STUDY & EVALUATION SCHEME

OF

BACHELOR OF SCIENCE IN FORENSIC SCIENCE

[APPLICABLE W.E.F. ACADEMIC SESSION 2017-18 TILL REVISED]

TEERTHANKER MAHAVEER UNIVERSITY
Delhi Road, Moradabad, Uttar Pradesh
244001 Website: www.tmu.ac.in

TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Study & Evaluation Scheme
Of
Bachelor of Forensic Science
SUMMARY

Programme : **Bachelor of Forensic Science**(BFS)

Duration : Three years full time (six semesters)

Medium : English

Minimum Required Attendance : 75%

Maximum Credits : 153

Minimum Credits required for the degree: 145

Assessment :

Internal	External	Total
40	60	100

Internal Evaluation (Theory Papers):

Class Test I	Class Test II	Class Test III	Attendance	Assignment	Total
Best two out of the three					
10	**10**	10	10	10	**40**

Evaluation of Practical/Dissertations & Project Reports:

Internal	External	Total
50	50	100

Duration of Examination :

External	Internal
3 hrs.	1.5hrs.

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester examination and teachers continuous evaluation. (i.e. both internal and external). A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have secured at least 50 % marks in aggregate to clear the semester. The subject marked with asterisk (*) in I & II Semesters are noncore papers.

Assessment:

	Internal	External	Total
Theory	40	60	100
Practical	50	50	100

English External Evaluation & Assessment: The students will be evaluated on all four parameters of LSRW

External Exam	Internal Assessment	Total
50	50	100

Internal Practical Evaluation (50 marks)

The Internal evaluation would also be done by the Internal Examiner based on the experiment performed during the internal examination

Experiment	Attendance	Viva+record	Total Internal
(30 MARKS)	(10 MARKS)	(10 MARKS)	(50 MARKS)

External Practical Evaluation (50 marks)

The external evaluation would also be done by the External Examiner based on the experiment performed during the external examination.

Experiment	File work	Viva	Total External
(30 MARKS)	(10 MARKS)	(10 MARKS)	(50 MARKS)

Internal Theory Assessment:40

Best 2 out of Three CTs	Attendance	Assignments	Total
20	10	10	40

English Internal Theory Assessment: 50

Best 2 out of Three CTs	Attendance	Workbook Assignments & Viva	Total
20	10	10+10	50

Viva to be carried out by external English faculty from within the university

Question Paper Structure (Theory External Examination):

Max. Marks in each theory paper will be of 60 marks. The question paper shall consist of 6 questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be Compulsory. Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 2 marks each). Out of the remaining five questions, the long answer pattern will have internal choice with unit wise questions with internal choice in each unit. In units having numerical, weightage and information should be available both in the syllabus and the paper pattern. The weightage of Question No. 2 to 6 shall be 10 marks each.

Admission to the Next Semester: As per the university norms.

OVERVIEW OF CURRICULUM

I. CORE PAPERS

YEAR	SEMESTER	NAME OF THE PAPER
YEAR I	FIRST SEMESTER	Basics of Forensic Science
		Basics of Chemistry I or Basics of Physics I
		Basics of Biology I
		Basics of Computer Science
		English Communication & Soft Skills – I
	SECOND SEMESTER	
		Criminal Law
		Basics of Chemistry I or Basics of Physics I
		Basics of Biology I
		Basics of Cyber Forensic
		English Communication & Soft Skills – II

YEAR	SEMESTER	NAME OF THE PAPER
YEAR II	THIRD SEMESTER	Forensic Medicine
		Forensic Chemistry I or Forensic Physics I
		Forensic BiologyI
		Forensic Psychology
		Environmental Science
		English Communication & Soft Skills – III
	FOURTH SEMESTER	Forensic Anthropology
		Forensic Chemistry II or Forensic PhysicsII
		Forensic BiologyII
		Digital and Cyber Forensic I
		Quality and management
		English Communication & Soft Skills – IV

II. COMPULSORY ELECTIVE PAPER POOL— Choose any pool in semester I& II.

YEAR	SEMESTER	NAME OF THE PAPER
YEAR III	FIFTH SEMESTER	Forensic Ballistic
		Questioned Documents
		Serology and DNA typing
		Digital and Cyber Forensic II
		Forensic Dermatoglyphics
	SIXTH SEMESTER	Forensic Toxicology
		Technological Methods in Forensic Science
		Introduction to Research Methodology
		Project/ Dissertation

SEMESTER	A. Elective Pool A	A. Elective Pool B
I&II SEMESTER	Basics of Chemistry Basics of Biology	Basics of Physics Basics of Biology
III & IV SEMESTER	Forensic Chemistry Forensic Biology	Forensic Physics Forensic Biology

III. COMPULSORY COURSE

SEMESTER III
Environmental Science

IV.NON CORE

SEMESTER I to IV
English Communication & Soft Skills

YEAR-I

SEMESTER I

	S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
SEMESTER I	1	BFS–S-101	Basics of Forensic Science I	4	-	-	4	40	60	100
	2	BFS-S-102 /BFS-S-107	Basics of Chemistry I/ Basics of Physics I	4	-	-	4	40	60	100
	3	BFS-S-103	Basics of Biology I	4	-	-	4	40	60	100
	4	BFS-S-104	Basics of Computer Science	4	-	-	4	40	60	100
	*5	* BFS-S-199	*English Communication & Soft Skills – I	3	-	2	4	50	50	100
	6	BFS-S-151	Basics of Forensic Science I Practical	-	-	2	1	50	50	100
	7	BFS-S-152/ BFS-S-157	Basics of Chemistry I Practical/ Basics of Physics practical I	-	-	2	1	50	50	100
	8	BFS-S-153	Basics of Biology I Practical	-	-	2	1	50	50	100
	9	BFS-S-154	Basics of Computer Science Practical	-	-	2	1	50	50	100
	Total			**19**	**-**	**10**	**24**	**410**	**490**	**900**

- **Note:** Elective Paper- Basic of Chemistry BFS-S-(102T+152P)/ Basic of Physics BFS-S-(107T+157P)
- **Note:** Subject marked with asterisk (*) are noncore papers.
- **Note:** Three lectures per week are designated for Library/ Seminar/Group Discussion
- **Note:** Fours Hrs per week are designed for Forensic science laboratory Visit

SEMESTER II

	S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
SEMESTER II	1	BFS –S-201	Criminal Law	4	-	-	4	40	60	100
	2	BFS-S- 202 /BFS –S-207	Basics of Chemistry II/ Basics of Physics II	4	-	-	4	40	60	100
	3	BFS-S- 203	Basics of Biology II	4	-	-	4	40	60	100
	4	BFS-S- 204	Basics of Cyber Forensic	4		-	4	40	60	100
	*5	*BFS-S-299	*English Communication & Soft Skills – II	3	-	2	4	50	50	100
	6	BFS-S-251	Basics of Forensic Science II Practical	-	-	2	1	50	50	100
	7	BFS-S- 252/ BFS-S- 257	Basics of Chemistry II Practical/Basics of Physics II practical	-	-	2	1	50	50	100
	8	BFS –S-253	Basics of Biology II Practical	-	-	2	1	50	50	100
	9	BFS –S-254	Basics of Cyber Forensic II Practical	-	-	2	1	50	50	100
	Total			**19**	**-**	**10**	**24**	**410**	**490**	**900**

- **Note:** Elective Paper- Basic of Chemistry BFS-S-(202T+252P)/ Basic of Physics BFS-S-(207T+257P)
- **Note:** Subject marked with asterisk (*) are noncore papers.
- **Note:** Three lectures per week are designated for Library/ Seminar/Group/Discussion
- **Note:** Four Hrs per week are designed for Forensic science laboratory visit

Year-II

SEMESTER III

	S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
SEMESTER III	1	BFS-S- 301	Forensic Medicine	4	-	-	4	40	60	100
	2	BFS-S-302/ BFS-S- 307	Forensic Chemistry I/ Forensic Physics I	4	-	-	4	40	60	100
	3	BFS –S-303	Forensic Biology-I	4	-	-	4	40	60	100
	4	BFS-S- 304	Forensic Psychology	4	-	-	4	40	60	100
	*5	*BFS –S-399	*English Communication & Soft Skills – III	3	-	2	4	50	50	100
	6	BFS-S-306	Environmental Science	4	-	-	4	40	60	100
	7	BFS-S- 351	Forensic Medicine Practical	-	-	2	1	50	50	100
	8	BFS-S- 352/ BFS –S-357	Forensic Chemistry Practical/ Forensic Physics Practical	-	-	2	1	50	50	100
	9	BFS-S- 353	Forensic Biology Practical	-	-	2	1	50	50	100
	10	BFS-S-354	Forensic psychology Practical	-	-	2	1	50	50	100
	Total			**23**	**-**	**10**	**28**	**450**	**550**	**1000**

- **Note:** Elective Paper- Forensic Chemistry BFS-S-(302T+352P)/ Forensic Physics BFS-S-(307T+357P)
- **Note:** One lecture per week are designated for Library/ Seminar/Group Discussion
- **Note:** two Hrs per week are designed for Forensic science laboratory visit

SEMESTER IV

	S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
SEMESTER IV	1	BFS-S-401	Forensic Anthropology	4	-	-	4	40	60	100
	2	BFS-S-402 /BFS-S- 407	Forensic Chemistry II/ Forensic Physics II	4	-	-	4	40	60	100
	3	BFS-S- 403	Forensic Biology-II	4	-	-	4	40	60	100
	4	BFS –S-404	Digital and Cyber Forensic I	4	- -	-	4	40	60	100
	*5	*BFS –S-499	*English Communication & Soft Skills – IV	3	-	2	4	50	50	100
	6	BFS-S-406	Quality management in Laboratory	4	-	-	4	40	60	100
	7	BFS –S-451	Forensic Anthropology Practical	-	-	2	1	50	50	100
	8	BFS –S-452/ BFS-S- 457	Forensic Chemistry Practical-II/ Forensic Physics Practical-II	-	-	2	1	50	50	100
	9	BFS-S- 453	Forensic Biology Practical-II	-	-	2	1	50	50	100
	10	BFS-S-454	Digital and cyber forensic –I Practical	-	-	2	1	50	50	100
	Total			**23**	**-**	**10**	**28**	**450**	**550**	**1000**

- **Note:** Elective Paper- Forensic Chemistry BFS-S-(402T+452P)/ Forensic Physics BFS-S-(407T+457P)
- **Note:** One lecture per week are designated for Library/ Seminar/Group Discussion
- **Note:** Two Hrs per week are designed for Forensic science laboratory Visit

Year-III

SEMESTER V

	S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
SEMESTER VI	1	BFS –S-501	Forensic Ballistic	4	-	-	4	40	60	100
	2	BFS-S-502	Questioned Documents	4	-	-	4	40	60	100
	3	BFS -S-503	Serology and DNA typing	4	-	-	4	40	60	100
	4	BFS –S-504	Digital and Cyber Forensic-II	4	-	-	4	40	60	100
	5	BFS –S-505	Forensic Dermatoglyphics	4	-	-	4	40	60	100
	6	BFS –S-551	Forensic Ballistic Practical	-	-	2	1	50	50	100
	7	BFS –S-552	Questioned Document Practical	-	-	2	1	50	50	100
	8	BFS –S-553	Serology and DNA typing Practical	-	-	2	1	50	50	100
	9	BFS –S-554	Digital and Cyber Forensic Practical	-	-	2	1	50	50	100
	10	BFS –S-555	Forensic Dermatoglyphics Practical	-	-	2	1	50	50	100
	Total			**20**		**10**	**25**	**450**	**550**	**1000**

- **Note:** Two lectures per week are designated for Library/seminar/group discussion
- **Note:** Four Hrs per week are designed for Forensic science laboratory Visit

SEMESTER VI

	S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Tota
SEMESTER V	1	BFS –S-601	Forensic Toxicology	6	-	-	6	40	60	100
	2	BFS-S-602	Technological Methods in Forensic Science	6	-	-	6	40	60	100
	3	BFS -S-603	Introduction to Research Methodology	6	-	-	6	40	60	100
	4	BFS –S-604	Dissertation	-	-	8	4	-	100	100
	5	BFS –S-651	Forensic Toxicology Practical	-	-	2	1	50	50	100
	6	BFS –S-652	Technological Methods in Forensic Science Practical	-	-	2	1	50	50	100
	7	BFS -S-653	Introduction to Research Methodology (Practical)	-	-	2	1	50	50	100
	Total			**18**		**14**	**25**	**270**	**430**	**700**

- **Note:** Four lectures per week are designated for Library/ Seminar/Group

❖ PROJECT CREDITS: 8

The Project will be based on a research topic in Forensic Science/Criminology. The topic will be assigned in consultation with police and forensic science establishments, giving due consideration to the problem areas faced by these institutions. The students will be expected to undertake extensive field work, in collaboration with mobile police laboratories. One month is assigned for completion of the project.

FIRST SEMESTER

PAPER-I (BFS-S-101): BASICS OF FORENSIC SCIENCE

L	T	P	C
4	0	2	5

Learning Objectives: To understand the nature, meaning and significance of forensic science and its relation to crime and criminal.

UNIT I

Crime: Definition of crime, characteristics of crime, classification of crimes, A brief ideas about White collar crime, professional crime, organized crime, present scenario of crime in India.

UNIT II

Crime scene Investigation: Definition of Crime Scene. Classification of crime Scene: indoor & outdoor, primary & secondary, macroscopic & microscopic crime scene. Significance of crime scene, argument and ethics of crime scene.

Physical evidence, Definition, classification of physical evidence, types of physical evidences, sources of physical evidence, signification and value of physical evidence, linkage between crime scene, victim and criminal, study of some special crime scene such as mass disaster, terror attack, geological scene and explosive etc.

UNIT II

Basics of Forensic Science: Introduction Global History and Scope, Need and Development Principles, emphasizing on Specific contribution of Scientists in the field of Forensic Science.

UNIT IV

Domains in Forensic Science: Branches of Forensic Science, Police officers, Prosecution, Judicial Officers and Medico legal expert etc. Role and Qualifications of forensic scientists. Code of conduct for forensic scientists, Ethical issue in Forensic Science, professional standards for practice of Criminalistics, sanction against expert for unethical conduct.

UNIT V

Organization set up of Forensic Science Laboratory: Structure and function of State and regional Forensic Science Laboratory, Central Forensic Science Laboratory and facility provided, Mobile Forensic Science Laboratory. Directorate of Forensic Science Service. Police and Forensic scientist relationship, role of FSL in criminal investigation, relationship between forensic expert and judiciary officer, Importance of FSL, National and International scenario of FSL, facilities provided in forensic science laboratory.

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

1. Review the history and development of the forensic science sub-disciplines covered.
2. List the services performed by a crime investigators, crime laboratories and medical examiners.
3. Discuss the role of a forensic scientist.
4. Familiarize oneself with the organization of a forensic science laboratory.
5. Need and nature of forensic science.

SUGGESTED READINGS

1. 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. Nordby, *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 Press, Boca Raton (2013).

FIRST SEMESTER

PRACTICAL PAPER I: (BFS-S-151) BASICS OF FORENSIC SCIENCE

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 crime.

FIRST SEMESTER

PAPER-II (BFS-S-102): BASICS OF CHEMISTRY I

L	T	P	C
4	0	2	5

Learning Objectives: Obtain a general knowledge of the basic principles and functions of inorganic, organic and physical chemistry.

UNIT –I

Periodic Properties: Atomic radii, ionization potential, electron affinity, electro negativity, metallic characters, non-metallic characters and magnetic properties, d-block elements, transition series (3d) elements with respect to electronic configuration, size, ionization energy, metallic nature, oxidation states, magnetic properties, colour of salts, catalytic properties, complex formation behaviour.

UNIT –II

Organic Compounds

Alcohols: Nomenclature, methods of preparation, physical and chemical properties, identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.

UNIT –III

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses

UNIT- IV

Liquid state: Free volume of liquid and density measurement, physical properties of liquid, Vapor pressure, surface tension surfactants, viscosity, molar refraction, optical activity structure of liquid, determination of surface tension by stalagnometer method (drop number method), viscosity by Ostwald's viscometer method and refractive index by Abbe's refractometer method. Effect of temperature on surface tension viscosity and refractive index Applications of surface tension, viscosity and refractive index.

UNIT –V

Thermo chemistry: Change in internal energy, enthalpy of reaction, relation between ΔH and ΔE, different types of thermo chemical equations, energy change during transition or phase change, bond energy.

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

1. Understand modern chemical principles both in theory and practice.
2. Importance of the Periodic Table of the Elements, how it came to be, and its role in organizing chemical information.
3. The principal laws of thermodynamics and how these dictate the behavior of chemical substances
4. Skills of thermo analysis.
5. Fluid Mechanics
6. Carbon Compounds with different Functional groups

SUGGESTED READING

1. Principles of Physical Chemistry and Puri, Sharma and Pathania,Vishal Publishing Company, 46th Edition 2013
2. Organic Chemistry by Moris and Boyed, Pearson Publishing, 7th edition 2011.
3. Text book of organic chemistry by Arun Bahl and B. S. Bahl, S. Chand Publishing, 2016

FIRST SEMESTER

PRACTICAL PAPER II: (BFS-S-152): BASICS OF CHEMISTRY I

LIST OF PRACTICALS

1. Introduction to Chemistry laboratory apparatus and instruments.
2. Standardization of given liquid by primary standard.
3. To determine surface tension of the given liquid by using stalagmometer.
4. To determine relative viscosity of given organic liquids by viscometer (Four liquids)
5. pH metric measurement
   (a)To prepare buffers and standardization of pH meter.
   (b) Determine the molarity of Hcl pH-metrically provided M/10 NaOH.
6. Determination of functional groups.
7. Analysis of acid and basic radicals.
8. Detection of elements.

FIRST SEMESTER

PAPER-II (BFS-S- 107): BASICS OF PHYSICS I

L	T	P	C
4	0	2	5

Learning objectives

This course provides knowledge and concepts of physics related laws. It includes simple and basic ideas for basic and better exposure of students.

UNIT -I

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.

UNIT -II

Thermal Physics: concept of temperature, ideal gas equation and its law. Vander Waal's equation, reversible and irreversible process, Zeroth law, first, second and third law of thermodynamics. Carnot's cycle.

UNIT -III

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.

UNIT –IV

Wheat-stone bridge and its sensitivity. Rectifiers, Amplifiers, semiconductor and its type of junction. Paramagnetic, diamagnetic, ferromagnetic materials and properties.

UNIT -V

Nuclear PhysicsNuclear 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.

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

1. Will help to understand the quantum mechanism and electromagnetic physic s and thermal physics.
2. Will be able to demonstrate general physic phenomena.
3. How to apply basics physics laws in daily concepts.

SUGGESTED READINGS

1. Engineering Physics Seventh Enlarged, Revised Edition 2004, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd. ISBN 81-219-0817-5
2. Optics – Ajoy Ghatak (3rd Edition) Mc. Graw Hill Co.
3. Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication.
4. Advanced Practical Physics – Worsnop and Flint Littlehampton Book Services Ltd; 9th Revised edition edition (1 December 1951)
5. A Text book of advanced Practical Physics – Samir Kumar Ghosh, New Central Book Agency – (3rd edition)

FIRST SEMESTER

PRACTICAL PAPER II: (BFS-S-157): BASICS OF PHYSICS I

LIST OF PRACTICALS:

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

FIRST SEMESTER

PAPER-III (BFS-S- 103): BASICS OF BIOLOGY I

L	T	P	C
4	0	2	5

Learning Objectives: To provide basic knowledge about Biology with objective to create platform for learning involvement of Biological evidence Investigation related to Forensic Biology and its domains.

UNIT I

Cell biology -Ultra structure of prokaryotic & eukaryotic cell-(both plant and animal cells), Structural organization and functions of plasma membrane and cell wall of prokaryotes & eukaryotes. Cellular Organelles and Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments).

UNIT II

Introduction, characteristics, chemical structures and Biochemistry of Amino acids, proteins, enzymes, nucleic acid carbohydrates, lipids.

UNIT III

Plant physiology: Plant anatomy, morphology of leaves, stem, flowers, roots, classification and taxonomy and system of classification of angiosperms (Bentham and Hooker) and Gymnosperms (chamberlain) scale. Mechanical and conducting tissue systems in plants types

.UNIT IV

Introduction to osteology and odontology: Human skeletal system, Formation of bones, different types of bones, ossification, Dental structure of humans, types of teeth and arrangement.

UNIT V

Basics of Microbiology: Broad classification of microorganisms Concept of pure culture technique, stains and staining techniques, Control of Microorganisms: Physical & Chemical methods of control.

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

1. Obtain a general knowledge about basic Structure of cell including the metabolic reactions that occur in cells.
2. Outline the structure of the bio molecules found in all living organisms.
3. Explain the structure and function of organ systems in the human body.
4. Describe cellular, biochemical, and physiological aspects of microorganisms and recognize the similarities and differences between microbial groups (bacteria, archaea, fungi, protozoa, viruses, viroids, and prions).

SUGGESTED READINGS

1. Cell Biology, Sixth Edition International,Students Edition, Gerald Karp,Wile Publications, 2010
2. Human Physiology : From Cells to Systems, II Lauralee Sherwood, Cengage Learning, 2008
3. Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D. and James Darnell, J. Molecular Cell Biology , Freeman, 6th edition n 2007.
4. Alberts, B. et al. Essential Cell Biology, Garland, 3rd edition n 2009.
5. Karp, G. Cell and Molecular Biology: Concepts and Experiments. Wiley, 6th edition 2010.
6. Chaurasia B.D., Human Anatomy CBC Publishers , 7th Edition 2016
7. Chatterjee C.C., Human Physiology, Medical Allied Agency, 1st edition , 1951
8. Text book of Microbiology, Ananth Naryan Pannikar, 10th edition 2017

FIRST SEMESTER

PRACTICAL PAPER III: (BFS-S-153): BASICS OF BIOLOGY I

LIST OF PRACTICALS:

1. Qualitative analysis of sugar, proteins, lipids and nucleic acids.
2. Study of Enzyme (Amylase), study the effect of substrate concentration on Enzyme activity.
3. Estimation of protein by Lowry method.
4. Staining Techniques, Simple, Negative staining, Gram Staining,
5. Study of aseptic techniques-preparation of cotton plugs for test tubes and pipettes, wrapping of Petri- plates and pipettes, transfer of media and inoculums.
6. Staining of bacteria :
    a. Simple staining.
    b. Gram's staining.

FIRST SEMESTER

PAPER – IV (BFS-S- 104): BASICS OF COMPUTER SCIENCE

L	T	P	C
4	0	2	5

Learning Objective: To provide basic knowledge about computer components, software and hardware with objective to create platform for learning complex techniques and advanced paper related to cyber forensics.

UNIT 1

Basics of Computers: History, Generation & Classification of Computers, Computer organization, components of computers – input output device, CPU, memory-RAM, ROM and external storage devices.

UNIT II

Data representations: integers, real, binary, octal hexadecimal & their conversions logic gates – Negation, OR, AND, X OR etc.

UNIT III

Introduction to Operating System: Basics of operating system, memory structure, concurrency, scheduling, file system, synchronization and memory management examples of operating systems-Windows and Linux.

UNIT IV

Basics of Networking- Components, Architecture, networking protocols, types of computer network, network topologies, network security- threats, vulnerabilities, Access control, virus, Trojans etc, security plan and policies.

UNIT V

Introduction to Internet: World Wide Web, E-mails, chat, search engines, connectivity. Internet Vs Intranet, virtual private network.

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

1. Have knowledge about different computer hardware and software.
2. Able to understand number system and methods for conversion from one number system to another.
3. Basic knowledge about different logic gates and computer architecture.
4. Have knowledge about operating system its type, features and common components.
5. Have knowledge about different computer network, protocols and network devices.
6. Able to effectively use the different services provided over the internet

SUGGESTED READINGS

1. Cyber Forensic - Concepts and Approaches by Ravi Kumar & B Jain, ICFAI University Press, first edition 2006
2. Cyber Forensic - Tools & Practices by Ravi Kumar & B Jain, ICFAI University Press, first edition 2006
3. Forensic Computing: A Practitioner's Guide by A J Sammes & Brian Jenkinson. Springer-Verlag London, 2nd edition 2007
4. Scene of the Cybercrime: Computer Forensics Handbook by Syngress, Elsvire, 2nd edition 2008

FIRST SEMESTER

PRACTICAL PAPER IV: (BFS-S-154): BASICS OF COMPUTER SCIENCE

LIST OF PRACTICAL:

1. Finding results of different logic gates and their combinations.
2. Working with windows file (creation, modification, deletion, attributes) folder (creation, nesting, attributes). Working with Linux- file (Creation, modification, deletion, attributes), folder (creation, nesting attributes).
3. Understanding LAN-client/server, user creation, password protection. Use of internet- visiting websites with given URL, searching information using search engine. Use of E-mail, creating e-mail, sending and receiving e-mails with attachments.
4. Networking commands- like ping, IP configuration etc, with various switches. Tracing E-mail, finding senders IP address, of received email, tracing route of email received using tool available on internet, e.g. Visual Trace Route etc.

FIRST SEMESTER

*PAPER-V (BFS-S-199): ENGLISH COMMUNICATION & SOFT SKILLS – I

L	T	P	C
3	0	2	4

Objective: To comprehend and communicate in simple English

Module -1: Introduction to English language (4 Lectures)

a) Role and significance of English language in the present scenario

b) English Language: Its relevance for the Indian industry

c) Introduction to Listening, Speaking, Reading, Writing (LSRW) and benchmarking of the class

[Note: As part of classroom activity, a guest lecture from an industry representative/Director (CRC) and maintaining progress card for each student on LSRW for future reference]

Module -2: Phonetics& Functional Grammar (14 Lectures)

a) Pronunciation and daily usage correction (speak with differences between p/b, s/sh, f/ph, t/d, v/w sounds)

b) Parts of speech, articles, tenses, verbs and modals

c) Practice of daily use words, numerals and tongue twisters

d) Vocabulary building, Construction of simple sentences: Basic sentence pattern, subject and Predicate

[Note: As part of classroom activity, language games, tongue & jaw exercises, simple passages from the newspapers for oral drills in the classroom and practice tests (written and oral)]

Module -3: English Communication- About Myself (14 Lectures)

a) Let's talk, making conversation, meeting and greeting

b) Introducing myself, my family and my friends

c) My opinions, my likes and dislikes

d) Life at college, hostel and workplace

[Note: As part of classroom activity, use the Work book for reference for classroom and home assignments, carry out practice tests (written and oral)]

Module -4: Personality Development-I (8 Lectures)

a) First impression: Dressing sense, good manners, speaking well and respectably.

b) Positive Attitude: Being happy and alert, a good listener and a good friend.

c) Consultation among peers: Soliciting advice and giving advice.

d) Goal setting, confidence building& handling rejection

[Note: As part of classroom activity, refer Workbook for classroom and home assignments; carry out practice tests (written and oral)]

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

1. Students will realise the significance of English for their career progression.
2. Benchmarking the students in the first semester to observe their progression in terms of LSRW.
3. Students will be able to understand distinct sounds and improve pronunciation.
4. Students will improve their English vocabulary of daily usage.
5. Students will be able to form simple sentences to talk about themselves, friends and relatives.
6. Students will be able to imbibe the pre-requisites of personality development.

Reference Books:

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation .
2. English Grammar Composition & Usage by J.C. Nesfield, Macmillan Publishers.
3. The Business letters by Madan Sood, Goodwill Publishing House, New Delhi.
4. Communication Skills by Sanjay Kumar &PushpLata, Oxford University Press.

SECOND SEMESTER

PAPER-I (BFS-S-201): CRIMINAL LAW

L	T	P	C
4	0	2	5

Learning Objectives: To study about Criminal law and Police organization.

UNIT-I

Definition 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, Primary and Sanctioning Rights Primary and Secondary functions of Court of Law.

UNIT II

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 offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass.

UNIT III

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.

UNIT-IV

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: INTERPOLE- history, structure general and special notices State Police organization: general organization of police at state and range level. Police organization at district level.

UNIT V

Acts Pertaining to Socio-economic and Environmental Crimes.

Dowry Prohibition Act.
Immoral Traffic Prevention Act.
Wildlife Protection Act.
Environment Protection Act.
Untouchability Offences Act.

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

1. Elements of Criminal Procedure Code related to forensic science.
2. Acts and provisions of the Constitution of India related to forensic science.
3. Acts governing socio-economic crimes.
4. Acts governing environmental crimes.
5. police organization setup and their functions

SUGGESTED READINGS

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. Pillia, 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).

SECOND SEMESTER

PRACTICAL PAPER I: (BFS-S-251) CRIMINAL LAW

LIST OF PRACTICALS

1. To prepare a schedule of five cognizable and five non-cognizable offences.
2. To study the powers and limitations of the Court of Judicial Magistrate of First Class.
3. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal Procedure Code.
4. To study a crime case in which an accused was punished on charge of murder under Section 302.
5. To study a crime case in which an accused was punished on charge of rape under Section 375.
6. To cite example of a case in which opinion of an expert was called for under section 45 of the Indian Evidence Act.

SECOND SEMESTER

PAPER-II (BFS-S-202): BASICS OF CHEMISTRY II

L	T	P	C
4	0	2	5

UNIT- I

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

UNIT -II

Chemical Bonding: Types of chemical bond-Covalent bond - definition, directional Characteristic, hybridization, various types of hybridization and shapes of simple molecules, bond strength and bond energy, Ionic bonds - definitions, factors affecting ionic bond formation, Hydrogen bonding, Van-der-Waals forces, coordination bond, Metallic bond and its free electron concept. Empirical and molecular formula.

UNIT -III

IUPAC nomenclature of alkanes, alkenes, haloalkanes, alcohol ether aldehydes, ketones, carboxylic acids, nitro compounds, nitrites including aromatic compounds.Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule.

UNIT -IV

Petroleum products: Composition and Classification, definition of flash Point and fire Point, knocking, octane number, aniline Point. Refining of Petroleum- cracking, thermal & catalytic cracking.

Heterocycles: Introduction, 5 and 6-membered heterocycles, orbital picture of pyrrole, furan, thiophene and pyridine.

UNIT –V

Dyes: Classification of dyes on the basis of structures, and on the basis of mode of application. **Polymers:** Introduction, types of polymers, addition and condensation polymers, introduction to natural products, insecticides and pesticides.

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

1. Understand modern chemical principles both in theory and practice.
2. Skills of gravimetric analysis.
3. Molecule formation skills, bonds and forces in a molecule.
4. Organic Chemistry, Brief description of automobile fuels.
5. Brief introduction to dyes and polymers.

SUGGESTED READINGS

1. Advanced Inorganic Chemistry, Volume-I, Nineteenth Edition, Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan, S. Chand Publication, ISBN- 81-219-0263-0. Concept and model
2. Concise Inorganic Chemistry, Fifth Edition, of Inorganic Chemistry, Third Edition, Douglas Mc. Doniels, Wiley India.J. D. Lee, Wiley India
3. General Chemistry, Sixth Edition, Raymand Chang, McGraw Hill
4. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

SECOND SEMESTER

PRACTICAL PAPER II: (BFS-S-252): BASICS OF CHEMISTRY II

LIST OF PRACTICALS

1. To determine the strength of the given acid conduct metrically using standard alkali solution.
2. To determine strength of given acid.
3. Determination of alkali content in antacid tablet using HCl.
4. Estimation of hardness of water by EDTA.
5. Inorganic micro / semi micro qualitative analysis.
6. Identification of organic compound.
7. Acetylation of aniline: preparation of acetanilide.
8. Benzoylation of aniline: preparation of benzanilide.
9. To determine the molecular weight of a high polymer by using solutions of different concentration.

SECOND SEMESTER

PAPER-II (BFS-S- 207): BASICS OF PHYSICS II

L	T	P	C
4	0	2	5

Learning objectives

This course provides knowledge and concepts of physics related laws. It includes simple and basic ideas for basic and better exposure of students.

UNIT –I

Atomic Physics: Black body radiation, Planck's theory, De Broglie waves. Heisenberg's Uncertainty principle, Rutherford's atomic model. Bohr's atomic model of Hydrogen atom and atomic spectra, Schrodinger wave equation. Moseley's experiment on X-rays, diffraction of X-rays and its application, Radioactivity.

UNIT –II

Wave Optics I -IInterference: Introduction to Interference, Fresnel's Bi-prism, Interference in Thin films, Newton's rings experiment, Michelson's interferometer and its application.

UNIT -III

Wave Optics –II---Resolving Power:Raleigh's criterion, Resolving power of optical instruments: Telescope, Prism and Grating.

UNIT-IV

Diffraction: Introduction to Diffraction and its Types, Diffraction at single slit and double slit. Reflection & Refraction: Introduction to Reflection & Refraction, Lenses: Terminology & application.

UNIT-V

Polarization: Introduction to polarization, Production of Plane polarized light, Bi-referengence, Polarizer and Analyzer, Malus law, Nicol prism, Retarders: Quarter and Half wave plates, Production and detection of linearly, elliptically and circularly polarized light.

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

1. This course helps to understand the atomic energy level their concepts and history.
2. It elaborates microscopic resolution of electron in particles and spectrum theory.
3. It builds on the ideas of wave particles, polarization role of wave equation and ranges of physics via reflections and refraction theory.
4. Students are able to perform related research on advance physics wave optics model.

SUGGESTED READINGS

1. Fundamentals of Optics – Khanna and Gulati (1994), S. Chand.
2. Fundamentals of Optics – Jenkins and White. (4th Edition), 2001, McGraw Hill International.
3. Optics – Ajoy Ghatak , 5th Edition Published by Tata McGraw-Hill Education Pvt. Ltd, 2012
4. Electronic Communication System and Device – Kennedy. (4th Edition),1999 Tata McGraw Hill.
5. Fibre Optics – Geard Kaiser, McGraw Hill, 4th edition 2007 .
6. Advanced course in Practical Physics D. Chattopadhya, PC. Rakshit and B. Saha. (6th Edition) Book and Allied Pvt. Ltd.

SECOND SEMESTER

PRACTICAL PAPERI I: (BFS-S-257): BASICS OF PHYSICS II

LIST OF PRACTICALS:

1) Standard operating procedures for using Vernier Caliper, Micrometer Screw Gauge, Travelling Microscope.
2) Standard operating procedures for using Spectrometer, Combination of lenses.
3) Determination of refractive index of material of prism using Spectrometer.
4) Determination of radius of curvature of Plano convex lens using Newton's rings.
5) Study of Interference with a biprism.
6) Determination the Resolving power of telescope.
7) Determination of Acceptance angle and NA of Optical Fibre.
8) Determination of wavelength of Laser using Plane transmission grating.
9) Determination of Refractive Index of given liquid using Laser.

SECOND SEMESTER

PAPER-III (BFS-S- 203): BASICS OF BIOLOGY II

L	T	P	C
4	0	2	5

Learning Objectives: To provide basic knowledge about Biology with objective to create platform for learning involvement of Biological evidence Investigation related to Forensic Biology and its domains.

UNIT-I

Immunity: Definition, types-natural, acquired, active, passive. Antigens-Definition, types of antigens, Factors influencing antigenicity; Antibody-Definition, structure, types, properties and functions of Immunoglobulin, Antigen and Antibody Reaction-Agglutination, Precipitation.

UNIT-II

Basic concepts of genetics: Genetic material– Discovery, experiments, composition and structure of DNA and RNA, organization of DNA in chromosomes, genetic code, Mendelian principles, Introduction to recombinant DNA technology, its applications in health, agriculture, industries & forensics.

UNIT-III

Human physiology: Introduction to Nervous system, respiratory system, digestive system, circulatory system, endocrine system.

UNIT-IV

The Skeletal System: Functions of the Skeleton, Types of Bone Tissue, Classification of Bones, Factors affecting bone growth and maintenance, The Skeleton, types of joints and movement

UNIT-V

Microscopy- Principle, working, mechanism, construction, ray Diagram, application and forensic significance of compound Microscope Phase Contrast Microscope, Fluorescence Microscope, Polarizing Microscope.

Learning outcome: - After studying this paper the students will know –

1. Understand the overall organization of the immune system
2. Understand DNA replication, transcription, translation as underlying mechanism of inheritance.
3. Mendelian genetics explain the structure and molecular basis of the genetics.
4. Explain the structure and function of organ systems in the human body.
5. To obtain basic laboratory skills such as microscopy.

SUGGESTED READINGS

1. Cell Biology, Sixth Edition International, Students Edition, Gerald Karp,Wile Publications, 2010
2. Human Physiology: From Cells to Systems, II Lauralee Sherwood, Cengage Learning, 2008
3. Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D. and James Darnell, W. H. Freeman; 4th edition (October 1999)
4. J. Molecular Cell Biology , Freeman, 6th edition, 2007.
5. Karp, G. Cell and Molecular Biology: Concepts and Experiments. Wiley, 6th edition 2010.
6. Chaurasia B.D., Human Anatomy CBC Publishers , 7th Edition 2016
7. Chatterjee C.C., Human Physiology, Medical Allied Agency, 1st edition , 1951
8. Principle of Biochemistry by Lehninger, W H Freeman & Co, 6th edition 2012

SECOND SEMESTER

PRACTICAL PAPER III: (BFS-S-253): BASICS OF BIOLOGYII

LIST OF PRACTICALS:

1. To study anatomy of and dissection to study Nervous system/Respiratory system
2. Study of construction and working of compound microscope.
3. Study of instruments: Microscope, Autoclave, Hot air oven, incubator, Ph meter, colorimeter, centrifuge, Laminar air flow
4. Study of beer-lamberts law using colorimeter

SECOND SEMESTER

PAPER – IV (BFS-S- 204): BASICS OF CYBER FORENSIC

L	T	P	C
4	0	2	5

Learning Objectives: To provide knowledge about cyber forensic investigation process, incident response process, forensic tools and biometric applications.

UNIT I

Introduction to Computer/Cyber Forensic, Investigation process. The Goal of the Forensic Investigation, Why Investigate (Internet usage exceeds norm, Using e-mail inappropriately, Use of Internet, e-mail, or PC in a non-work-related manner, Theft of information, Violation of security policies or procedures, Intellectual property infractions, Electronic tampering), Establishing a Basis or Justification to Investigate, Auditing V/s Cyber Forensic Investigations.

UNIT II

Introduction to Biometrics, What is Biometrics, Use of Biometrics, Model of Biometric system

Various types of Biometric methods, User Acceptance, Evaluating Accuracy, Advantages & disadvantages of biometrics.

UNIT III

Incident Response – Introduction , Computer Security Incident, goals of Incident Response, Who is involved in Incident Response Process, Incident Response Methodology, Formulate a Response Strategy, Investigate the Incident, Preparing For Incident Response, Overview of Pre-incident Preparation, Identifying Risk, Post Detection of an Incident.

UNIT IV

Cyber Forensic Tools and Utilities

Introduction, Examining Breadth of Products, Cyber Forensic Tools. What's the Right Incident Response Tool for Your Organization? Tool Review Forensic Toolkit, EnCase, Cyber check suites etc., Disk Imaging.

UNIT V

Evidence Collection and Analysis Tools

Volatile and Non volatile Evidences collection (Safeback, Gettime, FileList, Filecvt and Excel, Getfree, Swapfiles and Getswap, GetSlack, Temporary Files), Detailed Procedures for Obtaining a bit stream backup of hard drive, File System, Data Structure Of File System, Data Recovery in Different file system.

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

1. Able to justify why cyber forensic investigation is required.
2. Able to understand cyber forensic investigation process and its requirement
3. Able to understand different phases of incident response and its importance in maintaining network security.
4. Able to distinguish evidence, collect and analysis tool.

SUGGESTED READINGS

1. Incident Response and Computer Forensic by *Kelvin Mandia*, McGraw-Hill Education; 3rd edition (August 1, 2014)
2. Cyber Forensic A Field Manual for Collecting, Examining and Preserving Evidence of Computer Crimes by Albert Marcella, Jr., Doug Menendez,CRC Press 2nd Edition 2007
3. First Responder's Gude to Computer Forensics by *Richard* Nolanetal. - Carnegi Mellon, 2005.
4. Cyber Forensic by *Marecella Menendez,* John Wiley & Sons (15 May 2012)

SECOND SEMESTER

PRACTICAL PAPER IV: (BFS-S-254): BASICS OF CYBER FORENSIC

LIST OF PRACTICALS

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. Viewing small disk MBR.
6. Demonstration of Concealment Techniques (Cryptography PGP).
7. Demonstration of Concealment Techniques (Stenography).
8. Demonstration of other Concealment Techniques.
9. Formatting NTFS and EX2, EX3.
10. Case study of Biometric Techniques.

SECOND SEMESTER

*PAPER-V (BFS-S-299): ENGLISH COMMUNICATION & SOFT SKILLS – II

L	T	P	C
3	0	2	4

Objective: To build vocabulary, make simple sentences and communicate freely in simple English and overall professional development

Module -1: Basic Communication & Soft Skills (6 Lectures)

a) Review and Recap of the last Semester
b) Reading comprehension
c) Building conversational skills
d)Verbal & Non-verbal communication
[Note: As part of classroom activity, review and recap the last semester and carry out (oral and written) practice test to update the progress card of each student, refer to the Workbook]

Module -2: Vocabulary: Building Blocks (10 Lectures)

a) Word Formation: Prefix, suffix, conversion and compounding
b) Homophones and one-word substitution
c) Words often confused and misused
d) Idiomatic phrase, Antonyms and Synonyms
[Note: As part of classroom activity, organise and learning language games, initiate the learning of 5 new words per class]

Module-3: English Communication: World around Me (12 Lectures)

a) Market place, Bus stop, Bank, Post Office
b) Village, Town and City
c) Eating out: Stall, Dhaba and Restaurant
[Note: As part of classroom activity, refer Work book for classroom and home assignments; carry out practice tests (written and oral)]

Module -4: Personality Development-II (12 Lectures)

a) Etiquettes: Telephone, e-mail and at a wedding or social gathering
b) Public dealing: Making enquiries and requesting for help, handling difference of opinion, giving directions, instructions and getting assistance
c) Expressions: Giving compliments, making complaints, Feeling sorry and saying thank you
d) Entertainment: Radio, music, television, and computers
[Note: As part of classroom activity, refer Workbook for classroom and home assignments; carry out practice tests (written and oral)]

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

1. Gradual but significant improvement in student's progression in terms of LSRW to be noted.
2. Students will improve their English vocabulary of daily usage.
3. Students will be able to understand the world around them and communicate in diverse situations.
4. Students will be able to imbibe the requisites of personality development for demonstrating good manners in society.
5. Students will be able to exhibit basic etiquettes of personal communication.

Reference Books:

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation.
2. English Grammar Composition & Usage by J.C. Nesfield, Macmillan Publishers.
3. The Business letters by Madan Sood, Goodwill Publishing House, New Delhi.
4. Communication Skills by Sanjay Kumar &PushpLata, Oxford University Press.
5. Newspapers.

THIRD SEMESTER

PAPER I (BFS-S- 301) – FORENSIC MEDICINE

L	T	P	C
4	0	2	5

Learning Objectives: To understand and identification of informed Medico-legal responsibility

UNIT-I

DEATH INVESTIGATIONS-

Fundamental aspects and scope of forensic medicine. Approaching the crime scene of death. Obtaining first hand information from the caller. Rendering medical assistance to the victim, if alive. Protecting life. Recording dying declaration. Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses. Suspect in custody – initial interrogation and searching for evidence.

UNIT – II

Role of Forensic Medicine in court – Meaning and Scope Inquest Nature and Powers of Criminal Courts in India Procedure of calling a witness to a court.

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

UNIT – III

Autopsy 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 – IV

Thanatology- Definition of death. Types of death(somatic and molecular).Medico-legal aspects of death – Causes of death such as asphyxia(strangulation, hanging, drowning etc), electrocution, thermal trauma, heat burns, starvation, natural death, sudden death etc. Changes after death (immediate, early and late changes) and Determination of time since death.

UNIT – V

Wounds and Injuries- Definition of wounds and injuries and laws governing them. Types and classification of injuries. Ante mortem and post mortem injuries. Aging of injuries. Artificial injuries. Difference between suicidal, homicidal and accidental injuries.

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 medicaolegal answers of various modes of deaths.

SUGGESTED READINGS

1. Forensic medicine and toxicology: principles and practice, Professor Krishna Vij Publisher: Elsevier , 5 edition ,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 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

THIRD SEMESTER

PRACTICAL PAPER I: (BFS-S--351): FORENSIC MEDICINE

LIST OF PRACTICALS:

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

THIRD SEMESTER

PAPER – II (BFS-S- 302): FORENSIC CHEMISTRY I

L	T	P	C
4	0	2	5

Learning Objectives: Understand and to appreciate the breadth and diversity of analytical science in respect of forensic science.

UNIT I

Introduction to Forensic chemistry

Chemical analysis of evidences:

a) Screening, sampling-methods of collection, , different standard methods

b) Inorganic analysis

c) Micro-chemical method

UNIT –II

Chromatography-

Basic principle and types

1. TLC- Principle, Theory, instrumentation and applications.
2. Ion exchange, Gel Permeation Chromatography, Adsorption chromatography

UNIT III

General idea and basic principle of distillation, various types of distillation techniques Sample treatment techniques – Centrifuge, Filtration, Evaporation, Crystallization Distribution Law ,Solvent extraction technique like LLE, SPE, SPME.

UNIT IV

Polymers-Introduction-General idea of structures, types, polymerization processes with examples, radical and ionic mechanism of polymerization, characteristic properties of polymers, Structure, preparation and applications of Polyethylene (types and Ziegler-Natta process), Teflon, PVC, Polystyrene.

UNIT V

Fibre Types of fibres, forensic aspects of fibre 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 fibres. Fibre 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, polymers.
2. To understands the chemistry of common types of forensic evidences.
3. To gain an understanding of the analytical tools used to interpret forensic data
4. The techniques of chromatography, distillation, conventional and modern methods of sample extraction.

SUGGESTED READING

1. Instrumental Method of Chemical Analysis. Chatwal & Anand, Himalya Publication, 5th edition 2004.
2. Settle F. A.: Handbook of Instrumental Technique for Analytical Chemistry, Prentice Hall 1997.
3. Introduction of Forensic Science in Crime Investigation by Dr. (Mrs.) R. Krishnamurthy, Selective & Scientific Books (2015).
4. Handbook of Instrumental Technique for Analytical Chemistry by Settle F. A, Prentice Hall; Har/Cdr edition (4 June 1997)
5. Laboratory Procedure Manual: Petroleum Products, Directorate of Forensic Science, MHA, Govt. of India, 2005.
6. Working Procedure Manual on Chemistry; Directorate of Forensic Science MHA Govt. of India.

THIRD SEMESTER

PRACTICAL PAPER II: (BFS-S-352): FORENSIC CHEMISTRY I

LIST OF PRACTICALS:

1. General procedure of distillation and difference among various distillation.
2. Identification and comparison of fibres
3. TLC preparations
4. Identification of polymers
5. General procedure for centrifuge ,soxhlet extraction
6. Separation of leaf pigment by TLC
7. Separation of amino acids by TLC

THIRD SEMESTER

PAPER – II (BFS-S- 307): FORENSIC PHYSICS I

L	T	P	C
4	0	2	5

Learning Objectives: 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. Colour, 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, ignition-loss 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

Fibre Types of fibres, forensic aspects of fibre 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 fibres. Fibre 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

THIRD SEMESTER

PRACTICAL PAPER II : (BFS-S-357): FORENSIC PHYSICS I

LIST OF PRACTICALS:

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.

THIRD SEMESTER

PAPER – III (BFS-S- 303): FORENSIC BIOLOGY I

L	T	P	C
4	0	2	5

Learning Objectives: Aims To Provide Students The Specific Biological Skills That Are Very Important In The Forensic Science Workplace and Gain an appreciation of the different biology evidence types and their applications in the investigative process.

UNIT -I

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

UNIT -II

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

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

Fiber: - Types of fiber, natural (plant animal and mineral), synthetic (nylon, polyester, terylene, carbonnanotube fiber), and blended (terrycloth, rayon)

UNIT IV

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

UNIT V

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

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

1. Demonstrate proper crime scene investigation and reconstruction
2. Be able to apply basic principles and laboratory procedures of biology to forensic science
3. The forensic analysis of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.

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

THIRD SEMESTER

PRACTICAL PAPER III: (BFS-S-353): FORENSIC BIOLOGY I

LIST OF PRACTICALS:

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

THIRD SEMESTER

PAPER – IV (BFS-S- 304): FORENSIC PSYCHOLOGY

L	T	P	C
4	0	2	5

Learning Objectives: This course is designed to introduce students to the interface of psychology and the law, with a specific focus on forensic psychology. Critical issues, such as Not Guilty By Reason of Insanity pleas, will be addressed. Students will be introduced to the roles and responsibilities of a forensic psychologist including psychological assessments, expert testimony, offender treatment, and correctional psychology.

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. Antisocial Personality Disorder

UNIT-III

Investigative Psychology

1. Criminal profiling
2. Polygraph
3. Narco Analysis
4. BEOS

UNIT-IV

Psychology and Law--Application of Forensic Psychology in Civil and Criminal Legal Proceedings-Civil Proceedings- Assessment of Civil Competency, Criminal Proceedings**, Mc Naughten rule insanity** – Nature of Insanity, Insanity Assessment, *Competency to* stand trial, Criminal responsibility and insanity defence.

UNIT-V

Legal aspect- Mental Health Act, 1987 [Reception Order, Object, Establishment or Maintenance of Psychiatric Hospitals and Psychiatric Nursing Homes, Procedures on Production of Mentally Ill Person in front of Magistrate]

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

1. To survey the major areas of interests shared by psychology and the law
2. To become familiar with the types of forensic evaluations conducted in criminal and civil cases
3. The importance of psychological assessment in gauging criminal behavior.
4. The tools and techniques required for detection of deception like polygraphy, narco analysis and brain electrical oscillation signatures.

SUGGESTED READINGS:

1. Criminal Profiling-An Introduction to Behavioural Evidence analysis', Brent Turvey, Academic Press; 4th edition (13 May 2011)
2. Handbook of Forensic Psychology', Prof Dr. Vimala Veeraraghwan, Edition 1st, Elsevier
3. Handbook of Forensic Psychology', Irving B. Weiner, Allen K. Hiss, Edition 3rd , 2006, Wiley Publication.
4. Theoretical Psychology', Moazziz Ali Beg, Sangeeta Gupta Beg, Vol [04], Edition 2nd, 2013, Global Vision Publishing House, New Delhi.
5. 'Abnormal Psychology-The Problem of Maladaptive Behaviour', Irwin G. Sarson, Barbara R. Sarson, Editon 11th, 2012, PHI Publication, New Delhi.
6. 7 'Abnormal Psychology', James N. Butcher, Susan M. Mineka, Jill M. Hooley, Edition 15th, 2014, Pearson.
7. 'Psychological Interventions of Mental Disorders', S. K. Shrivastava, Nayanika Singh, Shivani Kant, Edition 1st, 2013, Sarup Book Publishers, PVT. LTD.
8. 'Psychology and Crime', Nageshwar Singh, Edition 1st,2013, RBSA Publishers, Jaipur.
9. 'Criminology' [2005] S. M. A. Qadri, fifth edition, EBC Publication, Lucknow

THIRD SEMESTER

PRACTICAL PAPER IV: (BFS-S-354): FORENSIC PSYCHOLOGY

LIST OF PRACTICALS

1. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
2. To study a criminal case in which hypnosis was used as a means to detect deception.
3. To prepare a case report on thematic appreciation test.
4. To prepare a case report on Minnesota multiphase personality inventory test.
5. To prepare a case report on thematic appreciation test.
6. To prepare a case report on word association test.
7. To prepare a case report on Bhatia's battery of performance test of intelligence.
8. To cite a criminal case in which Narco analysis was used as a means to detect deception.

THIRD SEMESTER

PAPER-V (BFS-S-399): ENGLISH COMMUNICATION & SOFT SKILLS – III

L	T	P	C
3	0	2	4

Learning Objective: To learn job oriented, presentation and interview skills and business correspondence.

Module -1 Functional Grammar-II (8 Lectures)

a) Sentence construction: Simple, Complex and Compound

b) Application writing

c) Paragraph writing, essay writing and precise writing

d) Pre-testing of oral and writing skills

[Note: As part of classroom activity, Review and recap of last semester and update progress of each student refer Module 3 of Workbook]

Module-2 Professional Skills (14Lectures)

a) Biodata, CV and resume writing
b) Joining Letter, Cover Letter & Resignation letter
c) Inter-Office Memo, Formal Business Letter, Informal Notes
d) Minutes of the Meeting, Reporting Events, Summary Writing

[Note: As part of classroom activity, use of standard templates and scenario buildings, practice sessions in classroom and homework assignments, refer to Workbook]

Module -3Presentation Skills (10Lectures)

a) Power-point presentations & presentation techniques
b) Body language
c) Describing people, places and events
d) Extempore speech and Just-a minute sessions

[Note: As part of classroom activity, practice sessions carried out in class on different topics of the domain expertise, refer to Workbook]

Module -4Interview Skills **(8 Lectures)**

a) Developing skill to (a) Debate (b)Discussion, Basics of GD &styles of GD
b) Discussion in groups and group discussion on current issues
c) Steps to prepare for an interview and mock interviews

[Note: As part of classroom activity, language games, extensive coverage of contemporary issues for GDs, facing mock interview sessions with faculty, respective TPOs and Director CRC]

Learning Outcome:

1. Considerable improvement in student's progression in terms of LSRW to be noted.
2. Students will improve their writing skills for official communication.
3. Students will be able to give presentation and extempore speech on select topics.
4. Students will be able to discuss among peers and participate in group discussions on current issues.

Reference Books*:

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation
2. Communication Skills for Engineers and Scientists by Sangeeta Sharma &Binod Mishra, PHI Learning Private Limited, New Delhi.
3. Professional Communication by Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.
4. Communication Skills by Sanjay Kumar &PushpLata, Oxford University Press
5. The Business letters by Madan Sood, Goodwill Publishing House, New Delhi

THIRD SEMESTER

PAPER-VI (BFS-S-306): ENVIRONMENTAL STUDIES

L	T	P	C
4	0	0	4

Learning Objective: To create awareness among students about environment protection.

UNIT I (LECTURES 08)

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Ecology andEnvironment:ConceptofanEcosystem-its structure andfunctions, Energy Flow in an Ecosystem,Food Chain,Food Web, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.

UNIT II (Lectures 08)

Natural Resources: Renewable & Non-Renewable resources; Landresources and landuse change;Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.

Biodiversity: Hot SpotsofBiodiversity inIndiaandWorld,Conservation,Importanceand FactorsResponsibleforLossofBiodiversity, Biogeographical Classification ofIndia

UNIT III (Lectures 08)

Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

UNIT IV (Lectures 08)

Environmental policies & practices: Climate change & Global Warming (GreenhouseEffect),Ozone Layer -Its Depletion andControl Measures, PhotochemicalSmog,AcidRain Environmental laws: Environment protection Act; air

prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context

UNIT V (Lectures 08)

Human Communities & Environment:

Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case studies.

Field Work:

1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/ rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; pond, river etc.

Learning Outcomes:

Based on this course, the Forensic graduate will understand / evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

Text Books:

1. "Environmental Chemistry", De, A. K., New AgePublishers Pvt.Ltd.
2. "Introduction to Environmental Engineeringand Science", Masters, G. M., PrenticeHall India Pvt. Ltd.
3. "Fundamentals of Ecology",Odem, E. P., W. B. Sannders Co.

ReferenceBooks:

1. "BiodiversityandConservation",Bryant, P. J., Hypertext Book
2. "Textbook of Environment Studies", Tewari, Khulbe&Tewari,I.K. Publication

***Latest editions of all the suggested books are recommended.**

FOURTH SEMESTER

PAPER I (BFS –S-401) – FORENSIC ANTHROPOLOGY

L	T	P	C
4	0	2	5

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, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

UNIT V

Facial Reconstruction - Portrait Parle/ Bertillon system. Photofit/identi kit. Facial superimposition techniques.Cranio facial super imposition techniques – photographic super imposition, videosuperimposition, 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 Outcomes: 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 forensic importance.
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; 3rd 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; 1st edition (5 March 2014)
7. Christensen,Nicholas V. Passalacqua and Eric J. Bartelink, Academic Press, USA, 2014.

FOURTH SEMESTER

PRACTICAL PAPER I: (BFS-S-451): FORENSIC ANTHROPOLOGY

LIST OF PRACTICALS:

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 their measurements.
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 human skull.*
9. *To estimate stature from long bone length.*
10. *To conduct portrait parley using photofit identification kit.*

FOURTH SEMESTER

PAPER – II (BFS-S- 402): FORENSIC CHEMISTRY II

L	T	P	C
4	0	2	5

Learning Objectives*:* Understand and to appreciate the breadth and diversity of analytical science in respect of forensic science.

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

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 labelling and forwarding of exhibits, and forensic detection of arson cases.

UNIT III

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 IV

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

UNIT –V

Miscellaneous

Characteristics, examination and legal aspects of gold, silver, sugar, salts, fertilizers,

Detective dyes- cases and importance in trap cases.

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

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

SUGGESTED READINGS

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).
6. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in *Forensic Science*, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

FOURTH SEMESTER

PRACTICAL PAPER II: (BFS-S--452): FORENSIC CHEMISTRY II

LIST OF PRACTICALS:

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 colour tests.
8. To identify ethyl / methyl alcohol.
9. Thin layer chromatography of Food adulterants.

FOURTH SEMESTER

PAPER – II (BFS-S- 407): FORENSIC PHYSICS II

L	T	P	C
4	0	2	5

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

UNIT-1

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 color 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 and 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. LUMA light
3. Video Spectral Comparator(VSC)
4. Electrostatic Developing Apparatus(ESDA)

Learning Outcome: 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, 2nd Edition 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.

FOURTH SEMESTER

PRACTICAL PAPER II: (BFS-S--457): FORENSIC PHYSICS II

LIST OF PRACTICALS:

1. Restoration techniques of tool mark impressions and casting footprints.
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 in different light sources and using different filters.
7. To compare glass samples by refractive index method.

FOURTH SEMESTER

PAPER – III(BFS-S- 403): FORENSIC BIOLOGY II

L	T	P	C
4	0	2	5

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** (collection of diatoms from drowned body, collection of control sample, extraction, digestion, examination, comparison and identification.
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 edition (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

FOURTH SEMESTER

PRACTICAL PAPER III: (BFS-S-453): FORENSIC BIOLOGY II

LIST OF PRACTICALS:

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. Identification of wild life materials, teeth, flowers and such as skin, fur, bones, nails, horn plant.

FOURTH SEMESTER

Paper – IV (BFS-S- 404): DIGITAL AND CYBER FORENSIC -I

L	T	P	C
4	0	2	5

Learning Objectives: 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, eDiscovery, 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, SSLSecure 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 (RFC 2196)

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 & Ram Mohan, 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. Cyberlaw Simplified Vivek Sood, TMG
6. TataMcGraw Hill Reference Cyber Law and E-Commerce, David Baumer, J C Poindexter, TMG.

FOURTH SEMESTER

PRACTICAL PAPER IV: (BFS-S-454): DIGITAL AND CYBER FORENSIC -I

LIST OF PRACTICALS

11. Identification, Seizure, Search of Digital media
12. Evidence Collection
13. Demonstration of various Forensic tools like Partition magic, Encase etc.
14. Data Recovery, Deleted File Recovery viewing small Disk.
15. Demonstration of Concealment Techniques (Cryptography PGP)
16. Demonstration of Concealment Techniques (Stegnography)
17. Demonstration of other Concealment Techniques
18. Case study of Biometric Techniques

FOURTH SEMESTER

PAPER-V (BFS-S-499): ENGLISH COMMUNICATION & SOFT SKILLS – IV

L	T	P	C
3	0	2	4

Learning Objective: To in calculate behavioural skills in students for the Corporate World

Module -1Fundamentals of Time Management & Managing Change (12 Lectures)

a) Time Management
b) Managing People and managing change
c) Team building, Leadership and taking decisions
d) Stress Management

[Note: As part of classroom activity, refer to the Workbook, guest lecture by management faculty]

Module -2Public Speaking (8 Lectures)

a) Art of public speaking
b) Welcome speech
c) Farewell Speech
d) Vote of thanks

[Note: As part of classroom activity, extensive practice sessions in class and home assignments]

Module -3Personality Development-III (8 Lectures)

a) Rude vs Polite Behaviour
b) Ethics and human values
c) Concern for environment
d) Crisis Management

[Note: As part of classroom activity, refer to the Workbook, guest lecture by management faculty and industry representative]

Module -4Oral Practice **(12 Lectures)**

a) Debate
b) Just-a-minute
c) Group Discussions
d) Mock Interviews

[Note: As part of classroom activity, extensively test the oral skills and update the progress card of each student]

Lerning Outcome:

1. Notable improvement in student's progression in terms of LSRW.
2. Students will be able to imbibe good practices of self-discipline and professionalism required in the corporate world.
3. Students will be able to develop the art of public speaking.
4. Students will be able to learn behavioural skills suitable for the corporate world.

Reference Books*:

1. ILFS Bi-lingual Course in Basic English, ILFS Skill Development Corporation
2. Communication Skills for Engineers and Scientists by Sangeeta Sharma &Binod Mishra, PHI Learning Private Limited, New Delhi.
3. Professional Communication by Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.
4. Communication Skills by Sanjay Kumar &PushpLata, Oxford University Press
5. The Business letters by Madan Sood, Goodwill Publishing House, New Delhi

FOURTH SEMESTER

PAPER – VI (BFS-S- 406): QUALITY MANAGEMENT IN LABORATORIES

L	T	P	C
4	0	0	4

Learning Objectives-

The Objective of this course is to introduce the students with the Quality management system and requirements for the competence of testing and calibration, the technical requirements needed in a laboratory.

UNIT I

Quality Management (ISO/IEC 17025) General requirements for the competence of testing and calibration laboratories, Introduction, Scope, Management requirements: organization, Quality System, Document Control, Test and calibration methods and methods validation, Equipment, measurement traceability, Sampling, Handling of test and calibration items, Asssuring the quality of test calibration results and reporting the results.

UNIT II

Laboratory Management, Laboratory information management system, validation and safety equipments.

UNIT-III

Accreditation and certification - Accreditation and certfication bodies- NABL, ISO, IEC, BIS, ASCLD/LAB, ABC, IAI

UNIT-IV

Report Writing and Evidence Evaluation**,** Components of reports and Report formants in respect of Crime Scene and Laboratory findings. Court Testimony- admissibility of expert testimony, pre Court preparations & Court appearance, Examination in chief, cross examination and re examination, Ethics in Forensic Science.

UNIT-V

Cases of Special Importance, Pertaining to forensic examination (Biology, serology, chemistry,toxicology) documents, fingerprints, ballistics, photography and physics, Voice identifications, Tape authentication & Computer frauds pertaining to forensic examination of cases

Learning Outcome:

Upon completion of this course, graduates are able to describe the importance of total quality management system and the technical requirements required for a forensic science laboratory

SUGGESTED READINGS

1. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E).
2. Crime Laboratory by Osterburg.
3. William L. Duncan: Total Quality, Key Terms and Concepts.
4. Murray S. Cooper: Quality control in the Pharmaceutical Industry.
5. John T. Rabbitt, Peter A Bergh: The ISO 9000 Book.
6. NABL -113
7. NABL -113A

FIFTH SEMESTER

PAPER I (BFS-S- 501) – FORENSIC BALLISTICS

L	T	P	C
4	0	2	5

Learning Objectives*:* To provide learners with an understanding of the role of the forensic firearm examiner, and introduce the fundamental principles in firearm identification, examination and investigation.

UNIT I

Firearms-History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms.

UNIT II

Internal ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting.

External Ballistics – Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballistic data.

UNIT III

Terminal Ballistics – Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, and influence of range. Ricochet and its effects, stopping power.

UNIT IV

Ammunition - Types of ammunition characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles. Headstamp markings on ammunitions. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks.

UNIT V

Firearm Evidence - Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire.Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothings.Identification and nature of firearms injuries.

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

1. The classification of firearms and their firing mechanisms.
2. The methods of identifying firearms.
3. The characteristics of ammunition.
4. The importance of firearm evidence.
5. The nature of firearm injuries.
6. The methods for characterization of gunshot residue.

SUGGESTED READINGS

1. B.J. Heard, *Handbook of Firearms and Ballistics*, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, *Forensic Science Handbook*, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
3. A.J. Schwoeble and D.L. Exline, *Current Methods in Forensic Gunshot Residue Analysis*, CRC Press, Boca Raton (2000).
4. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

FIFTH SEMESTER

PRACTICAL PAPER I: (BFS-S-551): FORENSIC BALLISTICS

LIST OF PRACTICALS:

1. To correlate the striking angle of the bullet with the impact on the target.
2. To estimate the range of fired bullets.
3. To identify gunshot residue.
4. To correlate the nature of injuries with distance from which the bullet was fired.
5. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

FIFTH SEMESTER

PAPER II (BFS-S- 502) – QUESTIONED DOCUMENTS

L	T	P	C
4	0	2	5

Learning Objectives: To Study of the scientific methods of identification and examination of questionable documents, handwriting examination, detection of forgery, falsification and counterfeiting of documents which stress the procedures of restoring and deciphering erasures and obliterations.

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 handwritings. Class and individual characteristics. 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)

Learning Outcomes:

After studying this paper the students will know –

1. Determine what a questioned document is and identify examples of it.
2. Analyze handwriting and identify its individual characteristics.
3. Recognize different types of altered documents and the techniques used to analyze them.
4. Differentiate between known and manufactured materials, such as forgeries and counterfeits.

SUGGESTED READINGS

1. Osborn, A.S. (1929). Questioned Documents, 2nd edition . Albany, New York: Boyd Printing Company. Reprinted, Chicago: Nelson-Hall Co.
2. W. Harrison, Suspected Documents and their Scientific Examination, Sweet & Maxwell Ltd., London (1966)
3. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).
4. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995).
5. E. David, The Scientific Examination of Documents – *Methods and Techniques, 2nd* Edition, Taylor & Francis, Hants (1997).

FIFTH SEMESTER

PRACTICAL PAPER II: (BFS-S-552): QUESTIONED DOCUMENTS

LIST OF PRACTICALS:

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

FIFTH SEMESTER

PAPER III (BFS-S- 503) – SEROLOGY AND DNA TYPING

L	T	P	C
4	0	2	5

Learning Objectives: demonstrate an understanding of the various uses of DNA typing technology and Complete and thorough knowledge regarding the various aspects of forensic serology.

UNIT-I

Foresic Serology I--Determination of human and animal origin from bones, hairs, nails, skin, body tissue, fluids / strains viz. blood, menstrual blood, semen, saliva, sweat, pus, vomit, etc., through immune diffusion..

Serogenetic markers:- Blood groups – biochemistry and genetics of ABO, Rh, Mn systems, Lewis antigen, Bombay Blood group ,determination of secretor / non secretor.

UNIT-II

Foresic Serology II--- Polymorphic enzymes typing – PGM, ESD, AK, , etc., and their forensic significance, HLA typing, paternity disputes etc.

UNIT-III

1. **Genetics**-Human Genome
2. **Deoxyribose Nucleic Acid** – Structural properties Sources of DNA evidence
3. **DNA Extraction**-Basic Principles -Method of DNA extraction
4. **DNA Quantification** -Slot Blot Assay , Southern /Northern Blotting
5. **DNA Amplification** by Polymerase Chain Reaction
6. **DNA data basing**

UNIT IV

Forensic DNA Typing - Polymorphism in DNA system – DNA markers RELP, RAPD, VNTRs, SNP, Autosomal – STR, Y-STR, Mitochondrial DNA.Touch DNA. Application in disputed paternity cases, child swapping, Missing person's identity – immigration, veterinary & wild life and Agriculture cases

UNIT V

Report Writing: DNA data base, DNA data basing Role of DNA typing in identifying unrecognizable bodies.

Legal perspectives – legal standards for admissibility of DNA profiling, procedural and ethical concerns, status of development of DNA profiling in India and abroad.

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

1. The significance of serological evidence and its admissibility in court and report writing of evidences.
2. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
3. The usefulness of genetic markers in forensic investigations.
   The forensic importance of DNA Typing which is used to link with certainty the origin of
4. Biological evidence to a single individual.

SUGGESTED READINGS

1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington Academic Press 2nd Edition (2005).
2. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton 2nd Edition (1997).
3. H. Coleman and E. Swenson, *DNA* in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton 8th Edition (2013).

FIFTH SEMESTER

PRACTICAL PAPER III: (BFS-S--553): SEROLOGY AND DNA TYPING

LIST OF PRACTICALS:

1. To determine titre of antisera.
2. To perform precipitin test for species of origin determination.
3. To perform Immunodiffusion test for species of origin.
4. To perform electrophoresis for separation of various polymorphic enzymes.
5. To carry out electrophoresis for separation of enzymes.
6. To prepare a report on the role of DNA typing in solving paternity disputes.
7. Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption inhibition, Absorption-elution and mixed agglutination technique, determination of secretor/non-secretor status.

FIFTH SEMESTER

PAPER IV (BFS-S- 504) – DIGITAL AND CYBER FORENSIC-II

L	T	P	C
4	0	2	5

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, Cheque 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 READINGS

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 implified Vivek Sood, TMG

FIFTH SEMESTER

PRACTICAL PAPER IV: (BFS-S--554): DIGITAL AND CYBER FORENSICII

LIST OF PRACTICALS:

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.

FIFTH SEMESTER

PAPER V (BFS-S- 505) – FORENSIC DERMATOGLYPHICS

L	T	P	C
4	0	2	5

Learning Objectives: The course aims to show on an example of dermatoglyphics - a scientific discipline which went through all phases of scientific development - the possibilities and limitations of sciences.

UNIT I

Basics of Fingerprints- Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting.

UNIT II

Types of fingerprints. Types of Fingerprint patterns. Fingerprint characteristics/minutiae.Plain and rolled fingerprints. Ridge counting. Significance of poroscopy and edgeoscopy

UNIT III

Classification and cataloguing of fingerprint record.(Henry's System of Classification and its extensions) Single digit Classification, Extension of Henry system, Fingerprint Bureau..Automated Fingerprint Identification System.

UNIT IV

Development of Fingerprints - Constituents of sweat residue.Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents. Application of light sources in fingerprint detection. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Fingerprinting the deceased.

UNIT V

Palm prints, their historical importance and forensic significance

Lip prints - Nature, classification, location, collection and examination of lip prints and their forensic significance.

Ear prints and their nature, location, classification, evaluation and forensic significance.

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

1. The fundamental principles on which the science of fingerprinting is based.
2. Fingerprints are the most infallible means of identification.
3. The world's first fingerprint bureau was established in India.
4. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.
5. The physical and chemical techniques of developing fingerprints on crime scene evidence.
6. The significance of foot, palm, ear and lip prints.

SUGGESTED READINGS

1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton 2004 by CRC Press.
2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton 2nd Edition (2016).
4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

FIFTH SEMESTER

PRACTICAL PAPER V: (BFS-S-555): FORENSIC DERMATOGLYPHICS

List of Practical

1. To record plain and rolled fingerprints.
2. To identify different fingerprint patterns
3. To carry out ten digit classification of fingerprints.
4. To identify core and delta.
5. To Classify core and delta
6. To identify different ridge characteristics
7. To carry out ridge tracing and ridge counting.
8. Document and Fingerprint Photography
9. To take Plain and Rolled inked fingerprints and to identify the patterns
10. To develop Latent fingerprints with Powder method
11. Lifting of Fingerprints

SIXTH SEMESTER

PAPER I (BFS-S- 601) – FORENSIC TOXICOLOGY

L	T	P	C
6	0	2	7

Learning Objectives:

This course stresses the practical and theoretical aspects to forensic toxicology, the study of drugs, and their implications in a forensic setting when toxicity sets in. The analysis and description of drugs are introduced.

UNIT I

Basics of Toxicology—Toxicology Introduction, Classification of Toxicology, Forensic toxicology .significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests. Postmortem Toxicology.

UNIT II

Poisons--Classification of poisons. Plant poisons, Animal poisons, Metallic Poisons. Physico-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings .Signs and symptoms of common poisoning and their antidotes. Metabolism and excretion of poisons.

UNIT III

Narcotics, Drugs and Psychotropic Substances-Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Drugs and psychotropic substances. Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substance.

UNIT IV

Collection Preservation and analysis

Collection and preservation of viscera, blood and urine for various poison and drug cases. Introduction of Screening and Presumptive ,chemical and instrumental analysis of drugs and poisons.

UNIT V

Relevant provision of:-

1. Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties)
2. The Poisons Act, 1919, and Section 284 of IPC, 1860 (Negligent conduct with respect to Poisonous substance).
3. Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics, Offenses and Penalties)

Learning Outcome:

After studying this paper the students will know –

1. The significance of toxicological studies in forensic science.
2. The classification of poisons and their modes of actions.
3. The absorption of poisons in body fluids.
4. The forensic identification of illicit liquors.
5. The classification and characteristics of the narcotics, drugs and psychotropic substances.
6. The menace of designer drugs.
7. The methods of identifying and purifying narcotics, drugs and psychotropic substances.
8. Information about relevant acts .

SUGGESTED READINGS

1. Poklis, Forensic toxicology in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert CRC Press, Boca Raton (1997).
2. Professor K.S. Narayan Reddy the Essentials Of Forensic Medicine And Toxicology, jaypee Brothers Medical Publishers, 33rd Edition, 2014
3. Professor V.V. Pillay Textbook Of Forensic Medicine And Toxicology, Paras Medical Publisher, 18th edition (2017)
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton 8th Edition (2013).
5. Principles of Forensic Toxicology Barry Levine ,Amer. Assoc. for Clinical Chemistry,4th Edition 2014

SIXTH SEMESTER

PRACTICAL PAPER I: (BFS-S-651): FORENSIC TOXICOLOGY

LIST OF PRACTICALS

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 colour tests for barbiturates.
8. To separate drugs of abuse by thin layer chromatography.

SIXTH SEMESTER

PAPER II (BFS-S- 602) – TECHNOLOGICAL METHODS IN FORENSIC SCIENCE

L	T	P	C
6	0	2	7

Learning objectives

Upon successful completion of this course the student should recognize the foundations of modern forensic science and explain the principles that form the basis for forensic instrumental analysis.

UNIT I

3. **GC:** Theoretical principles, instrumentations and technique, columns, stationary phases, detectors, Forensic applications.
4. **HPLC**: theory, Instrumentation, Technique, column, detectors, LC-MS, Forensic applications.

UNIT II

Microscopy- Stereomicroscope, Comparison microscope, Electron Microscopy TEM, SEM and their forensic Application.

UNIT III

Electrophoresis Technique: General principles, Factors affecting electrophoresis, Sodium dodecylsulphate (SDS) polyacrylamide gel electrophoresis, Agrose gel electrophoresis, Gel immune-diffusion, Immuno- electrophoresis.

UNIT IV

1. **Basic Spectroscopy--** Introduction, electromagnetic radiations, full range,

A. **UV-Visible** – principal absorbance, transmittance, Beer-Lambert's laws and its applications of UV-Visible

B. **IR**-molecular spectra, electronics, vibrational, rotational spectra. Principles, diagrams, working and construction, uses and applications and IR spectroscopy

UNIT V

1. ***AAS***- Introduction, Basic principles, Instrumentation and Techniques, Forensic applications.
2. **MASS Spectroscopy**- Principle, Instrumentation and working, Forensic applications.

Learning Outcomes:

After studying this paper the students will know –

1. The importance of chromatographic and spectroscopic techniques in analyzing trace evidence analysis.
2. The utility of electrophoresis and in identifying chemical and biological materials.
3. The significance of advanced microscopy in visualizing trace evidence and comparing it with control samples.

SUGGESTED READINGS

1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry, 6th edition 1992.
2. Srivastava Meena, Yadav R. S Principles Of Laboratory Techniques And Methods, 2007.
3. W. Kemp, Organic Spectroscopy, 3rd Edition, Macmillan, Hampshire (1991).
4. J.W. Robinson, Undergraduate Instrumental Analysis, 5th Edition, Marcel Dekker, Inc., New York (1995).
5. "Instrumental Methods of Analysis" by Willard H.W Merritt, L.L Dean J A Settie FA, , 7th Edition, CBS,2004.
6. "Analytical Chemistry for Technicians" by Kenkel, 4th edition CRC Press, 2013.
7. "Instrumental Methods of Chemical Analysis" by Galen W. Ewing, McGraw Hill Higher Education; 5th Revised edition

SIXTH SEMESTER

PAPER II (BFS-S- 652) – TECHNOLOGICAL METHODS IN FORENSIC SCIENCE

LIST OF PRACTICALS

1. To determine the concentration of a colored compound by colorimetry analysis.
2. To carry out thin layer chromatography of ink samples.
3. To carry out separation of organic compounds by paper chromatography.
4. To identify drug samples using UV-Visible spectroscopy
5. Electrophoretic Sepration of Serum Proteins.

SIXTH SEMESTER

PAPER-III (BFS-S-603): INTRODUCTION TO RESEARCH METHODOLOGY

L	T	P	C
6	0	2	7

Learning Objectives:

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.
3. Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

SIXTH SEMESTER

PAPER III (BFS-S- 653) – INTRODUCTION TO RESEARCH METHODOLOGY

LIST OF PRACTICALS

1. To perform practical for probability and non probability sampling types.
2. To calculate mean median mode of a given data
3. To calculate standard deviation , standard error, variance and coefficient of variation for given data
4. To perform correlation and regression analysis for given data
5. To perform student‘s’ test and Chi square analysis for hypothesis testing.

.

SIXTH SEMESTER

PAPER IV (BFS-S- 604) –PROJECT

L	T	P	C
0	0	8	4

Learning Objectives:

This course is conceived so that you can:

1. Provide an in-depth exploration of a topic of special interest.
2. Acquire knowledge on the chosen topic and apply the knowledge, experience, and skills learned in the Law and Justice programme to the chosen topic.
3. Apply various research techniques, find suitable sources of information, and acknowledge them in the research project.
4. Develop effective communicative skills to present research on Law and Justice Issues.

- **The Project will be based on a research topic in Forensic Science/Criminology. The topic will be assigned in consultation with police and forensic science establishments, giving due consideration to the problem areas faced by these institutions. The students will be expected to undertake extensive field work, in collaboration with mobile police laboratories. One month is assigned for completion of the project.**

Learning Outcome:

Upon successful completion of this course, you will be able to:

1. Conduct independent research on Law and Justice Topics.
2. Produce a thesis of publishable quality.
3. Effectively present and defend your research orally.