suicide crime scene investigation.
3. To perform mock hit-and-run crime scene investigation.
4. To perform mock hanging crime scene investigation.
5. Searching, Collection, packaging, preservation, handling, and forwarding of Physical evidences in different crimes.
6. To perform mock court testimony of expert evidences in different types of crimes.

SUBJECT- PHYSICS-II-LAB
SUBJECT CODE- BFS-213

LIST OF PRACTICALS:

1. Sound Intensity measurement
2. Ultrasonic interferometer
3. Determination of the wavelength of sodium light by Fresnel's bi-prism.
4. Wedge shaped film
5. Newton's rings
6. Laser parameter
7. Solar cell
8. Refractive index of liquid by using LASER
9. Transistor (CE) characteristics
10. LDR characteristics
11. LCR series resonance
12. Ex-or gate, NAND and NOR as universal building blocks

SUBJECT- GENERAL CHEMISTRY-II-LAB
SUBJECT CODE- BFS-214

LIST OF PRACTICALS:

1. Detection of the following functional group present in the given mono-functional organic compounds.
    a) Carboxylic acid.
    b) Phenol
    c) Alcohol
    d) Aldehyde.
    e) Ketone.
    f) Ester.
    g) Amine.
2. Preparation of the following inorganic compounds;
    a) Chrome Alum.
    b) Ferrous Ammonium Sulphate (Mohr's Salt).
    c) Copper Tetrammine Complex.
    d) Cupraammonium Sulphate.

Third Semester (13-18 Months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme		Total	CR
					Internal	External		
		L	T	P				
BFS-301	Forensic Medicine	3	1	-	40	60	100	4
BFS-302	Forensic Physics-I	3	1	-	40	60	100	4
BFS-303	Forensic Biology-I	3	1	-	40	60	100	4
BFS-304	Forensic Psychology	2	1	-	40	60	100	3
BFS-305	Forensic Chemistry-I	2	1	-	40	60	100	3
BFS-306	Environmental Study	2	1	-	40	60	100	3
BFS-311	Forensic Medicine-Lab	-	-	2	40	60	100	1
BFS-312	Forensic Physics-I-Lab	-	-	2	40	60	100	1
BFS-313	Forensic Biology-I-Lab	-	-	2	40	60	100	1
BFS-314	Forensic Chemistry-I-Lab	-	-	2	40	60	100	1
BFS-315	Forensic Psychology-Lab	-	-	2	40	60	100	1
Total		**15**	**06**	**08**	**440**	**660**	**1100**	**26**
Total Hours in Semester		**500**						

SUBJECT- FORENSIC MEDICINE
SUBJECT CODE- BFS-301

LEARNING OBJECTIVE: To understand and identification of informed Medico-legal responsibility and learn to perform forensic investigation with medico-legal aspects.

UNIT-I:

Forensic Medicine: Introduction, Definition, History, Development of Forensic Medicine in India. Fundamental aspects and scope of forensic medicine. Approaching the crime scene of death.

UNIT-II:

Thanatology: Definition of death, Types of death (somatic and molecular). Medico-legal aspects of death, causes of death such as asphyxia (strangulation & Suffocation, hanging, drowning etc), electrocution, thermal trauma, heat burns, starvation, natural death, sudden death etc. Changes after death (immediate, early and late changes), factors affecting these changes and determination of time since death.

UNIT-III

Wounds and Injuries: Definition of wounds and injuries and laws governing them. Types and classification of injuries& Wounds (Mechanical Injuries, Abrasion & Laceration, Bruise, Incised wound, Stab wound, Firearm injury, Head injury, Bite marks). Ante mortem and post mortem injuries. Aging of injuries. Artificial injuries. Difference between suicidal, homicidal and accidental injuries.

Sexual Offences: Medicolegal investigation of sexual offences, including examination of victims and suspects. Natural sexual offences, unnatural sexual offences and sexual preservation.

UNIT-IV

Medical Autopsy: Introduction and objectives, rules for medico legal autopsy, external and internal examination of body, collection of Ante-mortem and post-mortem samples, autopsy report.

UNIT-V

Role of Forensic Medicine in court: Meaning and Scope, Inquest, Nature and power of criminal courts in India, Procedure of calling a witness to account.

Procedure in court: Oath, Examination in chief, Cross Examination & Re-examination, Medical Evidence, Medico-legal reports and Dying declaration, Doctor as medical/Expert witness.

Learning Outcome: After studying this paper the students will know –

1. The duties of the first responding officer who receives a call on homicide or suicide case and the steps involved in processing the death scene.
2. The importance of Death and death scene to ascertaining whether the crime was staged to appear as suicide, accident, homicide.
3. The importance of External and internal autopsy findings in determining medico legal aspects of death.
4. The importance of forensic pathology in giving medico-legal answers of various modes of deaths.

Recommended Books:

1. Forensic medicine and toxicology: principles and practice, Professor Krishna Vij Publisher: Elsevier, 5 editions ,2014
2. Practical Aspects of Forensic Medicine, Dr T.D. Dogra Dr. AD Aggrawal jaypee publishers,2014.
3. Parikh's textbook of medical jurisprudence, forensic medicine and toxicology Professor C. K. Parikh, CBS; 6 editions, 2007
4. The essentials of forensic medicine and toxicology Professor K.S. Narayan Reddy Jaypee Brothers Medical Publishers; 34th edition 2017
5. Principles of forensic medicine Professor Apurva Nandy New Central Book Agency; 3rd Revised edition 2010
6. A Textbook of Medical Jurisprudence and Toxicology Dr. Jaising P. Modi (Edited by Justice K Kannan, Lexis Nexis; 24th edition 2012

SUBJECT- FORENSIC PHYSICS-I
SUBJECT CODE- BFS-302

LEARNING OBJECTIVE: Understand and to appreciate the breadth and diversity of Physical science in respect of forensic science.

Unit-I: Paint –
Types of paint and their composition, cases involve, collection and preservation of paint evidences. microscopic analysis of paint pigments, micro-chemical analysis- solubility test, chemical and instrumental analysis of paint evidences.

Unit-II: Glass -Types of glass and their composition. Matching and comparison. Forensic examinations of glass fractures- rib marks, hackle marks, cone fracture, wavy, backward fragmentation, concentric and radial fractures. Color, fluorescence, physical measurements, refractive index, density gradient, becke-line, specific gravity examination and elemental analysis of glass evidence.

Unit-III: Soil-Types and composition of soil, sample preparation, removal of contaminants, colour, molecular particle size distribution, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignitionloss test, elemental analysis, interpretation of soil evidence.

Unit- IV: Cement and Concrete-
Cement- bromoform test, fineness test, ignition-loss test. Identification of adulterated cement. Mortar and concrete analysis.

UNIT –V: Fiber-
Types of fibers, forensic aspects of fiber examination- fluorescence, optical properties, refractive index, birefringence, dye analysis. Physical fit and chemical testing. TLC, IR-micro spectroscopy, Py-MS. Difference between natural and man-made fibers. Fiber comparison of dye Component

Learning Outcomes: After studying this paper the students will know –

1. To gain knowledge of the different classes of materials examined as forensic evidence, including fibers, paint, soil, cement and glass and their significance at crime scene.
2. To understands the physics of common types of forensic evidences.
3. To gain an understanding of the analytical tools used to interpret forensic data.

Suggested Readings:

1. Caddy, B; Forensic Examination of Glass and Paint Analysis and Interpretation, CRC Press, New York, 2001.
2. Shaw, D; Physics in the Prevention and Detection of Crime, Contem Phys. Vol.17, 1976.
3. Saferstein, R; Forensic Science Handbook. Vol. I, II, (Edition), Prentice Hall, New Jersey, 1988.
4. Working Procedure Manual; Physics BPR&D Publication, 2000
5. Sharma, B.R; Forensic Science in Criminal Investigation and Trials (3rd Edition.), Universal Law Publishing Co., New Delhi, 2001.
6. Working Procedure Manual- Physics, BPR&D Publication. 2000

SUBJECT- FORENSIC BIOLOGY-I
SUBJECT CODE- BFS-303

LEARNING OBJECTIVE: The main objective of the course is to develop the understanding and importance of various biological evidences encountered at the crime scene and learn to perform crime scene investigation with respect to them.

UNIT -I

Forensic Biology & Serology- Introduction, Evidences of Biological Importance, Type & Nature of Biological Evidences, scope of crime scene presence and characterization (blood, semen, vaginal fluids, saliva, urine, sweat, tissue, tooth, bones, uterine fluid, vomit, vitreous humor, CSF, colostrum's, Botanical materials, diatoms, wild life samples and other biological evidences)

UNIT -II

Biological Evidence collection & Documentation: Crime Scene Investigation, Protection of biological evidences, Documentation, Chain of custody, Recognition of biological evidences encountered in various cases, Search & collection of biological evidences, Packaging & Transportation of biological evidences.

UNIT-III

Body Fluids: Definition, Types of Body Fluids, (Blood, Semen, Saliva, Sweat, Urine) their properties, Significance, collection, preservation, preliminary and confirmatory test.

UNIT IV

Bloodstain Pattern Analysis: -Bloodstain characteristics. Impact bloodstain patterns. Cast- off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Origin and age of Blood Stains, Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

UNIT V

Hair: Hair trichology, Collection, determination of origin, biochemistry and forensic examination (Structure and identification, origin, nature, source, sex determination and DNA profiling),

Fiber: - Types of fiber, natural (plant animal and mineral), synthetic and blended fibers. Forensic examination of Fiber evidences (Physical and chemical examination)

SUBJECT- FORENSIC PSYCHOLOGY
SUBJECT CODE- BFS-304

LEARNING OBJECTIVE:

Unit- I

Basics of Forensic Psychology- History of Forensic Psychology, Defining Forensic Psychology, Importance of Forensic Psychology, Ethical Standards of Forensic Psychology, Services provided by Forensic Psychologists

Unit-II

Theories of crime -Biological factors, social learning theories, psychological factors. Juvenile Delinquency: Definition, Concept Juvenile delinquency Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Unit-III

Psychological Disorders (Amnesia, Confabulation, Dementia, Delirium, Fuge state, Hallucination, Illusion, Neurosis, Psychosis, Psychopathy), Classification of psychiatric disorders (Mental Retardation, Organic psychosis, Functional Psychosis, Neurotic disorder, Personality Disorders, Sexual deviations), Common psychiatric disorders (Schizophrenia, Bipolar disorder, Panic disorder, Anxiety disorder, Phobia, Personality disorder).

Unit-IV

Investigative Psychology
1. Criminal profiling
2. Polygraph
3. Norco Analysis
4. BEOS

Unit-V

Forensic &Legal aspect of Insanity: - Mental Health Act, 1987, Feigned Insanity, Procedure of Admission of Mentally Ill in Psychiatric Hospital, Discharge of Mentally Ill Person, Criminal Law and People with Mental Disorders, Civil Law and People with Mental Disorders, Procedures on Production of Mentally Ill Person in front of Magistrate, Insanity as Defense: Case Study.

SUBJECT- GENERAL CHEMISTRY-II
SUBJECT CODE- BFS-305

Unit-1

Basic Chemical Calculations: Introduction, Concept of atom, Mole and mole fraction, Methods of expressing the composition of mixtures (mass percent, volume percent, mole percent), equivalent weight, normality, molarity, molality.

Unit-2

Gravimetric analysis: Precipitation, digestion, filtration, washing, incineration, with reference to estimation of barium sulfate, volumetric analysis- standard solution, types of titrations- Acid-base or neutralization titration, complexometric titrations, redox titration, double titration method

Unit-3

Separation techniques: Chromatography, Classification of Chromatographic methods, Elution in column chromatography, chromatograms, distribution constant, retention time, stationary phase, mobile phase, principle of adsorption and partition chromatography, column chromatography; principle, adsorbents used, preparation of column, adsorption, elution.

Unit-4

Spectroscopic Techniques: Basic principles of spectroscopic methods. The use of UV, Visible, IR,1HNMR, for the determination of the structure of simple organic compounds.

Unit-5

Nuclear Chemistry: Natural and artificial radioactivity, binding energy, rate equation for nuclear decay, nuclear fission and nuclear fusion and their applications, group displacement law, isotopes and isobars, applications of radioactivity: radiocarbon dating and radiotracer techniques.

Books Recommended:

1. Fundamentals of Analytical Chemistry, Douglas A. Skoog, Donald M. West, F. James Holler, 7thedition, Harcourt college publications.
2. Principles and practice of analytical chemistry, F. W. Fifield, D. Kealey, 5th edition, Blackwell publication.
3. Analytical Chemistry, Gary D. Christian, 6th edition, Wiley and son's publication.
4. Handbook of instrumental techniques for analytical chemistry, Frank A Settle, Prentice Hall Publication.
5. Analytical chemistry- Instrumental Techniques (Vol. II) – Mahindu Singh, Dominant publishers.
6. Basic concepts of analytical chemistry, S. M. Kopper, New Age International Publishers. Analyticalchemistry, D. Kealey, P.J.Haines, Viva books Pvt. Ltd
7. Introduction to spectroscopy: Pavia, Lampman&Kriz, 3rd Ed, Books/cole.

SUBJECT- ENVIRONMENTAL STUDY
SUBJECT CODE- BFS-306

LEARNING OBJECTIVE: The student will be made aware of our environment in general, natural resources, ecosystems, environmental pollution and social issues related to environment.

UNIT-I: INTRODUCTION TO ENVIRONMENT AND ECOSYSTEMS:
Environment, its components and segments, Multidisciplinary nature of Environmental studies, Concept of Sustainability and sustainable development, Environmental movements, Ecosystem, Structure & Function, Energy flow in the Ecosystem, Ecological Pyramids and Ecological Succession.

UNIT-2: NATURAL RESOURCES:
Energy Resources: Renewable and nonrenewable, Soil erosion and desertification, Deforestation, Water: Use and over exploitation, Impacts of large Dams, Case studies.

UNIT-3: BIODIVERSITY AND CONSERVATION:
Levels of biological diversity, Hot spots of biodiversity, India as a Mega Diversity Nation, Endangeredand endemic species of India, Threats to Biodiversity, Conservation of Biodiversity, Ecosystem andbiodiversity services.

UNIT-4: ENVIRONMENTAL POLLUTION, POLICIES AND PRACTICES:
Environmental pollution, Solid waste management, Ill effects of fireworks, Climate change, Ozonelayer depletion, acid rain and impacts on human communities an Environmental Laws: EnvironmentProtection Act, Wildlife protection Act, Forest conservation Act, Convention on Biological Diversity(CBD), Tribal rights, Human wildlife conflicts.

UNIT-5 : HUMAN POPULATION AND THE ENVIRONMENT:
Human population growth: Impacts on environment, human health and welfare, Resettlement andrehabilitation of project affected persons, Environmental ethics, Environmental communication andpublic awareness, case studies.

RECOMMENDED BOOKS:

1. Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahemdabad-380, India.
3. Brunner R.C. 1989. Hazardous waste incineration, McGraw Hill.
4. Clark R.S. Marine Pollution, Clanderon Press Oxford (TB).
5. Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jaicob Publication House, Mumbai.
6. De . A.K. Environmental chemistry Willey EasternLimited.
7. Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p.
8. Hawkins R .E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.

SUBJECT- FORENSIC MEDICINE-LAB
SUBJECT CODE- BFS-311

1. To design a questionnaire for the first responder to the death scene.
2. To design a protocol to deal with the media at the crime scene.
3. To design a checklist for the forensic scientists at the death scene.
4. To design a canvass form giving description of an unidentified victim.
5. To analyze and preserve bite marks.
6. To study different stages of changes after death
7. To identify shooter on the basis of firearm injuries
8. To identify different causes of death
9. To study post-mortem findings of a cadaver

SUGGESTED READINGS:

1. Forensic medicine and toxicology: principles and practice, ProfessorKrishnaVij Publisher: Elsevier , 5 edition ,2014
2. Practical Aspects of Forensic Medicine, Dr T.D. Dogra Dr. AD Aggrawaljaypeepublishers,2014.
3. Parikh's textbook of medical jurisprudence, forensic medicine and toxicology Professor C. K. Parikh ,CBS; 6 edition, 2007
4. The essentials of forensic medicine and toxicology Professor K.S. Narayan Reddy, Jaypee Brothers Medical Publishers; 34th edition 2017
5. Principles of forensic medicine Professor Apurva Nandy New Central Book Agency; 3rd Revised edition edition 2010
6. A Textbook of Medical Jurisprudence and Toxicology Dr. Jaising P. Modi (Edited by Justice K Kannan ,Lexis Nexis; 24th edition 2012

SUBJECT- FORENSIC PHYSICS-I-LAB
SUBJECT CODE- BFS-312

1. Preliminary examination of, soil, paint, Glass.
2. Examination of physical properties of, soil, cement and paint evidences.
3. Analysis of paint and pigment by microscopic, chemical analysis
4. To compare glass and soil samples by refractive index method

SUGGESTED READINGS:

1. Caddy, B; Forensic Examination of Glass and Paint Analysis and Interpretation, CRC Press, New York, 2001.
2. Shaw, D; Physics in the Prevention and Detection of Crime, Contem Phys.Vol.17, 1976.
3. Saferstein, R; Forensic Science Handbook. Vol. I, II, (Edition), Prentice Hall, New Jersey, 1988.

SUBJECT- FORENSIC BIOLOGY-I-LAB
SUBJECT CODE- BFS-313

1. Microscopic Comparison of Hair
   a) Animal Hair
   b) Human Hair
2. Microscopic Comparison of Fibers
3. Presumptive Tests for Blood
   a) Phenolphthalein Assay
   b) Benzedrine
   c) Leucomalachite Green (LMG)
   d) Luminal Test
4. Confirmatory Tests for Blood
   a) Crystallization Assays
5. ABO Grouping & Rhesus Factor
6. Techniques of species identification from various biological fluids
   b) Electrophoresis
   c) Precipitin tests
   d) Acid Phosphatase test for semen
   e) Prostate Specific Antigen (PSA)
7. Microscopic examination of spermatozoa
8. Detection of Amylase activity
   a) Starch-Iodine Assay

SUGGESTED READING:

1. Forensic Biology by Richard Li CRC Press; 2nd edition (27 April 2015)
2. Practical Skills in Forensic Science – Alan Langford, John Dean et al Addison Wesley Longman Ltd (February 1, 2005)
3. Scientific & Legal Applications of Bloodstain Pattern Interpretation – Stuart H. James CRC Press; Ist edition (June 29, 1998)

SUBJECT- GENERAL CHEMISTRY-III-LAB
SUBJECT CODE- BFS-314

1. Preparation of standard solution related to normality and molarity.
2. Determination of R*f* values and identification of organic compounds
   a) Separation of green leaf pigments (spinach leaves may be used).
   b) Preparation of separation of 2, 4-dinitrophenylhydrazones of acetone, 2-butanone, hexan-2, and 3-one using toluene and light petroleum (40:60).
3. Gravimetric Analysis: Analysis of Cu as CuSCN and Ni as Ni (dimethylglyoxime).

Fourth Semester (19-24 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme		Total	CR
					Internal	External		
		L	T	P				
BFS-401	Forensic Anthropology	3	1	-	40	60	100	4
BFS-402	Forensic Physics-II	3	1	-	40	60	100	4
BFS-403	Forensic Biology-II	3	1	-	40	60	100	4
BFS-404	Forensic Chemistry	3	1	-	40	60	100	4
BFS-405	Digital & Cyber Forensics-I	2	1	-	40	60	100	3
BFS-406	Quality Management in Laboratory	2	1	-	40	60	100	3
BFS-411	Forensic Anthropology-Lab	-	-	2	40	60	100	1
BFS-412	Forensic Physics-II-Lab	-	-	2	40	60	100	1
BFS-413	Forensic Biology-II-Lab	-	-	2	40	60	100	1
BFS-414	Forensic Chemistry-Lab	-	-	2	40	60	100	1
BFS-415	Digital & Cyber Forensics-I-Lab				40	60	100	
Total		**16**	**06**	**08**	**440**	**660**	**1100**	**26**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

SUBJECT- FORENSIC ANTHROPOLOGY
SUBJECT CODE- BFS-401

Learning Objectives: Forensic Anthropology is best described as the analysis of human remains for the medico legal purposes of establishing identity.

Unit-I

Forensic Anthropology - Scope of forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, sex, race from skeletal material.

Unit-II

Forensic Odontology- Development and role of forensic odontology in mass disaster, Types of teeth and their comparative anatomy, Estimation of age from teeth. Bite marks- Introduction, Forensic significance of bite marks. Collection, preservation and photography of bite marks evidence. Legal aspects of bite marks.

Unit-III

Personal Identification – Somatoscopy. Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.

Unit-IV

Personal Identification –Somatometry

Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, bodyweight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Unit-V

Facial Reconstruction - Portrait Parle/ Bertillon system. Photo fit/ identi kit.Facial superimposition techniques. Cranio facial super imposition techniques – photographic super imposition, video superimposition, Roentgenographic superimposition. Use of somatoscopic and craniometric methods in reconstruction. Importance of tissue depth in facial reconstruction.Genetic and congenital anomalies – causes, types, identification and their forensic significance.

LEARNING OUTCOME:

After studying this paper, the students will know –

1. Importance of forensic anthropology in recovery of skeletal elements (surface, buried).
2. Assessments of species, ancestry, sex, age, physical characteristics and time since death
3. Different techniques of facial reconstruction and their forensicimportance.
4. Significance of somatoscopy and somatometry.
5. The importance of forensic odontology in determining age of deceased and bite mark analysis.

SUGGESTED READINGS:

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
3. S.Rhine, Bone Voyage: A Journey in Forensic Anthropology, University of Mexico Press, Mexico (1998).
4. Introduction to Forensic Anthropology, Steven N. Byers, Pearson/ Allyn& Bacon; 3 rd edition edition (December 1, 2008)
5. Forensic Anthropology Laboratory Manual, Steven N. Byers, Pearson Education, USA, 2011
6. Forensic Anthropology: Current Methods and Practice, Angi M. Academic Press; 1 st edition (5 March 2014)
7. Christensen,Nicholas V. Passalacqua and Eric J. Bartelink, Academic Press, USA, 2014.

SUBJECT- FORENSIC PHYSICS-II
SUBJECT CODE- BFS-402

Learning Objectives: The student will develop an understanding and importance of Physics in Forensic Science.

Unit-I: Tool Marks-

Types of tool marks- compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks and cut marks on clothes and walls etc.

Unit-II Impressions:

Foot/Footwear/Tyre Impression- Collection, Tracing, Lifting, Casting of impressions, Enhancement of Footwear Impression, Analysis & comparison of foot impressions, Moulds, Gait Pattern and Identification characteristics.

Unit-III: Forensic Photography-

Basic principles of Photography, Techniques of black &white and colour photography, cameras, lenses, shutters, depth of field, film; exposing, development and printing techniques; Different kinds of developers and fixers; UV, IR, fluorescence illumination guided photography; Modern development in photography- digital photography, working and basic principles of digital photography; Surveillance photography, Videography, Crime Scene & laboratory photography.

Unit- IV: Restoration of erased / obliterated marks-

Method of making-cast, punch, engrave; methods of obliteration, method of restoration- etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks - restoration of marks on wood, leather, polymer etc.

UNIT -V

Principles, Working and Applications in Forensic Science

1. Electrostatic Dust Lifting Kit (DLK)
2. Video Spectral Comparator(VSC)
3. Electrostatic Developing Apparatus(ESDA)

Learning Outcomes: After studying this paper the students will know –

1. The methods of casting and impression tool marks in crime scene evidence.
2. The method of searching, collecting, preserving and analyzing photography evidence.
3. The analysis of erased numbers in identification of stolen vehicles etc.
4. The significance of portable forensic kit at crime scene.

Suggested Readings:

1. Houck, M.M& Siegel, J.A; Fundamentals of Forensic Science, Academic Press, London, 2 n d Edit io n 2010
2. Sharma, B.R; Forensic Science in Criminal Investigation & Trials, Universal Publishing Co., New Delhi, Fifth edition 2016.
3. Nanda B.B and Tewari, R.K; Forensic Science in India- A vision for the Twenty First Century, Select Publisher, New Delhi, Select publishers (2014)
4. Robertson and Vignaux; Interpreting Evidence, John Wiley, New York, 1995.
5. H.L. Blitzer and J.Jacobia; Forensic Digital Imaging and Photography, Ist Edition Academic Press, London, 2002
6. Forensic Medical Investigation of Motor Vehicle Incidence By Michel P. Burke,CRC Press ,2016

SUBJECT- FORENSIC BIOLOGY-II
SUBJECT CODE- BFS-403

Learning Objectives: To demonstrate theoretical and practical training in different branches of Forensic Biology and their role in crime scene investigation.

Unit-I: Forensic Entomology –

Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations, Determining the age of blow fly life cycle stages Determination of PMI

Unit-II

1. **Forensic Botany:** botanical evidence encounter in forensic investigation. Forensic analysis of pollen grains, algae. Investigation of ornamental, imported, stolen, endangered plants.
2. **Dendrography** (sandal, teak, red sandal wood).
3. **Limnology**: Introduction of Diatoms, collection of diatoms from drowned body, collection of control sample, extraction, digestion, examination, comparison and identification of diatoms.
4. **Dendrochronology**, Application of plant ecology

Unit-III: Wildlife Forensics-

Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals.

Unit-IV: Microbial Forensic –

Types and identification of microbial organisms of forensic significance. Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance. Bioterrorism.

Unit-V: Forensic ornithology-

Birds flight and means of locomotion, Strikes and collisions, Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts, Applications of Forensic Ornithology, Feather structure and topography.

Learning Outcomes: After studying this paper the students will know –

1. The significance of various Botanical evidences in different crimes scene.
2. The forensic importance of Microbial Forensic.
3. The importance of forensic ornithology
4. How wildlife forensics aid in conserving natural resources.
5. How forensic entomology assists in death investigations.

Suggested Reading:

1. Forensic Biology by Richard Li CRC Press; 2 editions (27 April 2015)
2. A textbook of Medical jurisprudence and toxicology- Modi Lexis Nexis; First edition (22 April 2016)
3. Wildlife forensic investigation-Principles and practice: Cooper and Cooper, CRC press, 2013
4. Forensic Palynology in the United States of America (1990)- Bryant, V.M. Jr, Milden hall, D.C. and Jones, J.G.14.PP.193-208
5. Microbial forensics -Roger Breeze, Bruce Budowle, Steven E. Schutzer, Elsevier

SUBJECT- FORENSIC CHEMISTRY
SUBJECT CODE- BFS-404

Unit-I

Petroleum and Petroleum Products- Commercial uses of different petroleum fractions.Analysis of traces of petroleum products in forensic exhibits.Adulteration of petroleum products.

Unit-II

Dyes: Introduction and classification of dyes on the basis of structure and the mode of application to the fibre. Colour and chemical constitution of dyes; Chemistry of the dyes with respect to general structural features, mode of application to fibre, colour shades, synthesis of typical 4-5 dyes., uses.

Unit-III

Arson and Fire: Chemistry of fire, difference between Arson and Fire, cause of fire and origin of fire Material and Chemicals use in initiating fire and arson Examination of scene of fire/arson, recognition and collection of evidence, packing labeling and forwarding of exhibits, and forensic detection of arson cases.

Unit-IV

Study of Analysis of Beverages- Introduction, Definition of alcohol and illicit liquor, Alcoholic and non-alcoholic beverages and their composition, Proof spirit, absorption, detoxication and excretion of alcohol, problems in alcohol cases and difficulties in diagnosis, Alcohol and prohibition, Consequences of drunken driving, Analytical techniques used for the analysis of alcohol.

Unit-V

Food laws and standards: Indian food safety laws and standards; BIS Laboratory Services and Certification by BIS.

Food adulteration: Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material.

Learning Outcomes: After studying this paper the students will know –

1. The methods of analyzing trace amounts of petroleum products in crime scene evidence.
2. Significance and role of Dyes in forensic science.
3. The method of searching, collecting, preserving and analyzing arson evidence. The classification of Alcoholic Beverages, and forensic analysis and their relation with law.
4. The significance of food adulteration analysis regarding their geographic origin.

Suggested Reading-

1. Saferstein, R; Forensic Science Handbook. Vol. I, II, (Ed.), Prentice Hall, New Jersey, 1988.
2. Working Procedure Manual; Chemistry BPR&D Publication, 2000.
3. Sharma, B.R; Forensic Science in Criminal Investigation and Trials (3rd Ed.), Universal Law Publishing Co., New Delhi, 2001.
4. J.D. DeHaan, Kirk's Fire Investigation, 3rd Edition, Prentice Hall, New Jersey (1991).
5. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

SUBJECT- DIGITAL & CYBER FORENSICS-I
SUBJECT CODE- BFS-405

LEARNING OBJECTIVE: To provide insight of cyber forensic investigation and technical issues related to it. To learn about cyber security tools, possible security issues, cyber-attacks and concealment techniques.

Unit- I

Cyber Forensics Investigation—Introduction to Cyber Forensic Investigation, Investigation Tools, Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking.

Unit-II

Technical issues – Security Technologies: Certification and key Distribution, Digital Signature Protocols for Transactions, SSL Secure Socket Layer, SET Secure Electronic Transaction

Unit-III

Security Issues –Types of Attacks(Active and Passive) Stealing Passwords, Social Engineering, Bugs and Backdoors, Illegal accessing, Authentication Failures, Protocol Failures, Information Leakage, Viruses and Worms, Denial-of Service, etc. – Firewalls, Packet Filters, Application-Level Filtering, Circuit- Level Gateways, Dynamic Packet Filters, Distributed Firewalls; Digging for Worms, Packet Filtering, Implementing policies (Default allow, Default Deny) on proxy, etc.

Unit-IV

Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Threats, crimes, etc.; why require a security? Picking a Security Policy, Strategies for a Secure Network, The Ethics of Computer Security, Security Threats, and levels, Security Plan (RFC2196
)

Unit-V

Cryptography Techniques: Introduction to Cryptography, Types of Cryptographic Algorithms(Secret Key Cryptography, Public Key Cryptography, Hash Function),Electronic Signature, Stegnography, Reversing the Stegnographic Process, Manipulating File System, Data Hiding on NTFS with Alternate data Streams.

Learning Outcomes: After studying this paper the students will know –

1. The significance of cyber forensic investigation process and when to conduct it.
2. The technical issues related to cyber forensic investigation.
3. The importance of cyber security and potential network threats.
4. Designing and implementation of security policies using software and hardware tools.
5. Importance of cryptography for data hiding.

Suggested Readings:

1. File System Forensic Analysis by Brian Carrier, Publisher: Addison-Wesley Professional
2. Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis) by Barkha & RamMohan, Publisher: Asian Law House, Hyderabad
3. Firewalls and Internet Security: Repelling the Wily Hacker , Second Edition ,Addison
4. E-Commerce: The Cutting Edge of Business by Kamlesh K. Bajaj & Debjani Nag,TataMcGraw Hill
5. Cyber law Simplified Vivek Sood, TMG

Tata Mc Graw Hill Reference Cyber Law and E-Commerce, David Baumer, JC Poindexter, TMG

SUBJECT- FORENSIC ANTHROPOLOGY-LAB
SUBJECT CODE- BFS-411

1. To determine of age and race from skull and teeth.
2. To determine of sex from skull.
3. To determine sex from pelvis.
4. To study identification and description of bones and theirmeasurements.
5. To investigate the differences between animal and human bones.
6. To estimate stature from long bone length.
7. To perform somatometric measurements on living subjects.
8. To carry out craniometric measurements of humanskull.
9. To estimate stature from long bone length.

Suggested Readings:

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in,Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.),CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
3. S.Rhine, Bone Voyage: A Journey in ForensicAnthropology,University of Mexico Press, Mexico (1998).
4. Introduction to Forensic Anthropology, Steven N. Byers,Pearson/ Allyn& Bacon; 3rd edition edition (December 1,2008)
5. Forensic Anthropology Laboratory Manual,StevenN.Byers,Pearson Education, USA, 2011.

SUBJECT- FORENSIC PHYSICS-II-LAB
SUBJECT CODE- BFS-412

1. Restoration techniques of tool mark impressions.
2. To identify and compare tool marks. To take photographs using different filters.
3. To take photographs of crime scene exhibits at different angles.
4. To record videography of a crime scene
5. To carry out photography of indoor and outdoor crime scenes
6. Crime scene photographic processing and development indifferent light sources and using different filters.
7. Casting & lifting of footprints and their photography.
8. Casting & lifting of shoe prints and their photography.
9. Casting & lifting of tyre marks and their photography.

Suggested Readings:

1. Houck, M.M& Siegel, J.A; Fundamentals of ForensicScience, Academic Press, London, 2 nd Edition 2010
2. Sharma, B.R; Forensic Science in Criminal Investigation & Trials, Universal Publishing Co., New Delhi, Fifth edition2016.
3. Nanda B.B and Tewari, R.K; Forensic Science in India- Avision for the Twenty First Century, Select Publisher, NewDelhi, Select publishers (2014)
4. Robertson and Vignaux; Interpreting Evidence, John Wiley, New York,1995.
5. H.L. Blitzer and J.Jacobia; Forensic Digital Imaging and Photography,IstEdition Academic Press, London, 2002
6. Forensic Medical Investigation of Motor Vehicle Incidence ByMichel P. Burke,CRC Press ,2016.

SUBJECT- FORENSIC BIOLOGY-II-LAB
SUBJECT CODE- BFS-413

1. Identification and culture of bacteria of forensic significance.
2. Identification of birds from feathers.
3. Identification of orders of insects and other arthropods of forensic significance
4. To carry out microscopic examination of pollen grains.
5. To carry out microscopic examination of diatoms.
6. To cite a crime case in which diatoms have served as forensic evidence.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics.
9. Identification of wild life materials, teeth, flowers and such as skin, fur, bones, nails, horn plant.

Suggested Readings:

1. Houck, M.M& Siegel, J.A; Fundamentals of Forensic Science, Academic Press, London, 2nd Edition 2010
2. Sharma, B.R; Forensic Science in Criminal Investigation &Trials, Universal Publishing Co., New Delhi, Fifth edition2016.
3. Nanda B.B and Tewari, R.K; Forensic Science in India- Avision for the Twenty First Century, Select Publisher, NewDelhi, Select publishers (2014)
4. Robertson and Vignaux; Interpreting Evidence, John Wiley, New York, 1995.

SUBJECT- FORENSIC CHEMISTRY-LAB
SUBJECT CODE- BFS-414

1. Analysis of residue material in fire and arson cases by TLC/, UV- spectrophotometric
2. Examination of chemicals used in Trap cases by UV-visible spectroscopy.
3. To carry out analysis of petroleum products.
4. To analyze arson accelerators.
5. To prepare a case report on a case involving arson
6. Identification of food adulteration. -vegetable oil, Cold drinks etc.
7. Detection and determination of various adulterants in alcohol, by color tests.
8. To identify ethyl / methyl alcohol.
9. Determination of acetic acid content of vinegar.
10. Thin layer chromatography of Food adulterants

SUBJECT- DIGITAL & CYBER FORENSICS-I-LAB
SUBJECT CODE- BFS-415

List of practical:

1. Identification, Seizure, Search of Digital media
2. Evidence Collection
3. Demonstration of various Forensic tools like Partition magic, Encase etc.
4. Data Recovery, Deleted File Recovery viewing small Disk.
5. Demonstration of Concealment Techniques (Cryptography PGP)
6. Demonstration of Concealment Techniques (Stegnography)
7. Demonstration of other Concealment Techniques
8. Case study of Biometric Techniques.

Fifth Semester (25-30 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-501	Forensic Toxicology	3	1	-	40	60	100	4
BFS-502	Forensic Ballistics	3	1	-	40	60	100	4
BFS-503	Digital & Cyber Forensics-II	3	1	-	40	60	100	4
BFS-504	Research Methodology	3	1	-	40	60	100	4
BFS-511	Forensic Toxicology-Lab	-	-	2	40	60	100	1
BFS-512	Forensic Ballistics-Lab	-	-	2	40	60	100	1
BFS-513	Digital & Cyber Forensics-II-Lab	-	-	2	40	60	100	1
BFS-514	Seminar	-	4	0	40	60	100	4
Total		**12**	**08**	**06**	**320**	**480**	**800**	**23**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

SUBJECT- FORENSIC TOXICOLOGY
SUBJECT CODE- BFS-501

LEARNING OBJECTIVE:to provide understanding about the different types of poisons toxicological evidences, their forensic significances and importance of proper examination.

UNIT-I:

Toxicology: Introduction, concept and history, forensic toxicological examination and its significance.

Drugs of abuse: introduction, classification of drugs of abuse, drug of abuse in sports, narcoticsdrugs and psychotropic substances, designers drug and their forensic examination, Drugs andCosmetic Act, Excise Act, NDPS Act.

UNIT-II

Poison-Administration, action of poison, classification of poisoning, types of poisons, collection, isolation, sign and symptoms of poisoning, mode of action and its effect on vital functions,classicalidentification techniques, modern technique Chromatography, mass spectroscopy,spectrophotometry, x-ray diffraction.

UNIT-III

Organic Poisons, Inorganic Poisons, Synthetic poisons, Individual Poison (Barbiturate, Arsenic, Organophosphorus Compound)- classification, nature, administration, symptoms, detection, Post mortem finding, estimation, toxicological material.

UNIT-IV

Vegetable poison- Dhatura, oleander, madar (Aak, Akdo) Nature, use, system, fatal dose, fatal period, Post mortem finding, isolation, detection, estimation.

Pesticides, Natural organic insecticidcs: pyrethroids and pyrethrins, Corrosive poisons, Poisonous gases-classification, nature,administration, symptoms, detection, Post mortem finding, estimation, toxicological material.

UNIT-V

Features of toxicological analysis, Tests for the detection of poisons, Extraction of poisons, Extraction of poisons from biological matrices. medico-legal aspects of poisoning.

SUBJECT- FORENSIC BALLISTICS
SUBJECT CODE- BFS-502

LEARNING OBJECTIVE-to develop the understanding about the fire arms and ammunition as well as their forensic examination.

UNIT – I

History and background of firearms: - Their classification and characteristics, various component of small arms, smooth bore and class characteristics, purpose of rifling, types of rifling trigger and firing mechanism, improvised / country-made / imitative firearm and their constructional features.

UNIT-II

Ammunition: Definition, History and Classification, constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, various types of bullet and compositional aspects.

UNIT-III

Internal and External Ballistics-Definition, ignition of propellant, shape and size of propellant, manner of burning, various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting. Equation of motion of projectile, principal problems of exterior ballistics, vacuum trajectory, effect of air resistance on trajectory, base drag, yaw, shape of projectile and stability.

UNIT-IV

Terminal Ballistics: Effect of projectile on hitting target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullet, effect of intermediate targets

Ricochet and wound ballistics, evaluation of injuries caused due to shot-gun, rifle, handguns and country made firearms, post-mortem and anti-mortem firearm injuries.

UNIT-V

Principles and practice of identification of firearms, ammunition and their components, different types of marks produced during firing process on cartridge- firing pin marks, breech face marks, chamber marks, extractor and ejector marks, number /direction of land and grooves, striation marks on land and grooves. Determination of range of fire- burning, scorching, blackening, tattooing and metal fouling, shot dispersion and GSR distribution.

SUBJECT- DIGITAL & CYBER FORENSICS-II
SUBJECT CODE- BFS-503

LEARNING OBJECTIVE: Able to understand the importance of cyber forensics in corporate and electronic world with emphasis on forensic auditing and IT Act.

UNIT –I

Data and Evidence Recovery – Computer and cyber forensic basics, Mobile Forensics, Blue- Tooth, Computer Ethics. Data and Evidence Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, File Transfer Protocol (FTP), Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access, Recover Internet Usage Data, Recover Swap Files/Temporary Files/Cache Files.

UNIT -II

Forensics Auditing- step-by-step process for securing, investigating, and auditing or assessing various IT environments. Introduction to Forensic Accounting and Fraud Examination; Principles of Forensic Accounting and Fraud Examination; Roles of the Forensic Accountant; Nature of Fraud, Fraud Prevention and Detection, Recognizing the Symptoms of Fraud.

UNIT-III

Investigating Theft Acts; Investigating Concealment, Conversion Investigation Methods; Private Sources of Information, Inquiry Methods and Fraud Reports, Honesty Testing, The Fraud Reports, Management of Fraud; Financial Statement Fraud; Revenue-and Inventory- Related Financial Statement Frauds; Liability, Asset, and Inadequate Disclosure Frauds; Fraud Against Organizations, Consumer Fraud; Identification of Theft, Investment Scams, Money Laundering; Bankruptcy, Divorce, and Tax Fraud, Fraud in E-Commerce; Resolution of Fraud, Legal Follow-Up, Being an Expert Witness; Financial Statement Fraud Standards; Avoiding common mistakes in fraud risk assessment and examination; Credit Card Frauds, Online Transaction Frauds, Cheese Frauds etc.

UNIT IV

Electronic World – Introduction, EDI, E-Business, E-Banking, Online payment modes, Mobile Banking E-commerce: Concerns for Ecommerce Growth, Concepts Electronic Communication, PCs and Networking, E-mail, Internet and intranets. EDI, EDI to E- commerce, UN/EDIFACT Concerns for E-commerce Growth, Internet bandwidth, Technical, Security and Legal issues, Business Electronic Commerce providers

UNIT V

Information technology law:

IT Act 2000: Scope, Objectives, E- Governance, Creation, Recognition and Verification of Digital Signature Digital Signature and Penalties under IT Act 2000, Certifying Authority and Controller. Emerging trends in Information Technology law.

Learning Outcomes: After studying this paper the students will know –

1. The significance of data recovery.
2. The importance of forensic auditing and accounting in corporate world.
3. About different services and issues in electronic world.
4. The importance and scope of IT Act 2000 in cyber world.

Suggested Reading:

1. File System Forensic Analysis by Brian Carrier, Publisher: Addison-Wesley Professional, Ist Edition (2005)
2. Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis) by Barkha& Ram Mohan, Publisher: Asian Law House, Hyderabad
3. Firewalls and Internet Security: Repelling the Wily Hacker , Second Edition (2003) Addison
4. E-Commerce: The Cutting Edge of Business by Kamlesh K. Bajaj &Debjani Nag, Tata McGraw Hill 2nd Edition, 2005
5. Cyber Law and E .Commerce by David Baumer, J C Poindexter, TMG Cyberlaw S implifiedVivekSood, TMG

SUBJECT- RESEARCH METHODOLOGY
SUBJECT CODE- BFS-504

LEARNING OBJECTIVE: The primary objective of this course is to develop a research orientation among the scholars and to acquaint them with fundamentals of research methods. Specifically, the course aims at introducing them to the basic concepts used in research and to scientific social research methods and their approach. It includes discussions on sampling techniques, research designs and techniques of analysis.

Unit-I

Introduction-Definitions and types of research; Research process and steps in conducting research; Applications of Research. Ethical issues in conducting research.

Unit-II

Research Modeling- Types of Data, Data collection methods- Survey method, Observation method, Experimentation; Scaling techniques; types of sampling, steps in sampling, advantage and limitations of sampling.

Unit-III

Application of Statistical tools -Measures of Central tendency – Mean, Median, Mode; Introduction of Probability Theories and Concepts, Probability Distributions- Discrete and Continuous Probability Distributions; Measures of Association: Correlation and regression

Unit- IV

Data Analysis Techniques--Quantitative and qualitative methods of data analysis; Hypothesis Testing - Parametric tests (Z-test, t-test, F-test) and Non-Parametric Tests (Chi-Square Test, ANNOVA), Tests of significance based on normal distributions; association of attributes.

UNIT –V

Report Writing-Report generation, report writing, and APA format – Title page, Abstract, Introduction, Methodology, Results, Discussion, References, and Appendices.

Learning Outcomes: At the end of this course, the students should be able to:

1. Understand Some Basic Concepts of Research And Its Methodologies
2. Identify Appropriate Research Topics • Select and Define Appropriate Research Problem and Parameters
3. Prepare A Project Proposal (To Undertake A Project)
4. Organize and Conduct Research (Advanced Project) In A More Appropriate Manner
5. Write A Research Report and Thesis
6. Write A Research Proposal (Grants)

Suggested Readings:

1. Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., (1985) W. B. Saunders Co.
2. Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed.(2012), University Park Press, Baltimore.

SUBJECT- FORENSIC TOXICOLOGY-LAB
SUBJECT CODE- BFS-511

List of practices:

1. Microscopic examination of Plant poisons
2. Color Tests for identification of poisons, drugs.
3. To identify metallic poisons.
4. To identify organic poisons.
5. Extraction methods of drugs, Poisons.
6. To identify drugs of abuse by spot tests.
7. To perform color tests for barbiturates.
8. To separate drugs of abuse by thin layer chromatography.

SUBJECT- FORENSIC BALLISTICS-LAB
SUBJECT CODE- BFS-512

List of practices:

1. Demonstration of Firearms- Rifle, Handguns (standard & Country made), Shot gun
2. To identify different types of marks on fired cartridge.
3. To co-relate the striking angle of the bullet with the impact on the target.
4. To estimate the range of fired bullets.
5. To identify gunshot residue.
6. To correlate the nature of injuries with distance from which the bullet was fired.
7. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

SUBJECT- DIGITAL & CYBER FORENSICS-II-LAB
SUBJECT CODE- BFS-513

List of practical:

1. Data Recovery integrated with forensic technology.
2. Access Data e Discovery.
3. Creation & verification of Digital Signature.
4. Network Analysis.
5. Detail Analysis of E-mail, E-Mail Investigation, E-Mail Tracking, IP Tracking, Email Recovery.
6. Working on Encase Software.
7. Imaging of discs using various tools.
8. Image processing using tools like, Photoshop, Corel Photo paint etc.

Sixth Semester (31-36 months)

Subject code	Course Titles	Hours Per Week			Evaluation Scheme			CR
		L	T	P	Internal	External	Total	
BFS-601	Questioned Document Examination	3	1	-	40	60	100	4
BFS-602	Explosives	2	1	-	40	60	100	4
BFS-603	Fingerprints & Impressions	3	1	-	40	60	100	4
BFS-604	Instrumental and Analytical Technique	3	1	-	40	60	100	4
BFS-611	Questioned Document Examination-Lab	-	-	2	40	60	100	1
BFS-612	Fingerprints & Impressions-Lab	-	-	2	40	60	100	1
BFS-613	Project Work/Dissertation	-	10	-	40	60	100	10
Total		**12**	**08**	**06**	**280**	**420**	**700**	**28**
Total Hours in Semester		**500**						

NOTE:

Abbreviations: L - Lecture, T - Tutorials and P – Practical

Considering four months per semester as working months, total contact hours per semester shall be 500 (Five hundred)

SUBJECT- QUESTIONED DOCUMENT EXAMINATION
SUBJECT CODE- BFS-601

Unit-I

Introduction to Questioned Documents – Definition, types of questioned documents. Handling, care, preservation, and marking of Questioned Documents, Preliminary examination of questioned documents. Basic tools needed for forensic documents.

Unit-II

Determining the age and relative age of documents. Analysis and Comparison of paper and ink. Different types of printers and analysis of printed documents. Study of typescripts and typewriter characteristics and analysis of typed documents.

Unit-III

Introduction to Handwriting Analysis - Principles of Handwriting Identification. Development of individuality in handwriting. Class and individual characteristics of handwriting. Natural variations, Disguise, and fundamental divergences in handwriting. Comparison of handwriting. Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting. Types and Collection of Standards for comparison of handwriting.

Unit-IV

Forgeries – Different types of Forgeries (Freehand and Traced). Alterations in documents, including erasures, additions, over-writings and obliterations. Study of indented and invisible writings.

Unit-V

Analysis of Charred documents. Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Determination of authorship in Disguised writing and anonymous letters (considering Forensic Linguistics and Stylistics, natural variation, class characteristics and individual characteristics of handwriting).

SUBJECT- EXPLOSIVES
SUBJECT CODE- BFS-602

UNIT-I

Introduction, Definition, Scope, Classification, composition and characteristics of explosives,

UNIT-II

Explosion, type of explosion, process and effects, types of hazard, effect of blast wave on structures, human etc. specific approach to scene of explosion, post-blast residue collection, preservation and packing

UNIT-III

Reconstruction of sequence of events, evaluation and assessment of scene of explosion,

UNIT-IV

Systematic examination of explosives and explosion residues in the laboratory using chemical and instrumental techniques and interpretation of results,

UNIT-V

Explosives Act. Pyrotechnics, IEDs,

SUBJECT- FINGERPRINT & IMPRESSIONS
SUBJECT CODE- BFS-603

LEARNING OBJECTIVE

UNIT-I

Introduction definition, scope, History and development of Fingerprint Science, formation of ridges, different type of ridge characteristics, classification of fingerprints – Henry system of classification, Single digital classification.

UNIT-II

Search and collection of Fingerprint, chance fingerprints, latent & visible fingerprints, plastic fingerprints, ridge tracing and ridge counting, Development of latent fingerprints, conventional methods of development of fingerprints – fluorescent method, magnetic power method, fuming method, chemical method etc.

UNIT-III

Taking of finger prints from living and dead persons, preserving and lifting of fingerprints, photography of fingerprints, comparison of fingerprints, and basis of comparison, class characteristics, and individual characteristics, various type of ridge characteristic, AFIS

UNIT-IV

Fingerprint enhancement techniques: by optical techniques and specialized light sources, detection of fingerprints on porous surfaces, non-porous surfaces and their enhancements.

Digital imaging of fingerprints: Introduction, image format, fingerprint image enhancement by MATLAB.

UNIT-V

Lip prints, Ear prints, Foot prints, Bite marks, Shoe prints, Tyre marks/skid marks: their importance, natural location, collection and evaluation, taking controlled samples for forensic comparison

SUBJECT- INSTRUMENTAL AND ANALYTICAL TECHNIQUE
SUBJECT CODE- BFS-604

Learning Objective:

UNIT-I: Introduction to Instrumental methods of Chemical analysis

General introduction, classification of the instrumental method, spectroscopy, properties, of electromagnetic radiation, the introduction of electromagnetic radiation with matter origin of the spectrum.

UNIT-II: Visible spectrophotometry & Calorimetry

Introduction, theory of spectrophotometry & calorimetry, deviation from Beer's law, instrumentation, application of Calorimetry & spectrophotometry.

UNIT-III Emission Spectroscopy

Introductory, theory, instrumentation, spectrograph, application, of emission spectroscopy, advantages, and disadvantages of emission spectroscopy.

UNIT – I V Microscopy

Basic principles of the simple microscope, phase contrast microscope, stereoscopic microscopic and compound microscope, comparison microscope, polarizing microscope, fluorescent microscope, and Electron microscopy.

UNIT-V Centrifugation Techniques:

Basic principles of sedimentation, various types of centrifuges, Density gradient centrifugation,
Preparative centrifugation, Analysis of sub-cellular fractions, Ultracentrifuge- Refrigerated Centrifuges.
Electrophoretic Technique: - General principles, Factors affecting electrophoresis, Law voltage thin sheet electrophoresis, High voltage electrophoresis, Sodium dodecyl sulfate (SDS) polyacrylamide gel-electrophoresis, Isoelectric focusing (IEF), Iso-electrophoresis, Preparative electrophoresis, Horizontal and Vertical electrophoresis.

SUBJECT- QUESTIONED DOCUMENT EXAMINATION -LAB
SUBJECT CODE- BFS-611

List of practical:

1. To identify handwriting characters (class and individual)
2. To compare handwriting samples.
3. To study free hand forgery.
4. To study and detect different types of traced forgery.
5. To study erasures, alterations and obliterations in handwriting samples.
6. To study indented writings
7. To study secret writings
8. To study counterfeit currency notes, passports and visa

SUBJECT- FINGERPRINTS & IMPRESSIONS -LAB
SUBJECT CODE- BFS-612

List of practical:

1. To record plain and rolled fingerprints and identify different fingerprint patterns
2. To carry out ten-digit classification of fingerprints.
3. To identify and classify core and delta.
4. To identify different ridge characteristics
5. To carry out ridge tracing and ridge counting.
6. Document and Fingerprint Photography
7. To develop Latent fingerprints with Powder methods & lifting of fingerprints.
8. To record lip prints and forensic examination of lip prints
9. To record ear prints and their specific features for forensic comparison
10. Forensic examination of tyre/skid marks.