



BANGALORE UNIVERSITY

Syllabus for

B.Sc. Forensic Science (UG)

CHOICE BASED CREDIT SYSTEM (CBCS)

Framed According to the National Educational Policy (NEP 2020)

III – IV SEMESTERS

To implement from the academic year 2022-23

FOREWORD

National Education Policy (NEP) 2020 seeks to transform the Higher Education system in India by introducing the exit and entry option to the students. Selecting courses of choice will improve the education quality of the students. A creative combination of disciplines like Core, Open Elective, and Elective courses with multi-disciplinary nature is one key recommendation of NEP 2020.

The multiple exit and entry options in the Higher Education System would remove rigid boundaries and create new possibilities for students to choose and learn the courses of their choice anywhere in India can pave the way for improving student progress. A formal system of credit recognition, credit accumulation, credit transfers and credit redemption is a praiseworthy recommendation in the education system. Karnataka is the first state in the country to implement NEP in higher education. The state come up with the NEP framework for all the UG-PG programmes starting from the academic year 2021.

The prominent features of the NEP framework are:

1. Flexibility in choosing subjects and even disciplines for the graduate program.
2. Vertical and horizontal mobility across subjects throughout the program.
3. Multiple entry and exit points.
4. Main streaming of skill based courses.
5. Credit based evaluation system.
6. Integration of research into IV year of the program leading to Honors degree.
7. Post-graduate Diplomas in respective disciplines.

I am delighted to present curriculum structure and syllabus of B. Sc Degree in Forensic Science with multiple exist entry with skills and job opportunities in point of exit system. I hope that the curriculum structure and syllabus will pave the way for overall development of the student community. I ensure that, students community will procure the benefits at large in higher education

Dr. P Mahaboob Basha
Chairman
BOS (UG) in Forensic Science
Bangalore University

Syllabus for B.Sc., Hons. in Forensic Science

Name of the Degree Program: **B. Sc., Hons.**
Discipline Core: **Forensic Science**
Total Credits for the Program: **52/102/147/187**
Starting year of implementation: **2021-22 (I & II sem)**
2022-23 (III & IV sem)

Progressive Certificate, Diploma, Bachelor Degree or Bachelor Degree with Honours Provided at the End of Each Year of Exit of the Four-year Undergraduate Programme/ Five-year Integrated Master's Degree Programme

Introduction

The NEP-2020 offers an opportunity to effect paradigm shift from a teacher-centric to student-centric higher education system in India. It aims to increase the focus on strengthen training, and reform the existing exam system, and also helps in restructuring regulatory framework of education. It caters skill based education where the graduate attributes are first kept in mind to design programs/ courses and supplementary activities to attain the graduate attributes and learning attributes. The learning outcomes-based curriculum framework for a degree in B.Sc. (Honours) forensic sciences intended to provide a comprehensive foundation to the subject and to help students to develop ability which leads to further studies and research in the subject. Effort has been made to integrate use of recent technology and use of MOOCs to assist teaching-learning process among students. The framework is designed to equip students with valuable cognitive abilities and skills to meet diverse needs of professional careers in a developing and knowledge-based society. The curriculum framework takes into account the need to maintain globally competitive standards of achievement in terms of the knowledge and skills in forensic science and allied courses, as well develop scientific orientation, spirit of enquiry problem, solving skills and, professional values which foster rational and critical thinking in the students.

In brief, forensic science, is any kind of science used in the legal or justice system to support and uphold the law. When a crime has been committed and evidence is collected at the scene, scientists analyse it, arrive at scientific results and give expert court testimony about their findings. Forensic science concentrates on facts that prove something did or did not happen in a criminal or civil case.

GRADUATE ATTRIBUTES IN B.Sc. (Hons.) Forensic Science

Some of the characteristic attributes a graduate in Forensic Science should possess are:

- Develop the essential and fundamental skills required to enter the professional world of forensics. Tasks, including DNA analysis and trace evidence examination.
- Skilled communication:
- Critical thinking and problem solving capacity:
- Logical thinking and reasoning:
- Team Spirit & Leadership Quality:
- Digital efficiency:
- Ethical awareness / reasoning:
- National and international perspective:
- Developing scientific knowledge.

Flexibility

- The programs are flexible enough to allow liberty to students in designing them according to their requirements. Students may choose a single Major, one Major or two Majors during third year (5th semester onwards). Teacher Education or Vocational courses may be chosen in place of Minor/s. Below listed are the various options students may choose from.
- One discipline, Two Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities.

- One discipline along with Languages, Generic Electives, Ability Enhancement, Skill Development and Vocational courses including Extracurricular Activities

AIMS AND OBJECTIVES OF UG PROGRAM IN Forensic Science

- Forensic science is a critical element of the criminal justice system.
- Forensic Scientists analyze physical evidence (fingerprints, blood, hair etc.) collected from the incident scene to identify suspects.
- Forensic professionals use image modification tools to search for criminals absconding from the law for a long time.
- The uniform grading system will benefit the students to move across institutions within India to begin with and across countries.
- It will also enable potential employers in assessing the performance of the candidates across the world.

Weightage for assessments

Type of Course	Formative Assessment / IA Marks	Summative Assessment Marks
Theory	30	45
Practical	25	25
Internship	45	105
Experiential Learning (Internships etc.)		

*In lieu of the research Project, two additional elective papers/ Internship may be offered

Credit distribution for the course

Proposed Curriculum Frame Work -4 Years BSc Program -Forensic Sciences
Proposed CBCS Scheme for the Four Years UG Honours Programme:
B.Sc. (Honours) Forensic Science

Sem	Discipline Specific Core Course	Discipline Specific Elective Course	Open Elective	AECC		SEC Skill based	Value Based	Total Credits
1	1. Introduction to Forensic Science (3+2) 2. Basic Forensic Chemistry (3+2) 3. Criminology (3)	-	Generic Elective from the Bank (3)	English I (3) Language I (3)		Digital Fluency (2)	1. Physical Education (Yoga) (1) 2. Health and Wellness(1)	26
2	4. Crime Scene Management (3+2) 5. Basic Forensic Biology (3+2) 6. Criminal Law (3)	-	Generic Elective from the Bank (3)	English I (3) Language I (3)	Environmental Studies (2)		1. Physical Education (Sports) (1) 2. NCC/NSS/Cultural (1)	26
Exit option with Certificate (52 credits)								
3	7. Forensic Dermatoglyphics (3+2) 8. Advanced Forensic Chemistry (3+2) 9. Technological Methods in Forensic Science(3+2)	-		1. English I (3) 2. Language I (3)		Artificial Intelligence (2)	1. Physical Education (Sports) (1) 2. NCC/NSS/Cultural (1)	25
4	10. Questioned Documents (3+2) 11. Advanced Forensic Biology (3+2) 12. Forensic Psychology(3+2)	-		3. English I (3) 4. Language I (3)	Constitution of India (2)		2. Physical Education (Sports) (1) 3. NCC/NSS/Cultural (1)	25
Exit option with Diploma in Science (102 credits)								
5	13. Forensic Toxicology (3+2) 14. Forensic Computing and Cyber Crime (3+2) 15. Forensic Physics (3+2)	1. Economic Offences/ Arson and Explosives (3)	-	-	-	Cyber Security (2)	1. Physical Education (Sports) (1) 2. NCC/NSS/Cultural (1)	22
6	16. Forensic Serology (3+2) 17. Digital Forensics (3+2) 18. Forensic Ballistics (3+2) Internship (2)	2. Forensic Engineering/Narcotic Drugs and Psychotropic Substances (3)	-	-	-	Professional Communication (2)	1. Physical Education (Sports) (1) 2. NCC/NSS/Cultural (1)	23
Exit option with Bachelor of Science Degree in Forensic science (147 credits)								
7	19. Forensic Psychology (3+2) 20. Forensic Anthropology (3+2)	1. Forensic Audio video and Speaker Identification/ Wildlife Forensics and Forensic Entomology (3+2) 2. Research Methodology (3)	1. Entrepreneurship in Forensic Science (3)	-	-	-	-	21
8	21. Forensic Medicine (3+2)	1. DNA Profiling/ Mobile and Cloud Forensics (3+2) 2. Research Project (6)	1. Forensic Accounting and Fraud Examination (3)	-	-	-	-	19
Award of Bachelor of Science Honors Degree, B.Sc.(Hons.) Degree in Forensic Science (187 credits)								

	SPECIALIZATIONS	Forensic Chemistry and Toxicology	Forensic Biology and Serology	Forensic Physics	Forensic Ballistics	Questioned Documents & Fingerprints	Digital Forensics		Credits
9 (M.Sc.)	Theory Paper (4) Practical Paper (2) + Open Elective Paper (4)	<ol style="list-style-type: none"> 1. Analysis of Essential Commodities, Fire, Arson and Explosives 2. Pharmacology of Poisons 3. Forensic Analysis of Drugs 4. Instrumentation in Forensic Chemistry and Toxicology 5. Analysis of Essential Commodities, Fire, Arson and Explosives Practical 6. Pharmacology of Poisons Practical 7. Forensic Analysis of Drugs Practical 	<ol style="list-style-type: none"> 1. Forensic Genetics 2. Extraction of DNA from Samples 3. Advanced Forensic DNA Profiling 4. Forensic Bioinformatics 5. Forensic Genetics Practical 6. Extraction of DNA from Samples Practical 7. Forensic DNA Profiling Practical 	<ol style="list-style-type: none"> 1. Advanced Forensic Voice Authentication 2. Advanced Forensic Video Analysis 3. Criminalistics and Forensic Engineering 4. Pattern and Impression evidence 5. Forensic Audio Analysis Practical 6. Forensic Video Analysis Practical 7. Criminalistics and Forensic Engineering Practical 	<ol style="list-style-type: none"> 1. Identification of Firearms, and ammunition, Range of Firing & Chemical Tests 2. Internal, External Ballistics & Gun-shot Residue 3. Wound Ballistics, Reconstruction & Report Writing 4. Instrumentation in Forensic Ballistics 5. Applications of Instrumentation Techniques in Forensic Ballistics 6. Identification of Firearms, Range of Firing, Chemical Tests Practical 7. Documentation of Crime Scene involving Firearm, handling of Evidentiary Clues Practical 	<ol style="list-style-type: none"> 1. Handwriting and Signature Analysis 2. Fingerprint Development and Comparison 3. Electronically Printed and Security Documents 4. Bank Frauds 5. Handwriting and Signature Analysis Practical 6. Fingerprint Development and Comparison Practical 7. Electronically Printed and Security Documents Practical 	<ol style="list-style-type: none"> 1. Advanced Digital Forensics 2. Network Forensics 3. Mobile and Wireless Device Forensics 4. Social Media Forensics and Cryptography 5. Advanced Digital Forensics Practical 6. Network Forensics Practical 7. Mobile and Wireless Device Forensics Practical 		26
10	Research Writing (5) Dissertation (20) Internship (5)								30

SEMESTER III

**Semester III-Forensic Science
Core Course Content
FS-301 - Forensic Dermatoglyphics**

Credits: 3

Hours: 45

Course Title: Forensic Dermatoglyphics	Course Code: FS-301
Course Type: Core Theory, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Course Outcomes (Cos):

After successful completion of the course, the student will be able to:

- To provide an understanding of dermatoglyphics and its application in forensic science.
- To enable students to examine fingerprint evidence.
- Explain the fundamentals of friction ridges
- classify fingerprints for purpose of comparison and identification
- Analyse fingerprints obtained in the crime scene
- evaluate impression evidence obtained from the scene of crime

**Semester III-Forensic Science
Core Course Content
Forensic Dermatoglyphics**

Unit 1: Basics of Dermatoglyphics

10 hours

Introduction and history: with special reference to India; Biological basis of fingerprints, Structure of skin; Formation of ridges; Fundamental principles of fingerprinting; Plain and rolled fingerprints; Types of fingerprints: latent, patent and plastic; Fingerprint patterns: arches, loops and whorls; Fingerprint characters/minutiae; Poroscopy and edgeoscopy: concept and significance.

Unit 2: Classification of Fingerprints and its significance

10 hours

Introduction and history of classification systems; Dr. Henry Faulds' syllabic system; Purkinje classification; Galton's tripartite system; Vucetich Argentine system; Henry's classification system; Battley's Single Digit classification system.

Unit 3: Latent Fingerprints: Development, Preservation and Identification

15 hours

Latent prints: formation, constituent of sweat residue; Application of light sources in fingerprint detection; Development of latent prints: physical methods (powder and iodine fuming) and chemical methods (ninhydrin, cyanoacrylate, amido black and silver nitrate); Developing fingerprints on gloves; Fingerprinting the deceased; Preservation of developed fingerprints; Digital imaging for fingerprint enhancement; Introduction to Automated Fingerprint Identification System (AFIS).

Unit4: Additional Impressions**10 hours**

Palm prints: collection, preservation, ATD angle and its significance; Footprint: types, location, preservation and significance; Collection of footprints: casting of footprints, electrostatic lifting of latent footprints; Lip prints: location, lifting, preservation, examination of lip prints using Suzuki and Tsuchihashi classification system, collection of standards and its significance; Ear prints: deposition and their significance.

References

1. Sharma, B. R. (2019). *Forensic science in criminal investigation and trials*. Central Law Agency.
2. Ashbaugh, D.A. (2000). *Quantitative-qualitative friction ridge analysis*. Boca Raton, CRC Press.
3. Champod, C. Lennard, Margot, Stoilovic (2004), *Fingerprints and other ridge skin Impressions*. Boca Raton, CRC Press.
4. Champod, C., Lennard, C. J., Margot, P., & Stoilovic, M. (2017). *Fingerprints and other ridge skin impressions*. CRC Press.
5. Cowger, J.E. (1983). *Friction ridge skin*. Boca Raton, CRC Press.
6. Daluz, H. M. (2014). *Fundamentals of fingerprint analysis*. CRC Press.
7. Hawthorne, M. R. (2009). *Fingerprints: analysis and understanding*. CRC Press.
8. Lee, Gaensleen (2013). *Advances in fingerprint technology*, 3rd Edition, R.S. Ramotowski (Ed.). Boca Raton, CRC Press.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in
House Examination/Test	15
Written Assignment/Presentation/Project / Term	10
Class performance/Participation	05
Total	30

Semester III-Forensic Science
FS-304-Forensic Dermatoglyphics Practical

Credits: 2

Hours: 60

Course Title: Forensic Dermatoglyphics Practical	Course Code: FS-304
Couse Type: Core Practical L-T-P: 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

<p>After successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> ● To provide an understanding of dermatoglyphics and its application in forensic science. ● To enable students to examine fingerprint evidence. ● Explain the fundamentals of friction ridges ● Classify fingerprints for purpose of comparison and identification ● Analyse fingerprints obtained in the crime scene ● Evaluate impression evidence obtained from the scene of crime

Lab Content

List of experiments to be conducted: 10 units (1unit- 4hrs)

S.No	Experiment	15 Units (1unit- 4hrs)
1.	Collection of rolled and plain prints on fingerprint recording slip.	1
2.	Identification of fingerprint patterns.	1
3.	Ridge counting and ridge tracing of fingerprints.	1
4.	Classification of fingerprints using Henry's Classification from the fingerprint slip.	1
5.	Development, collection and preservation of fingerprints on porous surfaces.	2
6.	Development, collection and preservation of fingerprints on non-porous surfaces.	2
7.	Comparison of disputed print with standard print.	2
8.	Analysing the characteristics of palm prints.	2
9.	Analysing the characteristics of footprints.	1
10	Casting of sunken foot prints.	2

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	05
Viva on Project/Seminar/Assignments	05
Practical Record(s)	05
Class performance/Participation	05
Total	25

**Semester III –Forensic Science
Core Content
FS-302 - Advanced Forensic Chemistry**

Credits: 3

Hours: 45

Course Title: Advanced Forensic Chemistry	Course Code: FS-302
Course Type: Core Theory, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Course Objectives:

After successful completion of the course, the student will be able to:

- To provide an understanding of the applications of forensic chemistry
- To learn about the analysis of substances under forensic chemistry
- Describe the analysis of exhibits encountered in forensic chemistry
- Analyse arson and petroleum exhibits
- Assess the exhibits encountered in explosion cases
- Evaluate evidence related to alcohol

**Semester III –Forensic Science
Core Content
Advanced Forensic Chemistry FS-302**

Unit 1: Basics of Forensic Chemistry **10 hours**

Definition and introduction; Types of cases and exhibits in forensic chemistry; Cement: types, adulteration and analysis; Trap cases: types and chemistry of detective dyes, detection of phenolphthalein, instrumental analysis; Analysis of adulterants in cosmetics, paints, oils, fats, grease, gold, silver, tobacco, tea, sugars, salts; Salient features of Drug and Cosmetics Act, 1940.

Unit 2 : Introduction to Arson and Petroleum products **11 hours**

Arson: introduction and motives; Fire: chemistry, behaviour, origin and cause; Arson scene investigation, collection and preservation of arson exhibits; Petroleum products: classification, commercial uses and adulteration; Analysis of petrol, kerosene, diesel and lubricants by Bureau Of International Standards (BIS) methods; Analysis and comparison of petroleum products as forensic exhibits: preliminary and confirmatory tests; Salient features of Petroleum Act, 1934.

Unit 3: Basic aspects of Explosives **12 hours**

Introduction and classification of explosives; Process of explosion: deflagration and detonation; Improvised Explosive Devices (IEDs) and their characteristics; Collection and preservation of explosive residues from the scene of occurrence; Evaluation and reconstruction of sequence of events.

Unit 4: Alcohol analysis and its legal control **12 hours**

Alcoholic beverages: types, country made liquors; Adulteration: types, methanol poisoning; Alcohol impaired driving: breath analyser, blood alcohol concentration, Widmark's equation; Identification and chemical analysis of methanol, ethanol, aldehyde, ester, chloral hydrate and furfural components by colour test; Instrumental techniques: headspace gas chromatography; Salient features of Excise Act.

References

1. Aggrawal, A. (2017). *Textbook of Forensic Medicine and Toxicology*. APC Publisher.
2. *Laboratory Procedure Manual Forensic Explosives* (2005). Directorate of Forensic Science Ministry of Home affairs.
3. DeHaan, J.D (2013). *Kirk's fire investigation*; 3rd Edition. New Jersey; Prentice Hall.
4. Saferstein, R (2015). *Criminalistics*; 8th Edition. New Jersey; Prentice Hall.
5. Crippin, J. B. (2017). *Explosives and Chemical Weapons Identification*. Ukraine: Taylor & Francis.
6. Ford, J. (2014). *Explosives & Arson Investigation*. United States: Mason Crest.
7. Newton, D. E. (2007). *Forensic Chemistry*. United States: Facts On File, Incorporated.
8. Meyer, R., Köhler, J., & Homburg, A. (2016). *Explosives*. John Wiley & Sons.
9. Ford, J. (2014). *Explosives & Arson Investigation*. Simon and Schuster.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term	10
Class performance/Participation	05
Total	30

Semester III-Forensic Science

FS-305 - Advanced Forensic Chemistry Practical

Credits: 2

Hours: 60

Course Title: Advanced Forensic Chemistry Practical	Course Code: FS-305
Course Type: Core Practical ,L-T-P : 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes:

At the end of the course the student should be able to:

- To use simple and compound microscopes.
- To understand the composition of various samples.
- To familiarize with various adulterants used in petroleum products.
- To analyze the various petroleum products
- To prepare the TLC plates

Lab Course Content: List of experiments to be conducted:

S.No	Experiment	15 Units (1unit- 4hrs)
1.	Detection of adulterant present in cement.	1
2.	Detection of adulterant present in oil.	1
3.	Detection of adulterant present in gasoline using filter paper and density test.	1
4.	Analysis of density and flash point of diesel.	1
5.	Analysis of density and flash point of kerosene oil.	2
6.	Analysis of arson accelerators.	2
7.	Analysis of explosive substances.	2
8.	Separation of explosive substances using thin layer chromatography.	2
9.	Qualitative analysis of ethanol.	1
10	Qualitative analysis of methanol.	1
11	Analysis of case studies	1

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	05
Viva on Project/Seminar/Assignments	05
Practical Record(s)	05
Class performance/Participation	05
Total	25

**Semester III-Forensic Science
Core Course Content
FS-303 Technological Methods in Forensic Science**

Credits: 3

Hours: 45

Course Title: Technological Methods in Forensic Science	Course Code: FS-303
Course Type: Core Theory, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Course Outcomes (Cos):

After successful completion of the course, the student will be able to:

- To explain the instrumentation used in forensic science
- To provide an understanding of the working principles of forensic instruments
- explain the working and applications of microscopy
- differentiate between the types of chromatography
- appraise the techniques of electrophoresis
- summarize the types of Spectroscopy used in forensic science

**Semester III-Forensic Science
Core Course Content
FS-303 Technological Methods in Forensic Science**

Unit I – Instrumentation and applications

10 hours

Principles of optics; Magnifying glass; Working principle, uses and forensic applications of compound microscope, fluorescence microscope, stereo microscope, phase-contrast microscope, comparison microscope, electron microscopes: SEM, TEM, STEM; Sample preparation for electron microscopy.

Unit II - Chromatography Techniques

12 hours

Chromatography: definition, Stahl's triangle, common applications; Working principle, uses and forensic applications of Paper chromatography, thin layer chromatography (TLC), column chromatography, high performance liquid chromatography (HPLC), gas chromatography (GC); Sample preparation for chromatography.

Unit III –Basics of Electrophoresis

08 hours

Electrophoresis: definition, factors affecting electrophoresis; Working principle, uses and forensic applications of agarose gel electrophoresis, Sodium Dodecyl-Sulfate Polyacrylamide Gel Electrophoresis.

Unit IV – Different Spectroscopic methods

15 hours

Beer-Lambert law; Working principle, uses and forensic applications of Colorimetry, UV-Vis spectrophotometer; Handheld spectroscope, IR spectroscopy, Atomic Absorption Spectroscopy (AAS), Atomic Emission Spectroscopy (AES), Mass Spectrometry (MS), X-Ray Spectrometer (XRS);

Working principle, uses and forensic applications of Enzyme-Linked Immunoassay (ELISA), Radial Immuno Assay (RIA), Neutron Activation Analysis (NAA).

References

1. Prakash Singh Bisen, A. S. (2012). *Introduction to instrumentation in life sciences*. CRC Press.
2. Joseph I. Goldstein, D. E. (2017). *Scanning electron microscopy and x-ray microanalysis*. Springer.
3. W. Kemp, *Organic spectroscopy*, CRC Press.
4. *Introduction to Instrumental Analysis*. By R.D.Broun, Mc.Graw Hill (1987)
5. *Extraction Chromatography* T.Braun, G. Ghersene, Elsevier Publications 1978
6. Shirley Bayne, M. C. (2010). *Forensic Applications of High Performance Liquid Chromatography*. CRC Press.
7. Stuart, S. A. (2013). *Forensic analytical techniques*. Wiley-Black.
8. Donald L. Pavia, G. M. (2014). *Introduction to spectroscopy*. Cengage Learning.
9. H.H. Willard, L.L. Merritt Jr. Dean, Settie. *Instrumental Methods of Analysis*, 7th Edition. (2004), CBS Publishers and Distributors.
10. Williams, B.L. and Wilson, K, *A Biologists Guide to Principles and Techniques of Practical Biochemistry*, (1975), CRC Press.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term	10
Class performance/Participation	05
Total	30

Semester III - Forensic Science

Technological Methods in Forensic Science Practical FS-306

Credits: 2

Hours: 60

Course Title: Technological Methods in Forensic	Course Code: FS-306
Course Type: Core Practical, L-T-P: 0-0-4	Course Credits: 2
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (Cos):

At the end of the course the student should be able to:

- Analysis of samples using various techniques
- Application of Physical, Chemical and Biological techniques
- To learn the working of Physical, Chemical and Biological
- To examine various biological and chemical samples using gel electrophoresis
- To learn the interpretation of spectrogram
- To learn epithelial cells.

Lab Course Content

List of experiments to be conducted:

S.No	Experiment	15 Units (1unit- 4hrs)
1.	Microscopic examination of blood smear under low, high and oil immersion objectives of compound microscope.	1
2.	Preparation of a hair sample for compound microscopy – decolorization, mounting and observation.	1
3.	Separation of plant pigments by paper chromatography.	1
4.	Separation of ink using Thin Layer Chromatography.	1
5.	Separation of amino acids using Thin Layer Chromatography.	2
6.	Preparation of agarose gel.	2
7.	Demonstration of Polyacrylamide Gel Electrophoresis.	2
8.	Estimation of concentration of coloured substances using colorimeter.	2
9.	Demonstration of analysis of a drug (Paracetamol) UV-Vis Spectrophotometer	2
10	Demonstration of Enzyme-Linked Immunoassay.	1

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	05
Viva on Project/Seminar/Assignments	05
Practical Record(s)	05
Class performance/Participation	05
Total	25

SEMESTER IV

**Semester IV-Forensic Science
Core Course Content
FS-401 - QUESTIONED DOCUMENTS**

Credits: 3

Hours: 45

Course Title: Questioned Documents	Course Code: FS-401
Course Type: Core Practical, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Course Objectives:

After successful completion of the course, the student will be able to:

- To learn about the discipline of questioned document examination
- To train students in the analysis of questioned documents.
- Describe the examination of questioned documents
- Point out the characteristics of signature and handwriting
- Evaluate cases related to questioned document examination

**Semester IV-Forensic Science
Core Course Content
FS-401 - QUESTIONED DOCUMENTS**

Unit 1: Basic Tools and Techniques of Questioned Documents

11 hours

Basic terminologies in questioned documents; Types of questioned documents; Care and handling of questioned documents; Preliminary examination of documents; Basic tools needed for forensic examination of questioned documents: measuring tools, magnification tools, Video Spectral Comparator (VSC), Electrostatic Detection Apparatus (ESDA); Light sources: ultraviolet, visible, infrared light; Photomicrography.

Unit 2: Examination of Handwriting and Signature

11 hours

Development of individuality in handwriting; Natural variations and fundamental divergences in handwritings; Factors affecting handwriting; Class and individual characteristics of handwriting and signature.

Unit 3: Context cases in Questioned Documents

11 hours

Alterations in documents: erasures, additions, over-writings, cutting and obliterations;

Secret writing: methods and decipherment; Charred documents: collection, preservation and decipherment; Forgery and its types; Disguised writing and its methods; Analysis of forged and disguised documents; Anonymous letters: introduction and examination.

Unit 4: Comparison and analysis of Documents

12 hours

Exemplar: types (requested and non-requested), merits and demerits; Collection of standards for comparison of handwritings, signatures, printed documents, photocopied documents and typed documents; Process of comparison of handwriting and signature; Determining the age and relative age of documents; Examination of printed documents, typed documents and photocopied documents; Examination of counterfeit Indian currency notes, passports and stamp papers; Types of opinion.

References

1. Sharma, B. R. (2012). *Treatise on handwriting forensic*. Universal Law Publishing Company, New Delhi.
2. Sharma, B. R. (2016). *Handwriting forensic*. Universal Law Publishing Company, New Delhi.
3. Sharma, B. R. (2019). *Forensic science in criminal investigation and trials*. Central Law Agency.
4. Day, S. P., Ellen, D., & Davies, C. (2005). *Scientific examination of documents: methods and techniques*. CRC Press.
5. Huber, R. A. (1999). *Handwriting Identification: Facts and Fundamentals*. Ottawa, Canada 1999: CRC Press.
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8. Osborn, A. S. (2018). *Questioned documents*. Albany, NY: Boyd Print. Company; Toronto: Carswell Company.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in
House Examination/Test	15
Written Assignment/Presentation/Project / Term	10
Class performance/Participation	05
Total	30

Semester IV-Forensic Science
FS-404- Questioned Document Practical

Credits: 2

Hours: 60

Course Title: Questioned Document Practical	Course Code: FS-404
Course Type: Core Practical, L-T-P: 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

After successful completion of the course, the student will be able to:

- To enable students to examine questioned documents
- To train students in the field of questioned document examination
- Analyse the class and individual characteristics of questioned documents
- Write questioned document examination reports
- distinguish genuine and counterfeit currency notes and passports

Lab Course Content: List of experiments to be conducted

S.No	Experiment	15 Units (1unit- 4hrs)
1.	Preliminary examination of questioned documents	1
2.	Determination of sequence of strokes	1
3.	Identification and comparison of handwriting	1
4.	Identification and comparison of signature	1
5.	Detection of forgeries (simulated and traced forgery)	2
6.	Detection of erasures and obliterations	2
7.	Collection and preservation of charred documents	2
8.	Identification of characteristics of printed documents	2
9.	Examination of security features of Indian currency notes	2
10	Examination of security features of Passport	1

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	05
Viva on Project/Seminar/Assignments	05
Practical Record(s)	05
Class performance/Participation	05
Total	25

**Semester III-B.Sc. Forensic Science
Core Course Content
FS-402 - Advanced Forensic Biology**

Credits: 3

Hours: 45

Course Title: Advanced Forensic Biology	Course Code- FS-402
Course Type: Core Practical, L-T-P: 3-0-0	Course Credits: 3
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Course Outcomes (COs):

<p>After successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> ● To provide an understanding of the nature and importance of biological evidence ● To enable students to evaluate and analyse biological evidence ● Describe the forensic significance of blood and body fluids ● Analyse hair samples encountered in crime investigation ● appraise the importance of botanical evidence ● hypothesize the reconstruction of the crime scene using blood pattern analysis
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**Semester III-B.Sc. Forensic Science
Core Course Content
FS-402 - Advanced Forensic Biology**

Unit 1: Botanical Evidence

10 hours

Leaves, seed, pollen, wood and plant juices as evidence; Transfer of botanical evidence and forensic significance; Collection and preservation of botanical evidence; Diatoms: general morphology; Significance in drowning cases.

Unit 2: Hair as Evidence

11 hours

Morphology; Microscopic morphology; Biochemistry; Growth cycle; Functions and characteristics of hair: scalp, axilla, facial and pubic; Sex differentiation, age estimation and race determination from hair; Disorders of hair; alopecia, hirsutism; Collection and preservation; Forensic examination: scale examination and morphometric analysis; Comparison of human and animal hair.

Unit 3: Blood and Body Fluids as Evidence

12 hours

Blood: composition, functions; Haemopoiesis; Haemoglobin; Forensically relevant enzymes present in blood; Blood smear examination: Leishman stain; Collection and preservation of blood evidence; Presumptive and confirmatory testing of blood evidence; Collection, preservation and examination of body fluids: semen, saliva, urine, faeces, sweat, tear, milk, menstrual blood, fetal blood.

Unit 4: Blood Pattern Analysis

12 hours

Physical, dynamic and biological properties of human blood; Blood stain drying time; Terminologies and classification of blood patterns: impact, cast-off, projected, contact and blood trails; Convergence and point of origin; Documentation of blood patterns; Significance in crime scene reconstruction.

References

- Abul K. Abbas, Andrew H. H. Lichtman, Shiv Pillai(2017):*Cellular and Molecular Immunology*. Elsevier
- Alan Gunn (2009):*Essential Forensic Biology*: Wiley
- J Thomas McClintock(2014):*Forensic analysis of biological evidence : a Laboratory guide for serological and DNA typing*: CRC Press
- Li, Richard (2015):*Forensic Biology*. CRC Press
- Kintz, Pascal, Salomone, Alberto, Vincenti, Marco (2015):*Hair Analysis in Clinical and Forensic Toxicology*: Academic Press
- Bruce Budowle, Steven Schutzer, Stephen Morse (eds.)(2020):*Microbial Forensics*: Academic Press
- Jane E. Huffman, John R. Wallace(2011):*Wildlife Forensics: Methods and Applications*: Wiley
- J E Cooper, Margaret E Cooper(2013):*Wildlife forensic investigation : principles and practice*: CRC Press

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term	10
Class performance/Participation	05
Total	30

Semester III-B.Sc. Forensic Science
FS-405- Advanced Forensic Biology Practical

Credits: 02

Hours: 60

Course Title: Advanced Forensic Biology Practical	Course Credits: 02
Course Type: Core Practical, L-T-P: 0-0-4	Course Code: FS-405
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

<p>After successful completion of the course, the student will be able to:</p> <ul style="list-style-type: none"> ● To train students in the analysis of blood and body fluids ● To enable students to examine biological evidence ● Analyse blood and body fluids as evidence ● Infer the significance of hair evidence ● Assess the evidentiary value of pollen and blood spatter

Lab Contents: List of experiments to be conducted:

S.No	Experiment	15 Units (1unit- 4hrs)
1.	Presumptive testing of dried blood stains	1
2.	Confirmatory testing of dried blood stains	1
3.	Leishman staining and microscopic examination of blood smear	1
4.	Examination of saliva	1
5.	Examination of seminal stains	2
6.	Microscopic examination of hair - Transverse and cross sections	2
7.	Microscopic examination of hair - scale examination	2
8.	Examination of pollen	2
9.	Documentation of blood splatter	2
10	Interpretation of blood patterns	1

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	05
Viva on Project/Seminar/Assignments	05
Practical Record(s)	05
Class performance/Participation	05
Total	25

**Semester IV-Forensic Science
Core Course Content
FS-403 - Forensic Psychology**

Credits: 3

Hours: 45

Course Title: Forensic Psychology	Course Code: FS-403
Course Type: Core Practical, L-T-P: 3-0-0	Course Credits: 03
Total Contact Hours: 45	Duration of ESA: 3 Hours
Formative Assessment Marks: 30	Summative Assessment Marks: 45

Course Outcomes (COs):

After successful completion of the course, the student will be able to:

- To orient students in the discipline of forensic psychology.
- To provide an understanding of the techniques used in forensic psychology & to explain the concepts of psychology.
- illustrate the applications of forensic psychology.
- assess the relationship between psychology and criminal behaviour.
- recommend the tools and techniques for use in forensic psychology.

**Semester IV-Forensic Science
Core Content I
FS-403 - Forensic Psychology**

Unit 1: Basic aspects of Psychology 10 hours

Psychology: introduction, definition and goals; originating schools of psychology; Current psychological perspectives: biological, psychodynamic, behavioristic, humanistic, cognitive and cultural; Basic psychological processes: sensation- selection, sensory adaptation, analysis and coding; Perception: sensing, perceiving, classifying, Gestalt principles; States of Consciousness: altered states of consciousness, sleep, need for sleep, sleep stages, dream analysis-signs and symbols; Memory: information processing view, encoding, storage and retrieval, three memory systems: Sensory, short term memory (STM) and long term memory (LTM); Neurobiology of Memory.

Unit 2: Introduction to Forensic Psychology 10 hours

Definition and fundamental concepts of forensic psychology and forensic psychiatry. Psychology and law. Ethical issues in forensic psychology; Assessment of mental competency; Mental disorders and forensic psychology; Psychology of evidence: eyewitness testimony, confession evidence; Criminal profiling; Psychology in the courtroom (with special reference to Section 84 of IPC); Classification of mental disorders; Diagnostic and Statistical Manual of Mental Disorders (DSM IV); International Classification of Diseases (ICD) 10.

Unit 3: Criminal Behaviour and Psychology 10 hours

Psychopathology and personality disorder. Psychological assessment and its importance. Serial murderers. Psychology of terrorism. Biological factors and crime: social learning theories, psycho-social factors, abuse. Juvenile delinquency: theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Unit 4: Tools and Techniques in Forensic Psychology

15 hours

Tools for detection of deception: interviews, non-verbal detection, statement analysis, voice stress analyzer: Layered Voice Analysis (LVA); Hypnosis; Polygraph: operational and question formulation techniques, the guilty knowledge test; Brain electrical oscillation signature profiling (BEOS) and Narco-analysis: principle, theory and question formulation; Ethical and legal issues; Personality assessment inventories: Minnesota Multiphasic Personality Inventory (MMPI), Personal Activity Intelligence (PAI); Projective techniques: Rorschach, Thematic Apperception Test (TAT).

References

1. Veeraraghavan, P. V. (2009). *Handbook of Forensic Psychology*. Delhi: Selective and Scientific Books.
2. Baron, R.A. (2004). *Psychology*: 5th edn. Pearson Education.
3. Bartol, C.R & Bartol, A.M. (2008). *Introduction to Forensic Psychology: Research and Application*. SAGE publications.
4. Carson, R.C., Butcher J.N. & Mineka. S.M (2000). *Abnormal Psychology and Modern Life*: C, 11thedn. Dorling Kindersley (India) Pvt. Ltd.
5. Coon, D.&Mitterer, J.O. (2013) *Introduction to Psychology: Gateways to Mind and Behaviour*: 13th ed. Cengage Learning.
6. Weiten, W. (2002). *Themes and variations*: 5th edn. Brooks/Cole, Publishing Co.
7. Wrightsman, Lawrence S. & Fulero, S. (2008). *Forensic Psychology*. Wadsworth / Thomson Learning.

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	15
Written Assignment/Presentation/Project / Term	10
Class performance/Participation	05
Total	30

Semester IV-Forensic Science
FS-406 Forensic Psychology Practical

Credits: 2

Hours: 60

Course Title: Basic Forensic Chemistry Lab	Course Code: FS-406
Course Type: Core Practical, L-T-P: 0-0-4	Course Credits: 02
Total Contact Hours: 60	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

<p>At the end of the course the student should be able to:</p> <ul style="list-style-type: none"> ● To enable students to conduct psychological tests ● To train students to apply psychological tools in forensic psychology ● Assess the psychology of an individual ● design protocols for the psychological assessment of an individual ● demonstrate the execution of assessment tools
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Lab Course Content: List of experiments to be conducted

S.No	Experiment	15 Units (1unit- 4hrs)
1.	Reliability of eyewitness testimony through a video.	1
2.	Analysis of a crime case involving serial murders; Commenting on the psychological traits of the accused.	1
3.	Analysis of a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.	1
4.	IQ test using Bhatia's Battery	1
5.	Thematic Apperception Test	2
6.	Demonstration of MMPI	2
7.	Analysis of a criminal case in which Narco-analysis was used as a means to detect deception.	2
8.	Question formulation for a simulated case with respect to Polygraph/ Brain Electrical Oscillation Signature Profiling (BEOS)	2

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	05
Written Assignment/Presentation/Project /Term papers/Seminar	05
Viva on Project/Seminar/Assignments	05
Practical Record(s)	05
Class performance/Participation	05
Total	25

Course pattern and scheme of examination for B.Sc./ B.Sc. (Hons.) as per NEP (2021-22 onwards)
Subject: FORENSIC SCIENCE

SL No.	Semester	Title of the paper	Teaching hours	Hours / week		Examination Pattern Max. & Min. Marks /Paper						Duration of Exam (hours)		Total Marks / paper	Credits	
				Theory	Practical	Theory			Practical			Theory	Practical		Theory	Practical
						Max.	MIN.	IA	Max.	MIN.	IA					
1	III	CORE subject (Theory + Practical)	45	3	4	45	14	30	25	9	25	3	3	125	3	2
		CORE subject (Only Theory)	45	3	-	45	14	30	-	-	-	3	-	75	3	-
		Open elective	42	3	-	45	14	30	-	-	-	3	-	75	3	-
		AECC	42	3	-	45	14	30	-	-	-	3	-	75	3	-
			28	2	-	30	9	20	-	-	-	2	-	50	2	-
		Skill Enhancement Course	60	-	4	-	-	-	25	9	25	-	3	50	-	2
Value Added	14	1	-	15	5	10	-	-	-	1	-	25	1	-		
2	IV	CORE subject (Theory + Practical)	45	3	4	45	14	30	25	9	25	3	3	125	3	2
		CORE subject (Only Theory)	45	3	-	45	14	30	-	-	-	3	-	75	3	-
		Open elective	42	3	-	45	14	30	-	-	-	3	-	75	3	-
		AECC	42	3	-	45	14	30	-	-	-	3	-	75	3	-
			28	2	-	30	9	20	-	-	-	2	-	50	2	-
		Skill Enhancement Course	60	-	4	-	-	-	25	9	25	-	3	50	-	2
Value Added	14	1	-	15	5	10	-	-	-	1	-	25	1	-		

Scheme of Internal Assessment Marks: Theory

Sl. No	Particulars	IA Marks
1	Attendance	05
2	Internal Tests (Minimum of Two)	15
3	Assignments /Seminar / Case Study / Project work / Reports on - Field visits made for observation and collection of data etc.,	10
	TOTAL Theory IA Marks	30

Scheme of Internal Assessment: Marks Practicals

Sl. No.	Particulars	IA Marks
1	Practical Test	05
2	Submission of Project Report	05
3	Viva-voce on project report	05
4	Active participation in practical classes (Attendance)	05
5	Practical Record(s)	05
	TOTAL Theory IA Marks	25

Blue Print format (Three Credit Course)

Blue Print

Maximum Marks : 45

Duration : 2½ hours

Section A : 5 Questions of 8, each carrying 2 marks (5 x 2 = 10)

Section B : 3 Questions of 5, each carrying 4 marks (3 x 5 = 15)

Section C : 2 Questions of 4, each carrying 10 marks (2 x 10 = 20)

Model Question Paper

III Semester Forensic Psychology (3 Credit)

Time: 2 ½ Hours

Max Marks :45

SECTION – A: (Answer *all* the following questions. Each questions carries one mark) **(10 X 1= 10)**

1. Who is Sigmund freud?
2. Which statement is right related to forensic psychology?
3. What is social learning?
4. Who is Ceasor Lombroso?
5. What is Deviance?
6. What is Psychopathology?
7. What is terrorism?
8. What is profiling?

SECTION – B: (Answer *any three* questions. Each question carries five marks. **(3 X 5= 15)**)

9. Write in brief about forensic psychology and psychology.
10. Briefly explain about Ethical issues in forensic psychology.
11. Critically examine social learning theories related to crime?
12. What is child abuse? Quote any two of them with an example.
13. What are the different theories of offending?

SECTION – C: (Answer *any two* questions. Each question carries 10 marks). **(2 X 10= 20)**

14. Describe in detail about different aspect of forensic psychology and its significance.
15. Write in detail about Psychological theories of crime with illustrations.
16. Explain in detail about drug addiction, serial murderers and crime.
17. Describe in detail about detection deception with different scientific methods.

**Model Question Paper
Forensic Psychology (2 credit)**

Total Marks: 25M

Duration: 3 Hours

1. Performance of any one practical from the list with procedure writing, analysis and results. (5X2=10M)
2. Procedure and principle writing of two one experiments. (5X 2M)
3. Viva-Voce 5M

25 M

**Model Question Paper (Formative Assessment)
House examination Test
Forensic Psychology**

Total Marks: 15M

Duration: 1 hr

- I. Write **any five** questions and give brief illustrations where ever necessary. (3 x 5 =15)
1. What is Psychopathology and personality disorder? Briefly explain.
 2. Briefly explain about tools of deception.
 3. What is criminal profiling? Quote different steps of it.
 4. Write in detail about Polygraphy.
 5. Explain in detail about Forensic psychology and law.
 6. Write in detail about Psychological theories of crime with illustrations.
 7. Explain in detail about drug addiction, serial murderers and crime.