K.R. MANGALAM UNIVERSITY

THE COMPLETE WORLD OF EDUCATION

SCHOOL OF BASIC AND APPLIED SCIENCES

Bachelor of Science (Honors) in Forensic Science

(B.Sc. (H) Forensic Science)

Programme Code: 37

2022-2025

Approved in the 29th Meeting of Academic Council Held on 09

August 2022

Academic Council
Member Secretary
K.R. Mangalam University

Registrar
K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)

SCHOOL OF BASIC AND APPLIED SCIENCES

Bachelor of Science (Honors) in Forensic Science

(B.Sc. (H) Forensic Science)

Programme Code: 37

2022-2025

Approved in the 29th Meeting of Academic Council
Held on 09 August 2022

List of Contents

Preamble

The objective of any program at Higher Education Institute is to prepare their students for the society at large. The K. R. Mangalam University visualizes all its programs in the best interest of their students and in this endeavour; it offers a new vision to all undergraduate courses. The School of Basic and Applied Sciences (SBAS) offers three year under graduate program, B.Sc. (H) Forensic Science. We have designed a flexible Choice-Based Credit System (CBCS), Learning Outcome Based Curriculum Framework (LOCF), multidisciplinary approach, and multiple entry and exit options for the duration of 2022-2025.

We are following Curriculum and Credit Framework for Undergraduate Programs (CCFUP)" incorporating a CBCS, LOCF, multidisciplinary approach, and multiple entry and exit options. This will facilitate students to pursue their career path by choosing the subject/field of their interest.

The curriculum is aligned with the needs of the industry and the job market and is flexible enough to adapt to changing trends and technologies. It integrates cross-cutting issues relevant to professional ethics, gender, human values, environment and Sustainable Development Goals (SDGs). All academic programs offered by the university focus on employability, entrepreneurship and skill development and their course syllabi are adequately revised to incorporate contemporary requirements based on feedback received from students, alumni, faculty, parents, employers, industry and academic experts.

We are committed to create a more inclusive, holistic, and relevant education system that will prepare our students for the challenges of the 21st century. With the focus on Outcome-Based Education (OBE), our university is continuously evolving an innovative, flexible, and multidisciplinary curriculum, allowing students to explore a creative combination of credit-based courses in variegated disciplines along with value-addition courses, Indian Knowledge Systems, vocational courses, projects in community engagement and service, value education, environmental education, and acquiring skill sets, thereby designing their own learning trajectory.

All the courses are having defined objectives and Learning Outcomes (LOs), which will help prospective students in choosing the elective courses to broaden their skills in the field of Forensic Science and interdisciplinary areas. The courses will train students with sound theoretical and experimental knowledge that suits the need of academics and industry. The courses also offer ample skills to pursue research as career in the field of Forensic Science. The K. R. Mangalam University will help students in making an informed decision regarding the goals that they wish to pursue in further education and life, at large.

1. UNIVERSITY VISION AND MISSION

K.R. Mangalam University (KRMU) located on Sohna Road, Gurugram, is one of the fastest growing and most promising upcoming universities in India. It is a State Private University established in 2013 by an act of the legislature of the Haryana Government under Haryana Private Universities Act (Amendment) 8 of 2013. It is recognized by the UGC under Section 2f of the UGC Act, 1956. The primary aim of the university is to promote excellence in basic and professional education while upholding moral values.

KRMU offers sixty-eight Undergraduate, Postgraduate, and Doctoral Degree programs across different disciplines. The group of educational units in the University aims to promote education in the areas of Engineering & Technology, Legal Studies, Basic and Applied Sciences, Management Sciences, Commerce, Journalism and Mass Communication, Hotel Management and Catering Technology, Medical and Allied Sciences, Architecture and Planning, Agriculture, Fashion Designing, Humanities and Education. All the disciplines follow a well-defined curriculum design keeping in view the guidelines of UGC/AICTE and appropriate regulatory bodies like Council of Architecture (COA), Bar Council of India (BCI), Pharmacy Council of India (PCI), National Council for Teachers Education (NCTE) etc., wherever applicable. All courses are semester and credit based.

KRMU has been striving to fulfill its prime objective of transforming young lives through ground-breaking pedagogy, global collaborations, and world-class infrastructure. Recognized for its virtues of quality, equality, inclusiveness, sustainability, and professional ethics, KRMU is synonymous with academic excellence and innovation.

1.1. VISION

K.R Mangalam University aspires to become an internationally recognized institution of higher learning through excellence in inter-disciplinary education, research and innovation, preparing socially responsible life-long learners contributing to nation-building.

1.2 MISSION

1. Foster employability and entrepreneurship through futuristic curriculum and progressive pedagogy with cutting-edge technology.
2. Instill notion of lifelong learning through stimulating research, outcomes-based education and innovative thinking.
3. Integrate global needs and expectations through collaborative programs with premier universities, research centers, industries and professional bodies.
4. Enhance leadership qualities among the youth having understanding of ethical values and environmental realities.

2. SCHOOL OF BASIC AND APPLIED SCIENCES (SBAS)

2.1 About the School Basic and Applied Sciences

The SBAS imparts both teaching and research in the field of Physics, Chemistry, Mathematics, and Forensic science. SBAS imparts students' disciplinary knowledge, enhances their skills and ability, motivating them to think ingeniously, helping them to act independently and take decisions accordingly in all their scientific pursuits and other endeavors. It strives to empower its students and faculty members to contribute for the development of society and Nation. The faculty is in constant touch with various experts in the relevant fields and is willing to experiment with latest ideas in teaching and research.

3. SCHOOL VISION AND MISSION

VISION

School of Basic and Applied Sciences intends for continuum growth as centre of advanced learning, research and innovation by disseminating analytical and scientific knowledge in the areas of basic and applied sciences by promoting interdisciplinary research and scientific acumen.

MISSION

M1: Enable students to be scientists/ academicians /entrepreneurs by accomplishing fundamental and advanced research in diverse areas of basic and applied sciences.

M2: Build strong associations with academic organizations/industries for knowledge creation, advancement, and application of scientific fervor.

M3: Create conducive environment for lifelong learning.

M4: Empower students to be socially responsible and ethically strong individuals through value-based science education.

4. INTRODUCTION TO THE BACHELOR OF SCIENCE (H) IN FORENSIC SCIENCE (B.Sc. (H) FORENSIC SCIENCE)

The Bachelor of Science (Honors) in Forensic Science (B.Sc. (H) Forensic Science) is an undergraduate academic program designed to provide students with a comprehensive foundation in the fascinating world of Forensic Science. This program offers a rigorous and engaging curriculum that covers diverse areas such as Forensic Serology, Forensic Chemistry, Questioned Documents Examination, Fingerprint Examination, and more. Students enrolled in this program will explore the fundamental principles that govern the universe, delve into complex problem-solving, and develop strong analytical and critical thinking skills. Students will gain practical experience and a deep understanding of scientific research methodologies through hands-on laboratory work. The B.Sc. (H) Forensic Science program prepares students

for exciting career opportunities in scientific research, technology, education, and various other fields that require a strong grasp of Forensic Science principles and applications.

4.1. Nature of B.Sc. (H) Forensic Science Program

SBAS is offering three year undergraduate degree program B.Sc (H) Forensic Science with multiple entry-multiple exit options from the academic session. Through multiple entry/exit option, students will be able to enter and exit the program at various stages. This course emphasized hands on practice, innovative thought process and project-based learning.

4.2. Aims of B.Sc. (H) Forensic Science Program

The aims of B.Sc. (H) Forensic Science program are multifaceted and comprehensive. The program aims to cultivate a strong foundation in forensic science principles and foster a deep understanding of the subject. It seeks to promote critical thinking, analytical skills, and problem-solving abilities among students, enabling them to address real-world challenges effectively. The B.Sc. (H) Forensic Science program also encourages research-oriented thinking and provides opportunities for students to engage in scientific inquiry and exploration. By emphasizing hands-on laboratory work and practical applications, the program aims to equip students with the necessary skills for conducting experiments and analyzing data. Moreover, the program seeks to foster an interdisciplinary approach, enabling students to connect Forensic Science with other scientific disciplines and societal issues. Overall, the B.Sc. (H) Forensic Science program aspires to produce well-rounded graduates with a passion for learning and a strong foundation in Forensic Science, ready to make significant contributions to the scientific community and society at large.

5. LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK IN BACHELOR OF FORENSIC SCIENCE (H) PROGRAM (B.Sc.(H) FORENSIC SCIENCE)

The LOCF in B.Sc.(H) Forensic Science is designed to provide students with a comprehensive understanding of the fundamental principles and advanced concepts in Forensic Science. This framework is tailored to equip students with the necessary knowledge, skills, and abilities to excel in their academic pursuits and future careers in various scientific and technical fields. The curriculum focuses on achieving specific learning outcomes that are aligned with the program's goals and objectives. These LOs are aimed at fostering critical thinking, problem-solving skills, and analytical reasoning among students.

6. GRADUATE ATTRIBUTES

GA1: To demonstrate competence in discipline specific theoretical and practical knowledge.
GA2: To develop creativity and innovation.
GA3: To enhance communication and interpersonal skills.
GA4: To enable critical & logical thinking and investigative research attitude amongst students.
GA5: To develop ethical values, teamwork and lifelong learning approach.

7. PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Demonstrate proficiency in applying scientific principles, techniques, and technologies relevant to forensic science in a professional setting

PEO2: Conduct thorough and accurate forensic analyses, interpreting results, and presenting findings effectively.

PEO3: Adhere to the ethical guidelines and legal frameworks governing the field, ensuring the responsible and unbiased application of forensic methodologies.

PEO4: Apply innovative approaches to problem-solving, adapting to evolving technologies, and taking on leadership roles within their organizations or contributing to the development of forensic science methodologies.

PEO5: Engage in ongoing professional development activities, such as attending conferences, pursuing advanced degrees, and participating in relevant training programs to enhance their expertise.

8. PROGRAM OUTCOMES

Students of the undergraduate degree program at the time of graduation will be able to:

PO1- Scientific knowledge: Acquire the knowledge with facts and figures related to various subjects in such as Forensic Science, Chemistry, Mathematics, Biology etc.

PO2- Modern tool usage: Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.

PO3- Problem analysis: Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using fundamental principles, and the scientific theories.

PO4- Effective communication: Develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

PO5- Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms

PO6- Individual and Team work: Demonstrate the capability to work both independently and in cooperation with others

PO7- Crime Scene Investigation: Proficiency in the techniques and methodologies used in crime scene investigation, including evidence collection, preservation, and analysis.

PO8- Research and Analysis: Conduct research, write reports, and present findings related to forensic science.

PO9- Crime Scene Reconstruction: Reconstruct crime scenes based on evidence and analysis, helping to provide a comprehensive understanding of criminal events.

PO10- Evidence Analysis: Analyze various types of physical and biological evidence, such as fingerprints, DNA, firearms, and trace evidence, and draw conclusions based on their findings.

9. PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1- To gain a strong foundation in various branches of forensic science to investigate and solve the real-life problem.

PSO2- Acquire jobs in government and public sector undertakings, banks, central government institutes and pursuing higher studies at countrywide.

PSO3- Analyze the local and global impacts of understanding of values, ideas, and outcomes in a specific subject area.

PSO4- To develop entrepreneurial skills to become empowered and self-reliant.

10.LEARNING OUTCOMES:

After completing the program, the student will be able to:

LO1- Develop an understanding and appreciation for the scope of Forensic Sciences.

LO2 -Develop knowledge of the functions and services provided by the Forensic Laboratories and utilization of basic sciences for forensic investigations

LO3- Develop comprehensive knowledge on crime scene reconstruction and significance of various biological, physical and chemical evidences in forensic investigations.

LO4 -Provide knowledge on procedures and scopes of fingerprints examination, serology, anthropology, DNA fingerprinting, toxicology and cyber forensic etc.

LO5- Introduce students about the sociological and psychological aspects of crime and criminal behavior and presentation of evidences in court of law.

11.PROGRAM DURATION

We have designed a flexible CBCS, LOCF, multidisciplinary approach, and multiple entry and exit options for the duration of 2022-2025. The minimum period required for certificate in Forensic Science is one year, for Diploma in Forensic Science is two years, and for B.Sc. degree is three years.

12.CAREER OPTIONS

Opportunities exist in academics, forensic science laboratories, and administration besides all the opportunities applicable to any other graduate like UPSC examinations, defense services, and other govt. jobs.

13.ELIGIBILITY CRITERIA

This course aims to impart basic and applied knowledge in Forensic Science with a view to produce good academics, researchers and professionals in the field.

Eligibility Criteria: - The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

14.CLASS TIMINGS

The classes will be held from Monday to Friday from 09:10 am to 04:00 pm.

15.TEACHING-LEARNING PROCESS

The School of Basic and Applied Sciences brings an attitudinal change among prospective teachers for their advancement into accountable agents of change in society. They are actively engaged in undertaking different activities such as school contact programs in various schools during their course with systematic support and feedback from the faculty. During this program, the student-teachers observe the school/classroom environments concerning infrastructure, equipment, teaching-learning materials, functioning, human resources, and organization of various activities. Such practices bring experiential learning by emphasizing reciprocal learning and reflection. The faculties foster and maintain a creative environment with a deep commitment to inculcate excellence in academics and contribute to student development through a focus on student-centric methods such as experiential learning, participative learning, problem-solving and ICT integration in the teaching-learning process.

16.ASSESSMENT METHODS

Both formative and summative assessments are integral part of the B.Sc. program. Formative assessments such as class discussions, group activities, projects, quizzes, assignments and presentations are conducted throughout the teaching-learning process, enabling teachers to monitor student progress continuously. Teachers provide oral or written feedbacks, engage in one-on-one discussions, and use rubrics and checklists to communicate student performance. Summative assessments such as Term End Examination, viva voce for project work, research dissertations, and performance evaluations are conducted after the completion of the course.

17.MINIMUM ACCEPTABLE LEVEL OF ACADEMIC STANDARDS

The minimum acceptable level of achievement that a student must demonstrate to be eligible for the award of academic credit or qualification is the minimum acceptable level of academic standards. The Letter Grades and Grade Points which shall be used to reflect the outcome of the assessment process of the student’s performance is indicated in Table 1.

Table 1: Letter Grades and Grade Points.

Marks Range (%)	Letter Grade	Grade Points	Description of the Grade
>90	O	10.0	Outstanding
80-90	A+	9.0	Excellent
70-80	A	8.0	Very Good
60-70	B+	7.0	Good
55-60	B	6.0	Above Average
50-55	C	5.5	Average
40-50	P	5.0	Pass
<40	F	0	Fail
-	AB	0	Absent
% marks≥ 50	S	-	Satisfactory
% marks <50	US	-	Unsatisfactory
	W	0	Withdrawal

18. Scheme of Studies for B.Sc. (H) Forensic Science as per Choice-Based Credit System and Learning Outcome-Based Curriculum Framework 2022-2025

FIRST SEMESTER

S.No.	Course code	Course Title	L	T	P	Credits	Type of course
1	**BSFS101A**	Introduction to Forensic Science	2	1	0	3	Core 1
2	**BSFS103A**	Crime and Society	2	1	0	3	Core 2
3	**BSFS105A**	Biology I	2	1	0	3	Core 3
4	**BSFS107A**	Chemistry I	2	1	0	3	Core 4
5	**BSFS109A**	Physics I	2	1	0	3	Core 5
6	**BSFS151A**	Forensic Practical I	0	0	6	3	Practical I
7	**BSFS111A**	Cyber Forensics I	2	0	0	2	Core 6
8	**UCES125A**	Environmental Studies	3	0	0	3	AEC I
9	**UCDM301A**	Disaster Management	3	0	0	3	GE 1
TOTAL CREDITS						**26**	

AEC= Ability Enhancement Compulsory Subject, GE= General Elective

SECOND SEMESTER

S.No.	Course code	Course Title	L	T	P	Credits	Type of course
1	**BSFS102 A**	Forensics Dermatoglyphics	2	1	0	3	Core 7
2	**BSFS104A**	Questioned Document	2	1	0	3	Core 8
3	**BSFS106A**	Biology II	2	1	0	3	Core 9
4	**BSFS108A**	Chemistry II	2	1	0	3	Core 10
5	**BSFS110A**	Physics II	2	1	0	3	Core 11
6	**BSFS152A**	Forensic Practical II	0	0	6	3	Practical II
7	**BSFS112A**	Basics of Digital Forensics	2	0	0	2	Core 12
8	**UCCS155A**	Communication skills	3	1	0	4	AEC II
9	**BSFS114A**	Research Methodology	3	0	0	3	DSE I
TOTAL CREDITS						**27**	

*AEC= Ability Enhancement Compulsory Subject**,** DSE= Discipline Specific Elective*

THIRD SEMESTER

S.No.	Course code	Course Title	L	T	P	Credits	Type of course
1	**BSFS201A**	Forensic Ballistics & Explosives	2	1	0	3	Core 13
2	**BSFS203A**	Forensic Biology & Serology	2	1	0	3	Core 14
3	**BSFS205A**	Biology III	2	1	0	3	Core 15
4	**BSFS207A**	Chemistry III	2	1	0	3	Core 16
5	**BSFS209A**	Physics III	2	1	0	3	Core 17
6	**BSFS251A**	Forensic Practical III	0	0	6	3	Practical III
7	**BSFS211A**	Cyber Forensics II	2	0	0	2	Core 18
8	**BSFS213A**	Forensic Photography	3	0	0	3	AEC III
9	**BSFS215A**	Crime Scenario in India	3	0	0	3	DSE II
TOTAL CREDITS						**26**	

*AEC= Ability Enhancement Compulsory Subject***,** *DSE= Discipline Specific Elective*

FOURTH SEMESTER

S.No.	Course code	Course Title	L	T	P	Credits	Type of course
1	**BSFS202A**	Forensic Physics & Biometric System	2	1	0	3	Core 19
2	**BSFS204A**	Forensic Anthropology	2	1	0	3	Core 20
3	**BSFS206A**	Biology IV	2	1	0	3	Core 21
4	**BSFS208A**	Chemistry IV	2	1	0	3	Core 22
5	**BSFS210A**	Physics IV	2	1	0	3	Core 23
6	**BSFS252A**	Forensic Practical IV	0	0	6	3	Practical IV
7	**BSFS212A**	Digital Forensics	2	0	0	2	Core 24
8	**BSFS214A**	Wildlife Forensics	3	0	0	3	AEC IV
9	**BSFS216A**	Instrumentation	3	0	0	3	GE II
TOTAL CREDITS						**26**	

AEC= Ability Enhancement Compulsory Subject, GE= General Elective

FIFTH SEMESTER

S.No.	Course code	Course Title	L	T	P	Credits	Type of course
1	**BSFS301A**	Forensic Medicine	2	1	0	3	Core 25
2	**BSFS303A**	Forensic Chemistry & Toxicology	2	1	0	3	Core 26
3	**BSFS305A**	Biology V	2	1	0	3	Core 27
4	**BSFS307A**	Chemistry V	2	1	0	3	Core 28
5	**BSFS309A**	Physics V	2	1	0	3	Core 29
6	**BSFS351A**	Forensic Practical V	0	0	6	3	Practical V
7	**BSFS311A**	Cyber Forensics III	2	0	0	2	Core 30
8	**BSFS313A**	Quality Management and Ethics	3	0	0	3	DSE III
TOTAL CREDITS						**23**	

DSE= Discipline Specific Elective

SIXTH SEMESTER

S.No.	Course code	Course Title	L	T	P	Credits	Type of course
1	**BSFS302A**	Criminology & Penology	2	1	0	3	Core 31
2	**BSFS304A**	Forensic Psychology	2	1	0	3	Core 32
3	**BSFS306A**	Biology VI	2	1	0	3	Core 33
4	**BSFS308A**	Chemistry VI	2	1	0	3	Core 34
5	**BSFS310A**	Physics VI	2	1	0	3	Core 35
6	**BSFS352A**	Forensic Practical VI	0	0	6	3	Practical VI
7	**BSFS312A**	Advanced Digital Forensics	2	0	0	2	Core 36
8	**BSFS314A**	Project/Dissertation	0	0	3	3	DSE IV
TOTAL CREDITS						**23**	

DSE= Discipline Specific Elective

19. SYLLABI WITH COURSE MAPPING

SYLLABUS-FIRST SEMESTER

BSFS101A	Introduction to Forensic Science	L	T	P	C
Version 1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The course focuses on the following objectives-

1. Developing an understanding and appreciation for the scope of Forensic Sciences.
2. Develop an understanding on historical development, Mobile Forensic Units and Expert's testimony.
3. Develop brief knowledge of the functions and services provided by the Forensic Laboratories

Course Outcome:

1. Develop and understanding of forensic science, its multidisciplinary nature, and its role in criminal investigations and the justice system.
2. Familiarize with different types of evidence, including physical, biological, trace, digital evidences etc.
3. Develop an understanding about the organizational structure of forensic science laboratory, process of report writing and submission to court.
4. Understand and explore different types of evidences and their admissibility in the court of law.
5. Learn about the role of mobile forensic science laboratory and their distribution in India

Course Contents

Section I: History and development of Forensic Science

Definition, Description, Principles, Concept, Needs and scope. History of Forensic Science and Forensic Science Labs; Progressive development and transformation of Forensic Science Labs; Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories; Basic services and optional services; Main Authority, Organizational structure of Forensic Science Laboratory – roles and responsibilities, Sections/ Divisions, Services provided, Process of report writing and submission to court, Chain of custody.

Section II: Evidence Applicability in Court

Definition, Various types of evidence, Laws of evidence, Expert's testimony and admissibility of scientific evidence in Court of Law.

Section III: Crime Scene investigation

Defining a crime and crime scene, Importance of crime scene, Problems associated with crime scenes (indoor and outdoor), Location and processing of Crime Scene; Introduction to Crime Scene Management, Handling clues and evidence; Types of crime scenes, Primary, Secondary crime scene, Mobile, Indoor and Outdoor crime scenes; Searching techniques used for locating physical evidences at scene of crime; Crime Scene documentation, Barrication of Crime Scene, Crime Scene Photography, Videography; Sketching; Notes making.

Section IV: Crime Scene Reconstruction

Procedure and requirement for Crime Scene Reconstruction, Modus operandi, Expert team constitution for different crime scenes, Roles of Investigating Officer.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Bodziak, W., Footwear Impression Evidence (2nd Edn.) CRC Press, Boca Raton, Florida, 2000.
2. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; an Introduction to Criminalistics, McGraw Hill, New York, 1983.
3. Fisher, B., Techniques of Crime Scene Investigation (6th Edn.) CRC Press, Boca Raton, Florida, 2000.
4. James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
5. James, S., and Eskerc, W., Interpretation of Blood Stain Evidence at Crime Scenes, (2nd Edn) CRC Press, Boca Raton, Florida, 1999.
6. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
7. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Edn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop and understanding of forensic science, its multidisciplinary nature, and its role in criminal investigations and the justice system.	PO1, PO3, PO5, PO7, PO8
CO2	Familiarize with different types of evidences, including physical, biological, trace , digital evidences etc.	PO1, PO3, PO6, PO8, P10
CO3	Develop an understanding about the organizational structure of forensic science laboratory, process of report writing and submission to court.	PO1, PO2, PO3, PO5, PO8, P10
CO4	Understand and explore different types of evidences and their admissibility in the court of law.	PO1, PO3, PO5, PO7, PO8, PO9, P10
CO5	Learn about the role of mobile forensic science laboratory and their distribution in India	PO1, PO2, PO3, PO7, PO8, PO9, P10

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS101A	CO1	3	1	3	1	3	1	3	3	2	2	3	3	3	2
	CO2	3	2	3	2	1	3	2	3	1	3	3	3	3	2
	CO3	3	3	3	2	3	2	2	3	1	3	3	3	3	3
	CO4	3	2	3	1	3	1	3	3	3	3	3	3	3	3
	CO5	3	3	3	2	2	2	3	3	3	3	2	3	3	3

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS103A	**Crime and Society**	**L**	**T**	**P**	**C**
Version 1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. The importance of criminology.
2. The causes of criminal behavior.
3. The significance of criminal profiling to mitigate crime.
4. The consequences of crime in society.
5. The elements of criminal justice system.

Course Outcome: Students will be able to:

1. Understand about the criminal justice system and its importance.
2. Learn about the sociological aspects of crime and criminal in society.
3. Develop the understanding of judiciary and its importance.
4. Understand about the role of prison.

Course Contents
Section I: Basics of Criminology Definition, aims and scope. Theories of criminal behavior – classical, positivist, sociological; Criminal anthropology; Criminal profiling; Understanding modus operandi. Investigative strategy. Role of media.
Section II: Fundamentals of crime Elements, nature, causes and consequences of crime. Deviant behavior. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence, White Collar crime, Victimology, Juvenile delinquency, Social change and crime.
Section III: Criminal Justice System Broad components of criminal justice system. Policing styles and principles. Police's power of investigation; Filing of criminal charges. Community policing; Policing a heterogeneous society; Correctional measures and rehabilitation of offenders; Human rights and criminal justice system in India.
Section IV: Punishment and Crime Prevention Measures Introduction, Sections and Punishments for different types of crimes in India (IPC and CrPC), Approaches for crime prevention, Law Commission of India, Global crimes.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; An Introduction to Criminalistics, McGraw Hill, New York, 1983.
2. Ahuja R., Criminology, Rawat Publishers, 2001
3. Sharma B.R. Forensic Science In Criminal Investigation And Trials 6Th Edition 2020
4. Nabar B.S. Forensic Science in Crime Investigation, Asian Law House, 3rd Edition, 2019

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand about the criminal justice system and its importance.	PO3, PO5, PO7, PO8
CO2	Learn about the sociological aspects of crime and criminal in society.	PO3,PO4, PO5, PO7, PO8
CO3	Develop the understanding of judiciary and its importance.	PO3, PO5, PO7, PO8
CO4	Understand about the role of prison.	PO3, PO5, PO7, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS103A	CO1	2	2	3	1	3	1	3	3	2	2	3	3	3	2
	CO2	2	1	3	3	3	2	3	3	2	2	1	2	2	1
	CO3	1	2	3	2	3	2	3	3	1	2	3	3	2	2
	CO4	2	1	3	1	3	2	3	3	2	1	3	3	3	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS105A	**Biology I**	**L**	**T**	**P**	**C**
Version 1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. Provide the knowledge about the fundamentals of biology.
2. To provide understanding of cell biology.
3. To develop the comprehensive understanding of study of the biomolecules, biochemistry and aspect of Genetics.

Course Outcome:

1. Develop a comprehensive understanding of cell biology.
2. Familiarize with the essential biomolecules such as carbohydrates, lipids, proteins and nucleic acids.
3. Learn the foundational principles of Mendelian genetics.
4. Understand the structure and functions of DNA and RNA as carriers of genetic information.
5. Explore the role of chromosomes in carrying genetic material.
6. Gain knowledge of genetic mutations, their causes, types and effects on organism.

Course Contents
Section I: The Cell Structural unit of life, History of cell, Organization of Prokaryotic & eukaryotic Cell. Cell cycle, mitosis and meiosis.
Section II: Molecules of Life Proteins - structure, properties and functions. Carbohydrates - structure, properties and functions. Lipids – structure, properties and functions. Types of micronutrients and macronutrients in the body.

Section III: Basic Genetics and Nucleic Acids Mendel's Laws, Exceptions to Mendel's Laws, DNA –structure, Watson and Crick Model, RNA– structure, function (in brief).
Section IV: Chromosome and Mutation Discovery, morphology and structural organization. Types of chromosomes; Supernumerary chromosomes Mutations: Definition, Types: spontaneous and induced, Mutagens.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. I.E. Celis Cell biology Academic Press 2nd Edition.
2. Robertis & Robertis Cell & Microbiology 8th Edition.
3. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
4. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
5. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
6. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
7. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
8. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
9. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a comprehensive understanding of cell biology.	PO1,PO3, PO5,PO8
CO2	Familiarize with the essential biomolecules such as carbohydrates, lipids, proteins and nucleic acids.	PO1, PO3, PO5, PO8
CO3	Learn the foundational principles of Mendelian genetics.	PO1, PO3, PO5, PO8
CO4	Understand the structure and functions of DNA and RNA as carriers of genetic information.	PO1, PO3, PO5, PO8
CO5	Explore the role of chromosomes in carrying genetic material.	PO1, PO3, PO5, PO8
CO6	Gain knowledge of genetic mutations, their causes, types and effects on organism.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS105A	CO1	3	2	3	1	3	1	2	3	1	2	2	3	2	1
	CO2	3	2	3	2	3	1	2	3	1	1	2	2	2	1
	CO3	3	1	3	2	3	2	1	3	2	1	2	3	3	2
	CO4	3	1	3	2	3	1	2	3	2	2	2	3	3	2
	CO5	3	2	3	1	3	1	1	3	1	2	2	3	3	1
	CO6	3	2	3	1	3	1	2	3	1	2	2	3	3	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS107A	Chemistry I	L	T	P	C
Version 1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The objectives of the course:

1. To focus on building a conceptual understanding of fundamental chemical principles
2. Including properties of atoms, molecules, states of matter, and chemical reactions.

Course Outcome:

1. Develop a strong foundation in atomic structure and related concepts.
2. Learn to analyze periodic properties such as atomic size, ionization energy, electron affinity and electronegativity across the periodic table.
3. Understand various types of chemical bonding and their implication in molecular properties.
4. Study hydrocarbons including alkanes, alkenes and alkynes.
5. Gain insight into reaction mechanism, concepts of resonance and variety of organic functional groups and their reactions.

Course Contents

Section I: Atomic Structure

Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass: molarity, normality, molality, percentage composition, empirical and molecular formula. de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's

Multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater's rules.

Section II: Periodic Properties

Periodic law and the present form of periodic table, Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, trends in periodic table (in s, p, d & f block elements). Comparative study of the elements including, diagonal relationships.

Concept of Acids and Bases

Arrhenius, Bronsted – Lowry and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases.

Section III: Organic Chemistry

General introduction, Classification of hydrocarbons: Alkanes, Alkenes, Alkynes, Aromatic hydrocarbons. IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes.

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions.

Reactive intermediates carbocations, carbanions, free radicals. Localized and delocalized chemical bond, resonance effect and its applications.

Section IV: Arenes and Aromaticity

Nomenclature of benzene derivatives. Aromatic nucleus and side chain.

Aromaticity: Huckel rule, aromatic ions, aromatic, anti-aromatic and non-aromatic compounds.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic And Biological Chemistry.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a strong foundation in atomic structure and related concepts.	PO1, PO3, PO5, PO8
CO2	Learn to analyze periodic properties such as atomic size, ionization energy, electron affinity and electronegativity across the periodic table.	PO1, PO3, PO5, PO8
CO3	Understand various types of chemical bonding and their implication in molecular properties.	PO1, PO3, PO5, PO8
CO4	Study hydrocarbons including alkanes, alkenes and alkynes.	PO1, PO3, PO5, PO8
CO5	Gain insight into reaction mechanism, concepts of resonance and variety of organic functional groups and their reactions	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS107A	CO1	3	2	3	1	3	1	2	3	1	2	2	3	2	2
	CO2	3	2	3	2	3	1	1	3	2	1	2	2	2	1
	CO3	3	1	3	2	3	2	2	3	1	1	2	3	3	1
	CO4	3	1	3	2	3	1	1	3	2	2	2	3	3	1
	CO5	3	1	3	2	3	1	2	3	1	2	2	3	3	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS109A	**Physics I**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The objectives of the course:

1. To focus on building a conceptual understanding of fundamental principles of physics.
2. To understands basics of physics and their applications in Forensic Science.

Course Outcome:

1. Learn the concepts of motion, Newton's law of motion, force and Motion.
2. Explain the concepts involving properties of waves including electromagnetic waves and sound waves.
3. Understanding the fundamentals of Atomic Physics.
4. Acquire the knowledge of the concepts involving properties of waves including electromagnetic waves and sound waves.

Course Contents
Section I: Force and Motion Definition of motion, position and displacement, average velocity, instantaneous velocity, average speed, acceleration, acceleration of freely falling body, projectile motion, Newton's laws, force, mass, friction, properties of friction, drag force and terminal speed, linear and circular motion.
Section II: Kinetic energy and work Energy, kinetic energy, work, work done by gravitational force, work done by spring force, power, work and potential energy, conservation of energy, work energy theorem.
Section III: Atomic Physics Bohr atomic model, quantum numbers, Pauli's exclusion principle, hydrogen spectrum, - series (Lyman, Balmer, Paschen, Bracket and pfund), vector atom model.
Section IV: Waves Types of waves, transverse and longitudinal waves, electromagnetic waves and electromagnetic spectrum, wavelength and frequency, speed of traveling wave, the wave equation, sound waves, speed of sound, intensity and sound level, the Doppler effect, shock waves, X Rays (continuous and characteristic), Spectra- Absorption and emission. Bragg's Law and X-ray diffraction.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Amato, Joseph (December 1996). "The introductory calculus-based physics textbook". Physics Today 49 (12): 46–51.
2. Thomas Brody (1993.) “The Philosophy Behind Physics” pp 18–24 (Chapter 2)
3. Glimm, James; Jaffe, Arthur (1987), 'Quantum physics: a functional integral point of view'(2nd ed.), New York, [NY.]: Springer.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Learn the concepts of motion, Newton’s law of motion, force and motion.	PO1, PO3, PO5, PO8
CO2	Explain the concepts involving properties of waves including electromagnetic waves and sound waves	PO1, PO3, PO5, PO8
CO3	Understanding the fundamentals of Atomic Physics.	PO1, PO3, PO5, PO8
CO4	Acquire the knowledge of the concepts involving properties of waves including electromagnetic waves and sound waves	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS109A	CO1	3	2	3	1	3	1	2	3	1	2	2	3	2	2
	CO2	3	2	3	2	3	1	1	3	2	1	2	2	2	1
	CO3	3	1	3	2	3	2	2	3	1	1	2	3	3	1
	CO4	3	1	3	2	3	1	1	3	2	2	2	3	3	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS111A	Cyber Forensics I	L	T	P	C
Version 1.0		2	0	0	2
Total Contact Hours	30 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

Students will be able to use the computer for basic purposes of preparing his/her personal/professional, information from the internet (The web), sending mails, using internet banking services etc.

Course Outcome:

1. Develop a foundational understanding of computer hardware, software and its components.
2. Learn about various input and output devices.
3. Understand the basics of digital crime and their significance in cyber forensic investigations.
4. Familiarize with digital forensics concepts, protocols and grasp their relevance in digital investigations.
5. Understand the proper procedures for collecting, preserving, and analyzing digital evidence from computers and networks.

Course Contents
Section -1: Introduction to computers Basics of Computer organization, Components of computers – Input & Output devices, CPU Memory Hierarchy and types of Memory (RAM and ROM and their types) external storage devices Application Software and System Software.
Section -2: Digital crimes and evidence Digital crimes and their types, benefits of forensics in digital crimes, digital forensics evidence, Collection and preservation of evidences, legal concerns and private issues.
Section -3: Digital forensics Introduction, types of digital forensics, fundamentals of digital forensics, file system FAT32 NTFS, HPFS, APFS, Ex FAT, Bit byte Sector cluster (HDD or SSD)
Section -4: Advancements in computer forensics Tools used for computer forensics, Imaging/ extraction/analysis of computer devices, Disc forensics, Windows Registry Collection of electronic devices.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and references:

1. Fundamentals of Computers –P. K. Sinha; BPB Publication
2. Fundamentals of computers –V Rajaraman; Prentice Hall of India
3. Introduction to Information Technology: Leon and Leon; Leon Tech World
4. Information Technology in Business Management: MukeshDhunna& and J. B. Dixit; Laxmi Publications, New Delhi.
5. Computer Applications in Business Management: Versha Mehta, N. Kumar; Anmol Publications

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a foundational understanding of computer hardware, software and its components.	PO1,PO2, PO3, PO5, PO8
CO2	Learn about various input and output devices.	PO1,PO2, PO3, PO5, PO8
CO3	Understand the basics of digital crime and their significance in cyber forensic investigations.	PO1,PO2, PO3, PO5, PO8
CO4	Familiarize with digital forensics concepts, protocols and grasp their relevance in digital investigations.	PO1,PO2, PO3, PO5, PO8, PO10
CO5	Understand the proper procedures for collecting, preserving, and analyzing digital evidence from computers and networks.	PO1,PO2, PO3, PO5, PO8, PO10

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS111A	CO1	3	3	3	2	3	2	2	3	2	2	3	1	1	2
	CO2	3	3	3	1	3	2	1	3	1	2	2	3	1	2
	CO3	3	3	3	2	3	1	2	3	2	2	2	1	3	2
	CO4	3	3	3	1	3	2	2	3	2	3	2	3	1	2
	CO5	3	3	3	2	3	1	2	3	1	3	2	3	1	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

UCES125A	Environmental Studies	L	T	P	C
Version1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure	Basics of Environment				
Co-requisites	-				

The student will be able to understand about the environment by developing an awareness of the natural, social and cultural environment.

Course Outcome: On completion of this course, the students will be able to:

1. Comprehend and become responsive regarding environmental issues
2. Acquire the techniques to protect our mother earth, as without a clean, healthy, aesthetically beautiful, safe and secure environment no species can survive and sustain.
3. Enable the students to discuss their concern at national and international level with respect to formulate protection acts and sustainable developments policies.
4. Know that the rapid industrialization, crazy consumerism and over-exploitation of natural resources have resulted in degradation of earth at all levels and find solutions for the same.
5. Become consciousness about healthy and safe environment.

Course Content

Section I: Environment and Natural Resources:

Multidisciplinary nature of environmental sciences; Scope and importance; Need for public awareness.

Land resources; land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Section II Ecosystems and Biodiversity:

Ecosystem: Definition and Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.

Case studies of the following ecosystems:

a) Forest ecosystem

b) Grassland ecosystem

c) Desert ecosystem

d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots ; India as a mega-biodiversity nation; Endangered and endemic species of India; Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity; Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Section III: Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution; Nuclear hazards and human health risks; Solid waste management: Control measures of urban and industrial waste.; Environmental legalization and implementation in India.

Environmental Policies & Practices: Sustainability and sustainable development.; Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture; Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest
Conservation Act.; Nature reserves and human wildlife conflicts in Indian context.

Section IV: Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare.; Disaster management: floods, earthquake, cyclones and land slides.; Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.; Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

Field Work: Visit to an area to document environmental assets: river/ forest/ flora/fauna,etc.; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.; Study of common plants, insects, birds and basic principles of identification.; Study of simple ecosystems-pond, river, Delhi Ridge,etc.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and references:

1. Bharucha, E. 2003, Textbook for Environmental Studies, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environmental Education and Research, Pune. 361.
2. Carson, Rachel. 1962. Silent Spring (Boston: Houghton Mifflin, 1962), Mariner Books, 2002

3. Economy, Elizabeth. 2010. The River Runs Black: The Environmental Challenge to China's Future.
4. Gadgil, M. &Ramachandra, G. 1993. This fissured land: an ecological history of India. Univ of California Press.
5. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
6. Grumbine, R. Edward, and Pandit, M.K. Threats from India's Himalaya dams. Science 339.6115 (2013): 36-37.
7. Heywood V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
8. McCully, P. 1996. Silenced rivers: the ecology and politics of large dams. Zed Books.
9. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
10. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Comprehend and become responsive regarding environmental issues	PO1, PO3, PO5, PO8
CO2	Acquire the techniques to protect our mother earth, as without a clean, healthy, aesthetically beautiful, safe and secure environment no species can survive and sustain.	PO1,PO3, PO5, PO8
CO3	Enable the students to discuss their concern at national and international level with respect to formulate protection acts and sustainable developments policies.	PO1,PO3, PO5, PO8
CO4	Know that the rapid industrialization, crazy consumerism and over-exploitation of natural resources have resulted in degradation of earth at all levels and find solutions for the same.	PO1,PO3, PO5, PO8
CO5	Become consciousness about healthy and safe environment.	PO1,PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
UCES125A	CO1	3	1	3	1	3	2	2	3	2	1	2	1	1	1
	CO2	3	2	3	2	3	2	1	3	1	2	2	2	2	1
	CO3	3	2	3	1	3	1	1	3	2	1	2	2	1	2
	CO4	3	1	3	1	3	1	2	3	1	1	1	2	2	1
	CO5	3	1	3	2	3	2	2	3	2	2	2	1	2	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

UCDM301A	Disaster Management	L	T	P	C
Version1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure	Basics of Disasters and control techniques				
Co-requisites	-				

Course Objectives

1. To create awareness about various types of disasters.
2. To educate the students about basic disaster management strategies and problem solving.
3. To examine the disaster profile of our country and illustrate the role of governmental and non- governmental organizations in its effective management.
4. To acquaint students with the existing legal framework for disaster management and understanding the appropriate rules and regulations.

Course Outcomes

On completion of this course, the students will be able to

1. Enable the students to know the difference between natural and man- made disaster
2. Acquire the knowledge related to disaster preparedness
3. Aware the student about recovery after disaster
4. Know the structure and functioning of disaster management framework of our country
5. Provide the knowledge about disaster management act

Course Content

Section I: Introduction to Disasters: Concept and definitions- Disaster, Hazard, vulnerability, resilience, risks. Different Types of Disaster: Causes, effects and practical examples for all disasters. Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc. Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc.

Section II: Disaster Preparedness: Concept and Nature, Disaster Preparedness Plan, Prediction, Early Warnings and Safety Measures of Disaster, Role of Information, Education, Communication, and Training, Role of Government, International and NGO Bodies, Role of IT in Disaster Preparedness, Role of Engineers on Disaster Management, Relief and Recovery, Medical Health Response to Different Disasters

Section III: Rehabilitation, Reconstruction and Recovery: Reconstruction and Rehabilitation as a Means of Development, Damage Assessment, Post Disaster effects and Remedial Measures, Creation of Long-term Job Opportunities and Livelihood Options, Disaster Resistant House Construction, Sanitation and Hygiene, Education and Awareness,

Dealing with Victims' Psychology, Long-term Counter Disaster Planning, Role of Educational Institute.

Section IV: Disaster Management in India

Disaster Management Act, 2005: Disaster management framework in India before and after Disaster Management Act, 2005, National Level Nodal Agencies, National Disaster Management Authority

Liability for Mass Disaster: Statutory liability, Contractual liability, Tortious liability, Criminal liability, Measure of damages

Epidemics Diseases Act, 1897: Main provisions, loopholes.

Applications of AI and ML in Disaster Management and risk predictions.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and references:

1. Government of India, Department of Environment, Management of Hazardous Substances Control
2. Act and Structure and Functions of Authority Created Thereunder.
3. Indian Chemical Manufacturers' Association & Loss Prevention Society of India, Proceedings of the National Seminar on Safety in Road Transportation of Hazardous Materials: (1986).
4. Author Title Publication Dr. Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.
5. Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.
6. Jagbir Singh Disaster Management: Future Challenges and Opportunities K W Publishers Pvt. Ltd.
7. J. P. Singhal Disaster Management Laxmi Publications.
8. Shailesh Shukla, Shamna Hussain Biodiversity, Environment and Disaster Management Unique Publications
9. C. K. Rajan, Navale Pandharinath Earth and Atmospheric Disaster Management: Nature and Manmade B S Publication
10. Indian law Institute (Upendra Baxi and Thomas Paul (ed.), Mass Disasters and Multinational Liability: The Bhopal Case (1986)
11. Indian Law Institute, Upendra Baxi (ed.), Environment Protection Act: An Agenda for Implementation (1987)
12. Asian Regional Exchange for Prof. Baxi., Nothing to Lose But our Lives: Empowerment to Oppose
13. Industrial Hazards in a Transnational world (1989)

14. Gurudip Singh, Environmental Law: International and National Perspectives (1995), Lawman (India) Pvt. Ltd.
15. Leela Krishnan, P, The Environmental Law in India, Chapters VIII, IX and X (1999), Butterworths, New Delhi.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Enable the students to know the difference between natural and man-made disaster	PO1, PO3, PO5, PO8
CO2	Acquire the knowledge related to disaster preparedness	PO1,PO3, PO5, PO8
CO3	Aware the student about recovery after disaster	PO1,PO3, PO5, PO8
CO4	Know the structure and functioning of disaster management framework of our country	PO1,PO3, PO5, PO8
CO5	Provide the knowledge about disaster management act	PO1,PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
UCDM301A	CO1	3	1	3	1	3	2	2	3	2	1	2	1	1	1
	CO2	3	2	3	2	3	2	1	3	1	2	2	2	2	1
	CO3	3	2	3	1	3	1	1	3	2	1	2	2	1	2
	CO4	3	1	3	1	3	1	2	3	1	1	1	2	2	1
	CO5	3	1	3	2	3	2	2	3	2	2	2	1	2	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

Forensic Practical I
Course Code: BSFS151A
Credits: 3

Course Objective and Outcomes: - The students will understand & perform experiments relating to:

1. Investigation of crime scene.
2. Recording/Sketching of outdoor/ indoor scene of crime
3. Packaging and forwarding of Evidences

Course Contents	
1.	Investigation and sketching of indoor scene of crime.
2.	Investigation and sketching of outdoor scene of crime.
3.	Crime Scene Photography: indoor, outdoor.
4.	Notes making.
5.	Searching of crime scene.
6.	Parts of camera.
7.	Packaging and forwarding.
8.	Envelop making and Druggist fold method.
9.	Sealing procedure.

Examination Scheme:

IA		**EE**	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva, A- Attendance

Text and references:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition.
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Investigation of crime scene.	PO1, PO2, PO3, PO5, PO6, PO8, PO9, PO10
CO2	Recording/Sketching of outdoor/ indoor scene of crime	PO1, PO2, PO3, PO5, PO6, PO8, PO9, PO10
CO3	Packaging and forwarding of Evidences	PO1, PO2, PO3, PO5, PO6, PO8, PO9, PO10

Course	**Course**	**PO**	**PSO**

Code	Outcome	1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS151A	CO1	3	3	3	2	3	3	2	3	3	3	1	3	2	2
	CO2	3	3	3	2	3	3	2	3	3	3	1	2	2	2
	CO3	3	3	3	2	3	3	2	3	3	3	1	3	2	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

SYLLABUS-SECOND SEMESTER

BSFS102A	Forensic Dermatoglyphics	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The course focuses on following objectives-

1. Developing an understanding and appreciation for the scope of Fingerprints Examination.
2. Develop an understanding on various methods of development of Fingerprints.
3. Develop comprehensive knowledge on fingerprint patterns, fingerprint classification, the various methods of fingerprint development- physical and chemical.

Course Outcome:

1. Develop a solid understanding of the fundamental principles of fingerprint identification, classification and comparison.
2. Learn to recognize and anlyze different ridge patterns, such as loops, whorls and arches, and understand their significance in fingerprint analysis.
3. Acquire skills in identifying and counting minutiae points.
4. Familiarize with various methods of fingerprint collection, including inked impression, latent prints.
5. Learn techniques to enhance and develop latent prints at crime scenes using chemical and physical methods.
6. Understand the utilization of fingerprint databases.
7. Develop the ability to compare known and unknown fingerprints to determine a match or exclusion.
8. Analyze real-world forensic fingerprinting cases to understand the practical application of fingerprint analysis techniques.

Course Contents
Section I: History and Development of Fingerprinting Origin & History of fingerprints, Principles of Fingerprint identification, Searching, location and significance of fingerprints in criminal investigation.

Section II: Introduction of Fingerprint and its characteristics Biological significance of skin pattern, Types of fingerprints, Fingerprint characteristics: class and individual, Collection, lifting and preservation of fingerprints, Photography of latent fingerprints and presentation of fingerprint evidence in court.
Section III: Classification of Fingerprints Henry's system of classification, Batley's Single Digit classification, Extension of Henry's system of classification. Primary, secondary, sub-secondary, major, Second sub-secondary, key and final Classifications, AFIS
Section IV: Fingerprint Developmental techniques Methods of lifting and developing latent fingerprints – Physical methods - Powder method (Black, silver, florescent, red, yellow), Iodine fuming etc. Chemical methods - Ninhydrin, Silver nitrate method.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
2. Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
3. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
4. James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
5. Nanda, B. B., and Tewari, R. K., Forensic Science in India. Select Publishers, New Delhi, 2001.
6. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
7. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a solid understanding of the fundamental principles of fingerprint identification, classification and comparison.	PO1, PO3, PO5, PO7, PO8
CO2	Learn to recognize and anlyze different ridge patterns, such as loops, whorls and arches, and understand their significance in fingerprint analysis.	PO1, PO3, PO5, PO7, PO8

CO3	Acquire skills in identifying and counting minutiae points.	PO1, PO3, PO5, PO7, PO8
CO4	Familiarize with various methods of fingerprint collection, including inked impression, latent prints.	PO1, PO3, PO5, PO7, PO8, PO10
CO5	Learn techniques to enhance and develop latent prints at crime scenes using chemical and physical methods.	PO1, PO3, PO5, PO7, PO8, PO10
CO6	Understand the utilization of fingerprint databases.	PO1, PO3, PO5, PO7, PO8
CO7	Develop the ability to compare known and unknown fingerprints to determine a match or exclusion.	PO1, PO3, PO5, PO7, PO8
CO8	Analyze real-world forensic fingerprinting cases to understand the practical application of fingerprint analysis techniques	PO1, PO3, PO5, PO7, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS102A	CO1	3	2	3	2	3	1	3	3	1	1	1	3	2	2
	CO2	3	1	3	2	3	1	3	3	1	2	1	2	2	2
	CO3	3	2	3	2	3	1	3	3	2	2	1	3	2	1
	CO4	3	1	3	1	3	1	3	3	2	3	1	3	1	1
	CO5	3	2	3	1	3	1	3	3	2	3	1	3	2	2
	CO6	3	2	3	2	3	1	3	3	1	1	1	3	2	2
	CO7	3	2	3	2	3	1	3	3	1	1	1	3	2	2
	CO8	3	1	3	1	3	1	3	3	3	2	1	2	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS104A	**Questioned Document**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	-				

Course Objective: The course focuses on the following objectives-

1. Developing an understanding and appreciation for the scope of Handwriting Identification and Examination.
2. Develop an understanding of handwriting and their characteristics, principles of identification.
3. Give a brief description on various methods of their detection and examination.
4. Develop comprehensive knowledge on typewritten documents, common styles and their examination.

Course Outcome:

1. Develop a foundational understanding of the principles and techniques used in forensic questioned document analysis.
2. Acquire skills to analyze handwriting characteristics, variations and individuality to determine authorship and authencity.
3. Understand the methods of examining and comparing signatures to determine if they are genuine or forged.
4. Understand the analysis of printed documents and photocopies to identify anomalies, source printers, or copying techniques.
5. Gain skills in comparing and identifying typewritten text.
6. Analyze real world forensic questioned document cases to understand the practical application of analysis techniques.

Course Contents
Section I: Introduction to Questioned Documents Definition: Documents, questioned documents and the type of cases encountered; Importance, nature and problems of documents, Location, collection, handling and presentation of documents, adequacy of exemplars and standards.
Section II: Document analysis Charred documents, security documents, torn documents, and Counterfeit currency. **General Equipment for Examination:** Hand lens, Camera, Compound Microscope, Stereo microscope, TLC, Transmitted light source, UV- IR radiation chamber and Oblique Light source, ESDA, VSC.
Section III: Handwriting Characteristics Identification – principle individual handwriting characteristics, external, internal and physical factors affecting handwriting or signature of a person, Authentic Signatures, forged signatures, disguised signatures, traced signatures, and their characteristics
Section IV: Typewritten and Computer-generated documents Comparison of typewritten documents, common types of styles, detection of altered typewritten documents, and ink analysis. Working of photocopiers and printers, scanners, examination of photocopies/ Xerox, printouts and scanned documents.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Albert, S. Osborn, Questioned Documents, Second Ed., Universal Law Publishing, Delhi, 1998.
2. Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy

Prior Bates, Springfield, Illinois, USA, 1971.
3. Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group.
4. Huber, A. R. Headrick, A. M. (1999). The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals, CRC Press, Boca Raton London.
5. James, S. H. And Nordby, J. J. (Eds), Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
6. Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a foundational understanding of the principles and techniques used in forensic questioned document analysis.	PO1,PO3, PO5,PO8
CO2	Acquire skills to analyze handwriting characteristics, variations and individuality to determine authorship and authenticity.	PO1, PO3, PO5, PO8
CO3	Understand the methods of examining and comparing signatures to determine if they are genuine or forged.	PO1, PO3, PO5, PO8
CO4	Understand the analysis of printed documents and photocopies to identify anomalies, source printers, or copying techniques.	PO1, PO2, PO3, PO5, PO8
CO5	Gain skills in comparing and identifying typewritten text.	PO1, PO3, PO5, PO8
CO6	Analyze real world forensic questioned document cases to understand the practical application of analysis techniques.	PO1, PO2, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS104A	CO1	3	2	3	1	3	1	2	3	1	2	2	3	2	1
	CO2	3	2	3	2	3	1	2	3	1	1	2	2	2	1
	CO3	3	1	3	2	3	2	1	3	2	1	2	3	3	2
	CO4	3	3	3	2	3	1	2	3	2	2	2	3	3	2
	CO5	3	2	3	1	3	1	1	3	1	2	2	3	3	1
	CO6	3	3	3	1	3	1	2	3	1	2	2	3	3	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS106A	**Biology II**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					

Co-requisites	**-**

Course Objective: The given course is designed to:

1. Provide the knowledge about the fundamentals of biology.
2. To provide understanding of cell biology.
3. To develop the comprehensive understanding of study of the biomolecules, biochemistry and aspect of Genetics.

Course Outcome:

1. Develop the proficiency in basic laboratory techniques used in Biology.
2. Understand the structure and function of cell organelles.
3. Comprehend the structure of cell membrane and the mechanism of passive and active transport across the membrane.
4. Learn about the cell wall in plant and animal cell, its role in support and interactions with the surrounding environment.
5. Understand the process of cell division.
6. Recognize the practical applications of cell biology principles.

Course Contents
Section I: Techniques in Biology Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Confocal microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.
Section II: Cell Organelles Mitochondria Structure, marker enzymes, composition; mitochondrial biogenesis; Semiautonomous nature; Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA **Chloroplast:** Structure, marker enzymes, composition; semiautonomous nature, chloroplast DNA **ER, Golgi body & Lysosomes:** Structures and roles. Signal peptide hypothesis, N-linked glycosylation, Role of Golgi in O- linked glycosylation. Cell secretion, Lysosome formation. **Peroxisomes and Glyoxisomes:** Structures, composition, functions in animals and plants and biogenesis **Nucleus:** Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).
Section III: Cell Membrane and CellWall The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall
Section IV: Cell Cycle: Interphase, Mitosis and Meiosis Role of Cell division; Overview of Cell cycle; Molecular controls; Meiosis

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. I.E. Celis Cell biology Academic Press 2nd Edition.
2. Robertis & Robertis Cell & Microbiology 8th Edition.
3. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
4. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
5. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
6. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
7. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
8. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
9. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop the proficiency in basic laboratory techniques used in Biology.	PO1, PO2, PO3, PO5, PO8
CO2	Understand the structure and function of cell organelles.	PO1, PO3, PO5, PO8
CO3	Comprehend the structure of cell membrane and the mechanism of passive and active transport across the membrane.	PO1, PO3, PO5, PO8
CO4	Learn about the cell wall in plant and animal cell, its role in support and interactions with the surrounding environment.	PO1, PO3, PO5, PO8
CO5	Understand the process of cell division.	PO1, PO3, PO5, PO8
CO6	Recognize the practical applications of cell biology principles	PO1, PO2, PO3, PO5, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS106A	CO1	3	3	3	2	3	1	2	3	2	2	1	3	2	2
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	2	2
	CO3	3	1	3	2	3	1	2	3	2	2	1	3	2	1
	CO4	3	2	3	1	3	1	2	3	1	1	1	3	1	1
	CO5	3	1	3	1	3	1	2	3	1	1	1	3	2	2
	CO6	3	3	3	2	3	1	2	3	2	2	1	3	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS110A	**Physics II**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To understand the fundamentals of linear and Circular motion
2. To gain a brief description of properties of material in terms of elasticity and Fluidity.
3. To develop an understanding of Properties and Transmission of sound waves factors in affecting the accosting sub-buildings.
4. To understand the fundamentals of light and associated Phenomena**.**

Course Outcome:

1. Understand and apply Newton's Laws of motion to describe the behavior of objects.
2. Analyze and predict the motion of objects using concepts such as displacement, velocity, acceleration etc.
3. Comprehend the principle of elasiticity and its application in understanding material deformation.
4. Learn the fundamental principles of fluid mechanics.
5. Study the property of sound waves.
6. Recognize the practical applications of sound and light phenomenon in various fields.
7. Develop the ability to apply physics principles to solve problems related to motion elasticity, fluid dynamics sound and light.

Course Contents
Section I: Newton's Laws of Motion Interpretation and applications of Newton's laws of motion (I, II, III), Linear and circular motion, Newtonian mechanics, Friction, properties of friction, Pseudo forces.

Section II: Elasticity & Fluid Dynamics Elastic properties of matter, elastic constants and their interrelations. Fluid dynamics, equation of continuity, Bernoulli's equation, stream line and turbulent flow, lines of flow in air foil, Poiseuille's equation.
Section III: Study of Sound Velocity of sound, noise and sound intensity measurement, echo, reverberation, Sabine's Formula, absorption coefficient, acoustics of buildings and factors affecting acoustics of buildings. Sound distribution in an auditorium, introduction to ultrasonic, production of ultrasonic waves, applications of ultrasonics.
Section IV: Study of Light Refraction through thin layers, thick lens, thin lens and lens combinations, aberrations, interference in thin films, fringes in wedge shaped films, Newton's rings, total internal reflection, Diffraction and polarization, simple table spectrophotometer.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand and apply Newton's Laws of motion to describe the behavior of objects.	PO1, PO3, PO5, PO8
CO2	Analyze and predict the motion of objects using concepts such as displacement, velocity, acceleration etc.	PO1, PO3, PO5, PO8
CO3	Comprehend the principle of elasiticity and its application in understanding material deformation.	PO1, PO3, PO5, PO8
CO4	Learn the fundamental principles of fluid mechanics.	PO1, PO3, PO5, PO8
CO5	Study the property of sound waves.	PO1, PO3, PO5,

		PO8
CO6	Recognize the practical applications of sound and light phenomenon in various fields.	PO1, PO3, PO5, PO8
CO7	Develop the ability to apply physics principles to solve problems related to motion elasiticity, fluid dynamics sound and light	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS110A	CO1	3	2	3	2	3	1	2	3	2	2	1	3	2	2
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	2	2
	CO3	3	2	3	2	3	1	2	3	2	2	1	3	2	1
	CO4	3	1	3	1	3	1	2	3	1	2	1	3	1	1
	CO5	3	1	3	1	3	1	2	3	1	2	1	3	2	2
	CO6	3	2	3	2	3	1	2	3	2	2	1	3	2	2
	CO7	3	2	3	2	3	1	2	3	2	2	1	3	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS108A	**Chemistry II**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	-				

Course Objective: The objectives of the course:

1. To focus on building a conceptual understanding of fundamental chemical principles
2. Including properties of atoms, molecules, states of matter, and chemical reactions.

Course Outcome:

1. Acquire a thorough understanding of the properties of s, p, d, f Block elements.
2. Learn about the chemistry of alkali metals and alkaline earth metals.
3. Explore the properties and compounds of main group and their roles in various chemical reactions.
4. Acquire skills in designing and performing synthetic reactions involving s,p,d,f block elemnts.
5. Recognize the environmental impact and considerations related to the chemistry of these elements and their compound.

Course Contents
Section I: Chemistry of s-block elements Ionic bond, Covalent bond, Coordinate bond. Valence shell electron pair repul2sion (VSEPR) theory to NH3, $H3O^{+}$, SF4, CIF3, ICI $^{-}$ and H2O. Valence bond theory and its limitations, directional cha^{4}racteris^{4}tics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF2, BF3, CH4, PF5, SF6, IF7 SO^{2-}, ClO^{-}). MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.
Section II: Chemistry of p-block elements **Boron family (13th group):** Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazene – chemical properties and structure. **Carbon Family (14th group):** Allotropy of carbon, Catenation, pה– dה bonding (an idea), carbides, fluorocarbons– general methods of preparations, properties and uses. **Nitrogen Family (15th group):** Oxides – structures of oxides of N, P. oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. **Oxygen Family (16th group):** Oxyacids of sulphur – structures and acidic strength. **Halogen Family (17th group):** Basic properties of halogen, hydro and oxyacids of chlorine – structure and comparison of acid strength. **Noble Gases (18th group):** Basic properties of noble gases, physical properties and structure of important compounds of Xenon.
Section III: Chemistry of d-block elements Definition of transition elements, position in the periodic table, General characteristics & properties of d- block elements, Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and spectral properties. **Coordination Compounds** Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral and tetrahedral complexes, factors affecting the crystal-field parameters.
Section IV: Chemistry of f-block elements **Lanthanides:** General features and Electronic structure, oxidation states and ionic radii and lanthanide contraction. **Actinides:** General features and chemistry of actinides, actinide contraction. Comparison of properties of Lanthanides and Actinides and with transition elements. Elementary idea about the transuranic elements.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Texts & References:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic and Biological Chemistry.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Acquire a thorough understanding of the properties of s, p, d, f Block elements.	PO1, PO3, PO5, PO8
CO2	Learn about the chemistry of alkali metals and alkaline earth metals.	PO1, PO3, PO5, PO8
CO3	Explore the properties and compounds of main group and their roles in various chemical reactions.	PO1, PO3, PO5, PO8
CO4	Acquire skills in designing and performing synthetic reactions involving s,p,d,f block elemnts.	PO1, PO3, PO5, PO8
CO5	Recognize the environmental impact and considerations related to the chemistry of these elements and their compound.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS108A	CO1	3	2	3	2	3	1	2	3	2	2	1	3	2	2
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	2	2
	CO3	3	2	3	2	3	1	2	3	2	2	1	3	2	1
	CO4	3	1	3	1	3	1	2	3	1	2	1	3	1	1
	CO5	3	1	3	1	3	1	2	3	1	2	1	3	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS112A	**Basics of Digital Forensics**	**L**	**T**	**P**	**C**
Version1.0		2	0	0	2
Total Contact Hours	30 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

In recent years, digital forensics has emerged as an essential source of tools and approaches for facilitating digital preservation and curation, specifically for protecting and investigating evidence from the past. Institutional repositories and professionals with responsibilities for personal archives can benefit from forensics in addressing digital authenticity, accountability and accessibility.

Course Outcome:

1. Understand data representations used in digital representations used in digital systems.
2. Familiarize with various operating systems, their structures and file systems to effectively navigate and extract digital evidence.
3. Identify and classify different types of digital evidences.
4. Gain knowledge about volatile and non-volatile memory and explore methods to extract and anlyze data from different memory sources.
5. Learn techniques to analyze software artifacts.
6. Explore how input and output devices can provide valuable evidence in digital investigations.

Course Contents
Section I: Cloud Forensic Introduction of cloud forensics, Identification and conducting cloud forensic investigations and security incidents, anti-forensic techniques used in the cloud.
Section II: Data collection Seize electronic evidence present in the cloud, Data recovery strategies for deleted and overwritten data, Ethical hacking to cloud forensics, Malicious Code and circumventing Virtual Machines, Resource Pooling
Section III: Analysis Metadata and Metadata Logs, Analysis on cloud storage models including OneDrive, Dropbox, and Google Drive and cloud services in SaaS, PaaS, IaaS, and FaaS, AWS case study, forensic investigation involving AWS.
Section IV: Introduction to Operating System Introduction to Operating System (Batch Operating System, Distributed operating system, etc.) , Basics of Operating System, memory structure, concurrency, scheduling, synchronization & memory management, process description and control

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Compute Crime and Computer Forensic by Dr. R.K. Tiwari
2. Introduction to Forensic Science in Crime Investigation By Dr.(Mrs.) Rukmani Krishnamurthy
3. Cyber Law in India by Farooq Ahmad- Pioneer Books
4. Information Technology Law and Practice by Vakul Sharma- Universal Law Publishing Co. Pvt. Ltd.
5. The Indian Cyber Law by Suresh T. Vishwanathan- Bharat Law House New Delhi
6. Guide to Cyber and E- Commerce Laws by P.M. Bukshi and R.K. Suri- Bharat Law House, New Delhi
7. Guide to Cyber Laws by Rodney D. Ryder- Wadhwa and Company, Nagpur
8. The Information technology Act, 2000- Bare Act- Professional Book Publishers, New Delhi.

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand data representations used in digital representations used in digital systems.	PO1, PO2, PO3, PO5, PO8
CO2	Familiarize with various operating systems, their structures and file systems to effectively navigate and extract digital evidence.	PO1, PO2, PO3, PO5, PO8, PO10
CO3	Identify and classify different types of digital evidences.	PO1, PO2, PO3, PO5, PO8, PO10
CO4	Gain knowledge about volatile and non-volatile memory and explore methods to extract and anlyze data from different memory sources.	PO1, PO2, PO3, PO5, PO8
CO5	Learn techniques to analyze software artifacts.	PO1, PO2, PO3, PO5, PO8
CO6	Explore how input and output devices can provide valuable evidence in digital investigations.	PO1, PO2, PO3, PO5, PO7, PO8, PO10

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS112A	CO1	3	3	3	2	3	2	2	3	2	2	2	2	2	2
	CO2	3	3	3	2	3	2	2	3	2	3	2	2	2	2
	CO3	3	3	3	1	3	2	2	3	2	3	2	2	2	2
	CO4	3	3	3	1	3	2	2	3	2	2	2	2	2	2
	CO5	3	3	3	2	3	2	2	3	2	2	2	2	2	2
	CO6	3	3	3	2	3	2	3	3	2	3	2	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

UCCS 155A	Communication Skills	L	T	P	C
Version 1.0		4	0	0	4
Total Contact Hours	60 Hours				
Pre-requisites/Exposure	--				
Co-requisites	--				

Course Objective:

Students will be able to develop their intellectual, personal and professional abilities.

Course Outcome:

1. Understand the basics of Grammar to improve written and oral communication skills
2. Understand the correct form of English with proficiency
3. Improve student's personality and enhance their self-confidence
4. Improve professional communication.
5. Enhance academic writing skills

Course Content
Section I: Introduction to Communication: Importance of Communication Skills, Meaning, Forms & Types of Communication; Process of Communication; Principles of Effective Communication/7Cs, Barriers in Communication (Interpersonal, Intrapersonal and Organizational)
Section II: Academic Writing: Précis (Summary – Abstract – Synopsis – Paraphrase – Précis: Methods), Letter & Résumé (Letter Structure & Elements – Types of letter: Application & Cover - Acknowledgement – Recommendation – Appreciation – Acceptance – Apology – Complaint – Inquiry).Writing a proposal and synopsis. Structure of a research paper. Citations and plagiarism.
Section III: Technology-Enabled Communication: Using technology in communication tasks, E-mails, tools for constructing messages, Computer tools for gathering and collecting information; Different virtual medium of communication.
Section IV: Building Vocabulary: Word Formation (by adding suffixes and prefixes); Common Errors; Words Often Confused; One word substitution, Homonyms and Homophones; Antonyms &Synonyms, Phrasal Verbs, Idioms & Proverbs (25 each); Commonly used foreign words (15 in number)
Section V : Personality Development: Etiquettes& Manners; Attitude, Self-esteem & Self-reliance; Public Speaking; Work habits (punctuality, prioritizing work, bringing solution to problems), Body Language: Posture, Gesture, Eye Contact, Facial Expressions; Presentation Skills/ Techniques.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz I	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Texts and References:

1. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brat iBiswas
2. Fluency in English Part II Oxford University Press, 2006
3. Business English, Pearson, 2008.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the basics of Grammar to improve written and oral communication skills	PO3, PO4, PO5
CO2	Understand the correct form of English with proficiency	PO3, PO4, PO5
CO3	Improve student's personality and enhance their self-confidence	PO3, PO4, PO5
CO4	Improve professional communication.	PO3, PO4, PO5
CO5	Enhance academic writing skills	PO3, PO4, PO5

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
UCCS 155A	CO1	2	2	3	3	3	1	2	1	2	1	1	2	1	1
	CO2	1	1	3	3	3	2	1	2	2	1	2	2	1	2
	CO3	2	2	3	3	3	1	1	1	2	2	1	1	2	1
	CO4	1	2	3	3	3	1	2	2	1	2	2	2	2	1
	CO5	2	1	3	3	3	2	2	1	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS114A	**Research Methodology and statistics**	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	-				

Course Objective: This course objective is to introduce the student with the:

1. The research process: conceiving, designing, conducting and analyzing.
2. Methods of statistical description and analysis.
3. Ethical issues about research.
4. Graphical presentation of data.

Course Outcomes:

1. Define research methodology and its importance in the scientific inquiry.
2. Identify different research approaches, such as qualitative and quantitative methods.
3. Learn how to formulate research questions and hypotheses.
4. Understand the principles of sampling and data collection techniques.
5. Understand the fundamental concepts of statistics, including variables, scales of measurement, and probability.
6. Analyze research data using appropriate statistical methods.
7. Develop skills in identifying and minimizing bias in research studies.
8. Apply research methodology and statistical techniques to real-life research projects or case studies.

Course Contents
Section I: Introduction Definition, concept and research in science and forensic science.
Section II: Methods of Research Introduction to Research Methodology; Experimental research and non – experimental research design. Observation, questionnaires, interview, schedules, case study methods, types of data, graphical representation of data, parts of statistical table.
Section III: Introduction to Statistics Introduction to statistics; one tailed test, two tailed test, parametric (f-test, z-test, t- test, chi square test) and non-parametric statistics (sign test, rank test).
Section IV: Descriptive Statistics Measures of central tendency: Mean, Mode, Median. Measures of dispersion: Range, Variance, Skewness Kurtosis, Quartile. Simple correlation methods (Karl Pearson method) and regression on two lines.

Examination Scheme:

Components	A	CT	EE
Weightage (%)	5	5	40

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Broota, K.D., Experimental designs in psychological research, Wiley eastern, New York, 1992.
2. Guilford, Statistics in Psychology and Education, McGraw hill, New York, 1986.
3. Katz and Kahn, Research in Behavioural Sciences, Methuen, USA, 1979.
4. Kerlinger, F., Foundations of Behavioural Research, Surjeet Publications, Delhi, 1983.
5. Rajamanickam, M., Statistical Methods in Psychological and Educational Research, Concept Publishing Co. New Delhi, India, 1983.
6. Smith, Jonathan, A. (Ed.), Qualitative Psychology: A Practical Guide to Research Methods, Sage Publications, 2003.
7. Woodworth and Schlosberg, Experimental Psychology, Methuen and co. ltd, London, 1971.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Define research methodology and its importance in the scientific inquiry.	PO1, PO3, PO5, PO8
CO2	Identify different research approaches, such as qualitative and quantitative methods.	PO1, PO3, PO5, PO8
CO3	Learn how to formulate research questions and hypotheses.	PO1, PO3, PO5, PO8
CO4	Understand the principles of sampling and data collection techniques.	PO1, PO3, PO5, PO8
CO5	Understand the fundamental concepts of statistics, including variables, scales of measurement, and probability.	PO1, PO3, PO5, PO8
CO6	Analyze research data using appropriate statistical methods.	PO1, PO3, PO5, PO8
CO7	Develop skills in identifying and minimizing bias in research studies.	PO1, PO3, PO5, PO8
CO8	Apply research methodology and statistical techniques to real-life research projects or case studies.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS114A	CO1	3	1	3	1	3	2	2	3	2	1	1	2	1	2
	CO2	3	2	3	2	3	1	1	3	2	2	2	1	2	1
	CO3	3	1	3	1	3	2	1	3	1	1	1	2	1	1
	CO4	3	2	3	1	3	1	2	3	1	1	1	1	2	2
	CO5	3	1	3	2	3	1	1	3	1	2	2	1	1	1
	CO6	3	2	3	2	3	2	2	3	2	1	1	2	2	2
	CO7	3	1	3	1	3	2	2	3	1	2	1	2	1	1
	CO8	3	2	3	2	3	1	1	3	2	1	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

Forensic Practical II

Course Code: BSFS152A **Credit Units: 03**

Course Objective:

1. The students will understand & perform experiments relating to:
2. Packaging and forwarding of physical evidences.
3. Identifying fingerprints, their patterns, footprints and preparing fingerprint chart.

Course Outcome:

1. Students will be able to identify forged and genuine signature and handwriting.
2. Students will understand types of fingerprints and their lifting and comparison.
3. Students will be able to identify Genuine and Fake currency
4. Students will able to identify the security features of documents.

Course Contents
Fingerprints: 1. Prepare fingerprint card and identify the patterns. 2. Tape lifting of fingerprint. 3. Casting of foot prints/ fingerprint. 4. Ninhydrin method for fingerprint development. 5. Iodine fuming method for fingerprint development. 6. Silver nitrate method for fingerprint development. **Questioned Documents:** 1. Handwriting analysis based on class and individual characteristics. 2. Examination of documents under different light sources- transmitted, oblique, UV. 3. Identification of genuine and fake currencies. 4. Identification features of security documents.

Examination Scheme:

IA		EE	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition2009.
2. A. I. Vogel, Textbook of Practical organic Chemistry including Qualitative organic analysis.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Students will be able to identify forged and genuine signature and handwriting.	PO1, PO3, PO5, PO8
CO2	Students will understand types of fingerprints and their lifting and comparison.	PO1, PO3, PO5, PO8
CO3	Students will be able to identify Genuine and Fake currency	PO1, PO3, PO5, PO8
CO4	Students will able to identify the security features of documents.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS114A	CO1	3	2	3	1	3	1	2	3	2	1	1	2	1	1
	CO2	3	1	3	2	3	2	1	3	2	1	2	2	1	2
	CO3	3	2	3	2	3	1	1	3	2	2	1	1	2	1
	CO4	3	2	3	1	3	1	2	3	1	2	2	2	2	1

1. *1=weakly mapped, 2= moderately mapped, 3=strongly mapped*

SYLLABUS-THIRD SEMESTER

BSFS201A	**Forensic Ballistics and Explosives**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The course focuses on following objectives-

1. To understand the role of ballistics in Forensic Science
2. Classification of firearms, determination of the range of firing, methods of laboratory examination of fired cartridges and firearms.
3. The students will also learn to reconstruct the sequence of events in cases involving firearms.
4. Provide the scientific knowledge and understanding needed in Fire and Explosion

Course Outcome:

1. Recall the history, the classification, characteristics and working mechanism of firearms
2. Basic Understanding of the determination of Range of fire
3. Understand about the reconstruction of shooting incident and their presentation in the court of law.
4. Elaborate the different types of explosives and their identification.

Course Contents
Section I: Firearms & Ammunition Definition, Indian Arms Act, Forensic Importance; Nature of firearms, parts of a firearm, classification of firearm, Types, Bullet comparisons, cartridge case examination, class and individual characteristics of identification
Section II: Range of Fire Muzzle pattern, scorching, blackening, tattooing, wad distribution, pellet patterns, GSR analysis, and primer residues, Entrance wound, exit wound and internal wound, evaluation of firearm injuries.
Section III: Analysis and Reconstruction Reconstruction of the sequence of events in a shooting case. Presentation of evidence in the court. accidental firing
Section IV: Explosives Introduction to explosives, definition, High explosives and low explosives, difference and classification, Identifying the explosives, Black and smokeless powder identification, dynamite identification, identifying other explosives, reconstructing the destructive devices.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
2. Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
3. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
4. James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
5. Nanda, B. B., and Tewari, R. K., Forensic Science

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Recall the history, the classification, characteristics and working mechanism of firearms	PO1, PO3, PO5, PO8, PO10
CO2	Basic Understanding of the determination of Range of fire	PO1, PO3, PO5, PO7, PO8
CO3	Understand about the reconstruction of shooting incident and their presentation in the court of law.	PO1, PO3, PO5, PO7, PO8, PO9
CO4	Elaborate the different types of explosives and their identification.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS201A	CO1	3	2	3	1	3	1	2	3	2	3	2	3	2	1
	CO2	3	2	3	1	3	1	3	3	1	1	2	2	2	2
	CO3	3	3	3	1	3	2	3	3	3	1	2	3	3	2
	CO4	3	1	3	2	3	1	1	3	2	2	2	3	3	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS203A	**Forensic Biology and Serology**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The course focuses on following objectives-

1. To understand the significance of serological evidence.
2. Complete and thorough knowledge regarding the various aspects of forensic serology
3. Blood and its detailed study for identification.
4. Importance of body fluids and their forensic significance.

Course Outcome:

1. Define and relate the various concepts behind the Forensic Biological and Serological analysis of evidence.
2. Interpret the results obtained after examination through Forensic Biology and serological techniques
3. Distinguish the different evidential points by applying the modern methods, concepts and techniques of biology and serology, which further helps in reconstruction of Scene of Crime (SOC).

4. Defend the importance of various biological trace evidences and microbial evidences during legal investigations and design solutions for the challenges faced during forensic examinations of biological evidence.

Course Contents
Section I: Introduction and analysis of Body Fluids Introduction to various body fluids, their nature and characteristics and Forensic analysis of Semen, Saliva, Urine, Sweat etc.
Section II: Blood and its analysis The nature of blood, collection, preservation and packing of blood evidence, procedures and precautions. ABO system, Rh system; Techniques for the determination of blood groups; Identification of bloodstains by microscopic methods, Catalytic tests, crystal tests, bloodstain patterns. **Species of Origin analysis:** Application of Spectrophotometric method and immunological methods (Ring, Precipitin, reverse agglutination, normal/mixed agglutination).
Section III: DNA fingerprinting Short tandem repeats (STR), Variable number of tandem repeats (VNTR), single nucleotide polymorphism (SNP), Applications of PCR in forensics, DNA fingerprinting, CODIS, DNA footprinting.
Section IV: Semen and its analysis Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
2. James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
3. Saferstein, R. (1998). Criminalistics, An Introduction to Forensic Science, 6th Ed. 6th Ed. Prentice –Hall
4. Kirk, P.L., Introduction in crime investigation (2nd), John Willey and, New York, 1974.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Define and relate the various concepts behind the Forensic Biological and Serological analysis of evidence.	PO1, PO2, PO3,PO5, PO7, PO8,
CO2	Interpret the results obtained after examination through Forensic Biology and serological techniques	PO1, PO2, PO3, PO5,PO7, PO8,
CO3	Distinguish the different evidential points by applying the modern methods, concepts and techniques of biology and serology, which further helps in reconstruction of Scene of Crime (SOC).	PO1, PO2, PO3, PO5,PO7, PO8,
CO4	Defend the importance of various biological trace evidences and microbial evidences during legal investigations and design solutions for the challenges faced during forensic examinations of biological evidence.	PO1, PO2, PO3, PO5,PO7, PO8,

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS203A	CO1	3	3	3	1	3	1	3	3	2	2	2	3	2	3
	CO2	3	3	3	1	3	1	3	3	1	1	2	2	2	3
	CO3	3	3	3	1	3	2	3	3	2	1	2	3	3	3
	CO4	3	3	3	2	3	1	3	2	1	2	2	3	3	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS205A	**Biology III**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. Provide the knowledge about the Nutrition and healh.
2. To provide understanding of Nutritional biochemistry.
3. To understand selected physiological functions and metabolic pathways of the major nutritional components (protein, carbohydrates, lipids and selected vitamins).
4. To study Nutritional and health aspects of energy balance.
5. Demonstrate familiarity with nutrients, their food sources, their functions, and signs and symptoms of deficiency or excess

Course Outcome:

1. Acquire a fundamental understanding of biological principles, with a specific focus on food, biochemistry and their relationship to human health.
2. Understand the components of balanced diet, the importance of nutrition, and the role of different food groups in maintaining health.
3. Gain knowledge of essential biochemical processes, including metabolism, cellular respiration and photosynthesis.
4. Learn about the role of enzymes and proteins in biochemical reactions and their significance in maintaining biological functions.
5. Explore how nutrients are absorbed in the body to support various physiological functions.
6. Analyze the connections between nutrition, biochemistry and human health, including the impact of diet on disease prevention and management.

Course Contents
Section I: Introduction Basic concept of food and nutrition
Section II: Functions of Food Components of food-nutrients (Macro and micronutrients): their biochemical role and dietary sources. Food groups and the concept of a balanced diet. Causes of food spoilage; Food adulteration Nutrition through the life cycle- Physiological considerations, nutrient needs and dietary pattern for various groups- adults, pregnant and nursing mothers, infants, preschool and school children, adolescents and elderly.
Section III: Nutritional Biochemistry Carbohydrates, Lipids, Proteins - Definition, Classification, Structure and properties Significance of acid value, iodine value and saponification value of lipids; Essential and Non-essential amino acids; Enzymes Definition, Classification, Properties; Coenzymes Vitamins- Fat-soluble and Water-soluble vitamins; their Structure and properties Minerals- Iron, calcium, phosphorus, iodine, selenium and zinc: their properties
Section IV: Health **Introduction to health**- Definition and concept of health. **Major nutritional deficiency diseases**- Protein Energy Malnutrition, Vitamin A deficiency, Iron deficiency anemia, Iodine deficiency disorders, their causes, symptoms, treatment, prevention and government programs, if any. **Life style related diseases**- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications. **Social health problems**- smoking, alcoholism, drug dependence and Acquired Immuno Deficiency Syndrome (AIDS). **Common aliments**- cold, cough, fevers, diarrhea, constipation- their causes and dietary treatment. Food hygiene; Potable water- sources and methods of purification Food and Water borne infections

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Acquire a fundamental understanding of biological principles, with a specific focus on food, biochemistry and their relationship to human health.	PO1, PO3, PO5, PO8
CO2	Understand the components of balanced diet, the importance of nutrition, and the role of different food groups in maintaining health.	PO1, PO3, PO5, PO8
CO3	Gain knowledge of essential biochemical processes, including metabolism, cellular respiration and photosynthesis.	PO1, PO3, PO5, PO8
CO4	Learn about the role of enzymes and proteins in biochemical reactions and their significance in maintaining biological functions.	PO1, PO3, PO5, PO8
CO5	Explore how nutrients are absorbed in the body to support various physiological functions.	PO1, PO3, PO5, PO8
CO6	Analyze the connections between nutrition, biochemistry and human health, including the impact of diet on disease prevention and management.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS205A	CO1	3	2	3	2	3	1	2	3	2	2	1	3	2	2
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	2	2
	CO3	3	2	3	2	3	1	2	3	2	2	1	3	2	1
	CO4	3	1	3	1	3	1	2	3	1	2	1	3	1	1
	CO5	3	1	3	1	3	1	2	3	1	2	1	3	2	2
	CO6	3	2	3	2	3	1	2	3	2	2	1	3	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS207A	**Chemistry III**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. To focus on building a conceptual understanding of fundamental chemical principles.
2. Including properties of atoms, molecules, states of matter, and chemical reactions.
3. Understand the principle and applications of modern chemical instrumentation, experimental design, and data analysis
4. Understand the concepts states of matter and how they depend on temperature and pressure as well as how they co-exist in phase equilibrium.
5. To gain knowledge about chemical equilibrium and its relationship with themodynamic quantities

Course Outcome:

1. Understand and comprehend the principles and theories related to chemical equilibrium, distribution law, states of matter and UV spectroscopy.
2. Familiriaze with the distribution law and its applications .
3. Gain knowledge about the different states of mater and their properties.
4. Develop the ability to apply chemical principles to solve problems related to the concepts of chemistry.
5. Analyze complex chemical systems and data to draw meaningful conclusions.
6. Critically evaluate experimental results and theoretical models in chemical equilibrium, states of matter and UV spectroscopy.

Course Contents
Section I: Chemical equilibrium Equilibrium constant and free energy, concept of chemical potential, thermodynamic derivation of law of chemical equilibrium, temperature dependence of equilibrium constant, Vant'sHoff reaction isochoric, VantHoff reaction isotherm, Le- chatelier's principle and its application, Clapeyron equation and Clausius-clapeyron equation and its application.
Section II: Distribution law Nernst distribution law- thermodynamics derivation, modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: (i) distribution of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. (ii) determination of equilibrium constant of potassium tri-iodide complex and process of extraction
Section III: States of matter **Solid state:** crystal, types of crystals, crystal defects, Bragg's law. Metallic bond and its characteristics. Liquid crystals: difference between solid, liquids and liquid crystals, types of liquid crystals. Applications of liquid crystals. **Liquid state**: properties of liquids- surface tension, viscosity and their determination. **Gaseous state**: derivation of real gases from ideal behavior. Derivation of vander wall's equation of state, explanation of behavior and real gas using vander wall's equation. **Critical phenomenon**: critical pressure, critical temperature, critical volume and the determination of PV isotherms of real gases, continuity of states, isotherms of vander wall's equation.

Section IV: Ultraviolet (UV) absorption spectroscopy

Absorption laws (Beer's Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. UV spectra of conjugated enes and enons. Wood fieser rules. Applications of UV spectroscopy in structure elucidation of simple organic compounds.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand and comprehend the principles and theories related to chemical equilibrium, distribution law, states of matter and UV spectroscopy.	PO1, PO3, PO5, PO8
CO2	**Fa**miliriaze with the distribution law and its applications .	PO1, PO3, PO5, PO8
CO3	Gain knowledge about the different states of mater and their properties.	PO1, PO3, PO5, PO8
CO4	Develop the ability to apply chemical principles to solve problems related to the concepts of chemistry.	PO1, PO3, PO5, PO8
CO5	Analyze complex chemical systems and data to draw meaningful conclusions.	PO1, PO3, PO5, PO8
CO6	Critically evaluate experimental results and theoretical models in chemical equilibrium, states of matter and UV spectroscopy	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS207A	CO1	3	2	3	2	3	1	2	3	2	2	1	3	2	2
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	2	2
	CO3	3	2	3	2	3	1	2	3	2	2	1	3	2	1
	CO4	3	1	3	1	3	1	2	3	1	2	1	3	1	1
	CO5	3	1	3	1	3	1	2	3	1	2	1	3	2	2
	CO6	3	2	3	2	3	1	2	3	2	2	1	3	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS209A	Physics III	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. To focus on building a conceptual understanding on ray optics and optical instrument.
2. To understand the theory and application of relativity.
3. To understand the concept and theory of communication system.

Course Outcome:

1. Demonstrate and understand the principles of ray optics, including reflection, refraction and the behavior of light in different media.
2. Familiarize with the working principle and application of optical instruments and communication system.
3. Describe the basic concepts of theory of relativity.
4. Integrate the knowledge of ray optics

Course Contents
Section I: Ray optics and optical instrument Reflection of light by spherical mirror, Refraction and diffraction through a prism, Rainbow formation. Optical instrument: Microscopic and astronomical telescope and Newtonian telescope. Wave optics: Young's double slit experiment, Huygen's principles, reflection and refraction by Huygen's principles, polarization.
Section II: Communication system Elements of communication system, Block diagram, Band width of signals, Satellite communications, Modulation, Need for modulation, Amplitude modulation, Basic idea of internet and intranet
Section III: Theory of relativity Inertial and non- inertial frame of reference, Galilean transformation (velocity and acceleration), Michelson and Morley experiment and its outcome, Postulates of special theory of relativity, Lorentz transformation, Length contraction, Time dilation.
Section IV: Application of relativity Realistic transformation of velocity, frequency and wave number, Relativistic kinematics, Transformation of energy and momentum, concept of four vectors.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and References:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Demonstrate and understand the principles of ray optics, including reflection, refraction and the behavior of light in different media.	PO1, PO3, PO5, PO8
CO2	Familiarize with the working principle and application of optical instruments and communication system.	PO1, PO3, PO5, PO8
CO3	Describe the basic concepts of theory of relativity.	PO1, PO3, PO5, PO8
CO4	Integrate the knowledge of ray optics and optical instruments to design and optimize optical systems.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS209A	CO1	3	2	3	2	3	1	2	3	2	2	1	3	2	2
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	2	2
	CO3	3	2	3	2	3	1	2	3	2	2	1	3	2	1
	CO4	3	1	3	1	3	1	2	3	1	2	1	3	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS213A	**Forensic Photography**	**L**	**T**	**P**	**C**
Version 1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. Provide foundation knowledge of photography
2. Develop an understanding and application of Photography in Forensic Science and CSI.
3. Understand advance photographic methods for forensic science.
4. Explain the parts of a camera, different types of photography and importance of forensic photography used in the investigation of crime.
5. Interpret the various methods of photographing a crime scene etc.

Course Outcome:

1. Demonstrate an understanding of the principles and techniques of forensic photography.
2. Explain the importance using specific equipment and camera settings in forensic photography.
3. Apply techniques to effectively document crime scene and evidence and apply appropriate photographic methods to capture clear and detailed images.
4. Analyze different types of evidence using various lightning and camera techniques.
5. Evaluate the ethical considerations and legal implications related to the use of forensic photography in investigations and court proceedings.

Course Contents
Section I: Introduction Introduction to forensic photography; required equipment for photography, Importance of Forensic photography in a crime scene investigation photography in indoor and outdoor crime scene.
Section II: Types of Photography Surveillance photography – Cameras, Type and accessions for surveillance photography. Aerial photography, Underwater photography, Videography.
Section III: Photo prints Various methods for developing photographs, chemical processing, negative development, introduction and types of films, Photographic aspects of physical injuries, Use of photography in reconstruction the scene of crime (Indoor and outdoor) and its presentation in the court of law
Section IV: Guidance Documentation and High-tech Photography for Crime Scene Image magnification, U. V. and I. R. illumination in Photography, Photography of Art factual evidences (Bloodstain, fingerprint, imprints, and micro evidence). High-speed photography, legal aspects of visual evidence.

Examination Scheme:

Components	**At**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; Att: Attendance

Text & References:

1. Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Press, London, 1994.
2. Henry Horeustein; Colour Photography -A working Manual, Little Brown Co. Boston (1995)
3. B.H.E. Jacobson, Ray GG Attridge; The Manual of Photography, Focal Press, London (1988)
4. Jahne B; Digital Image Processing, Heidelberg Springer (1996)
5. H.L. Blitzer and J. Jacobia; Forensic Digital Imaging and Photography, Academic Press (2002)
6. David R. Redsicker; The Practical Methodology of Forensic Photography- 2nd Ed. CRC Press LLC (2001)
7. R.E. Jacobson, S.F. Ray, G.G. Attridge, N.R. Oxford; The Manual of Photography-Photographic and Digital Imaging, Focal Press (2000)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Demonstrate an understanding of the principles and techniques of forensic photography.	PO1, PO2, PO3, PO5, PO7, PO8
CO2	Explain the importance using specific equipment and camera settings in forensic photography.	PO1, PO2, PO3, PO5, PO7, PO8
CO3	Apply techniques to effectively document crime scene and evidence and apply appropriate photographic methods to capture clear and detailed images.	PO1, PO2, PO3, PO5, PO7, PO8
CO4	Analyze different types of evidence using various lightning and camera techniques.	PO1, PO2, PO3, PO5, PO7, PO8
CO5	Evaluate the ethical considerations and legal implications related to the use of forensic photography in investigations and court proceedings.	PO1, PO2, PO3, PO5, PO7, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS213A	CO1	3	3	3	1	3	1	3	3	1	2	2	3	2	1
	CO2	3	3	3	2	3	1	3	3	2	1	2	2	2	2
	CO3	3	3	3	2	3	2	3	3	2	1	2	3	3	2
	CO4	3	3	3	2	3	1	3	3	1	2	2	3	3	1
	CO5	3	3	3	1	3	1	3	3	2	2	2	3	3	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS211A	Cyber Forensics II	L	T	P	C
Version1.0		2	0	0	2
Total Contact Hours	30 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. Develop an understanding on cyber crime and IT Act.
2. Develop an investigative process for the digital forensic investigation.
3. Understand Windows file systems, FAT and NTFS
4. Explain methods of focusing investigations through analysis of multiple evidence sources.

Course Outcome:

1. Understand cyber forensic principle, methodologies, legal aspects and the type of cybercrimes.
2. Explain the significance of cyber laws including the IT Act
3. Lean about the seizing of digital evidences, their collection and packaging.
4. Analyze and interpret digital evidence to draw conclusions about cyber incidents and potential perpetrators.
5. Evaluate the reliability and validity of digital evidences and ensure its proper documentation through the chain of custody.

Course Contents
Section I: Mobile Technologies Introduction to Mobile Technologies - Asynchronous Transfer Mode (ATM), Wireless Application Protocol (WAP). Cellular technologies - Advanced Mobile Phone System (AMPS), Imode, Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) and relative strengths. Subscriber Identity Module (SIM), International Mobile Equipment Identity (IMEI).
Section II: Functions of Bluetooth and security issues. Various Generation of Mobile Phone Technologies. Understanding of the mobile phone operating systems – Android, iOS, Windows. Understanding of SQLite Databases.
Section III: Mobile attacks Phone Phreaking, Call tampering, Wireless Hack Walkthrough and Man-in-the-Middle-attacks. Overview of WEP attack. Attacks on WEP, WPA and WPA-2 Encryption, fake hotspots. Wireless Public Key Infrastructure. Securing WLAN, WEP Decryption script.

Section IV: Mobile Forensics: Overview of Mobile Forensics, Seizure and Preservation of mobile phones and PDA. Types of Evidence present in mobile phones - Files present in SIM card, external memory dump, and evidences in memory card. Mobile phone evidence extraction process, Data Acquisition Methods – Physical, File System, Logical and Manual Acquisition. Mobile Forensic Investigation Toolkit. Tracking of mobile phone location.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand cyber forensic principle, methodologies, legal aspects and the type of cybercrimes.	PO1, PO3, PO5, PO7, PO8
CO2	Explain the significance of cyber laws including the IT Act	PO1, PO3, PO5, PO7, PO8
CO3	Lean about the seizing of digital evidences, their collection and packaging.	PO1, PO3, PO5, PO7, PO8, PO10
CO4	Analyze and interpret digital evidence to draw conclusions about cyber incidents and potential perpetrators.	PO1, PO3, PO5, PO7, PO8
CO5	Evaluate the reliability and validity of digital evidences and ensure its proper documentation through the chain of custody.	PO1, PO3, PO5, PO7, PO8

Course Code	Course Outcome	PO										PSO			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS211A	CO1	3	2	3	1	3	1	3	3	2	2	2	3	2	3
	CO2	3	2	3	2	3	1	3	3	2	1	2	2	2	3
	CO3	3	3	3	2	3	2	3	3	2	3	2	3	3	3
	CO4	3	1	3	2	3	1	3	3	2	2	2	3	3	2
	CO5	3	2	3	2	3	1	3	3	1	1	2	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS215A	Crime Scenario in India	L	T	P	C
Version1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To introduce students about the Sociological aspects of crime and Criminal behavior.
2. To study the concept and functioning of Criminal Justice System.
3. To study the importance of judiciary and its importance.
4. To study about prison system and its role in judicial system.

Course Outcome:

1. Understand about the criminal justice system in india and its importance.
2. Learn about the sociological aspects of crime and criminal in society.
3. Develop the understanding of judiciary and its importance.
4. Understand about the role of prison.

Course Contents
Section I: Introduction to Criminal Justice System Introduction, meaning, purpose and social relevance, Criminal justice system in INDIA and its importance, Organizational structure, co-operation and co-ordination among the various sub-systems of the criminal justice system.
Section II: **Crime and sociology** Sociological aspects of crime and criminals in society; Theories- Environmental, Sociological, Geographical, Biological. Fundamental elements of crime, Stages of crime : Intention, preparation, attempt and commission, Society-Criminal interaction and various types of crimes in India.
Section III: Judiciary Meaning and importance of judiciary, organizations and features of Indian Judicial System. Hierarchy of Courts in India, Difference between criminal law and tort, Recidivism- Causes and prevention. Role of police in prosecution and interse relationship. Modernization and reforms in the justice administration, Importance of judicial system in modern societies.
Section IV: Prisons Historical development of prisons, objectives of imprisonment. Prison organization and types of prisons in India. Legal framework of prison system in India, Modernization and Prison Reforms Committees in India. Prison structure- Auburn System and Pennsylvania System. Human Rights of prisoner as per UN convention, Constitutional Rights of prisoners in India.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References

1. Henry Lee's Crime Scene Handbook.
2. Crime Scene Processing and Laboratory Work Book by Patric Jones
3. Introduction to Forensic Science in Crime Investigation By Dr. (Mrs.) Rukmani Krishnamurthy
4. Crime Scene Management with Special Emphasis on National level Crime Cases by Dr. Rukmani Krishnamurthy under publishing
5. Compute Crime and Computer Forensic by Dr. R.K. Tiwari.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand about the criminal justice system in india and its importance.	PO3, PO5, PO7, PO8
CO2	Learn about the sociological aspects of crime and criminal in society.	PO3,PO4, PO5, PO7, PO8
CO3	Develop the understanding of judiciary and its importance.	PO3, PO5, PO7, PO8
CO4	Understand about the role of prison.	PO3, PO5, PO7, PO8

Course Code	Course Outcome	PO										PSO			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS215A	CO1	2	2	3	1	3	1	3	3	2	2	3	3	3	2
	CO2	2	1	3	3	3	2	3	3	2	2	1	2	2	1
	CO3	1	2	3	2	3	2	3	3	1	2	3	3	2	2
	CO4	2	1	3	1	3	2	3	3	2	1	3	3	3	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

Forensic Practical III

Course Code: BSFS251A **Credit Units: 03**

Course Objective:

1. To learn the methods for characterization of gunshot residue.
2. To know the characteristics of ammunition.
3. To understand the methods of identifying firearms.
4. To develop their skills to identify the hair morphology.
5. To determine blood group and identify stain in saliva and urine.

Course Contents
Forensic Biology and Serology 1. Analyse different blood stain pattern found at crime scene. 2. Perform preliminary tests for blood. 3. To identify blood samples by confirmatory chemical tests. 4. To identify the given stain as semen 5. To prepare slides of scale pattern of human hair 6. To examine human hair for cortex and medulla. **Forensic Ballistics and Explosives** 1. To classify the firearms and their firing mechanisms 2. To know the characteristics of ammunition 3. Collection, preservation and packing of exhibits. 4. To perform chemical tests of powder residues (Walker's Test) around gunshot holes in fabrics. 5. Restoration of erased serial numbers on firearms. 6. Photography and sketching of crime scene involving firearms. 7. To perform chemical tests for the identification of GSR.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009.
2. A. I. Vogel, Textbook of Practical organic Chemistry including Qualitative organic analysis.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	To learn the methods for characterization of gunshot residue.	PO1, PO3, PO5, PO7, PO8, PO10
CO2	To know the characteristics of ammunition.	PO1, PO3, PO5, PO7, PO8, PO10
CO3	To understand the methods of identifying firearms.	PO1, PO3, PO5, PO7, PO8, PO10
CO4	To develop their skills to identify the hair morphology.	PO1, PO3, PO5, PO7, PO8, PO10
CO5	To determine blood group and identify stain in saliva and urine	PO1, PO3, PO5, PO7, PO8, PO10

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS251A	CO1	3	2	3	1	3	1	3	3	2	3	2	3	2	3
	CO2	3	2	3	2	3	1	3	3	2	3	2	2	2	3
	CO3	3	3	3	2	3	2	3	3	2	3	2	3	3	3
	CO4	3	1	3	2	3	1	3	3	2	3	2	3	3	2
	CO5	3	2	3	2	3	1	3	3	1	3	2	2	2	2

5. *1=weakly mapped, 2= moderately mapped, 3=strongly mapped*

SYLLABUS-FOURTH SEMESTER

BSFS202A	**Forensic Physics & Biometric System**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To understand the metric system and its importance in forensic science.
2. This course introduces the student to forensic applications of physics, via the study of selected topics.
3. Students will study the physics behind investigative methods used to gather evidence and reconstruct crime events.
4. To acquire knowledge of physical evidence like glass, pain and soil.

Course Outcome:

1. Develop a comprehensive understanding of the metric system and its significance in the field of forensic science.
2. Gain knowledge and comprehension of the applications of physics in forensic science, focusing on selected topics.
3. Acquire an in-depth understanding of the physics principles underlying investigative methods employed in evidence collection and crime event reconstruction.
4. Demonstrate knowledge and proficiency in identifying and analyzing physical evidence such as glass, paint, and soil, using relevant scientific techniques and methodologies
5. Evaluate and analyze physical evidence using scientific techniques and methodologies.
6. Applying the knowledge of physical evidence for the purpose of investigation and law.

Course Contents
Section I: The Metric System Introduction to the metric system, Biometrics in Personal Identification: Introduction, Concepts of Biometric Authentication, Role in person Identification, Techniques and Technologies (Finger Print Technology, Face Recognition, IRIS, Retina Geometry, Hand Geometry). Introduction to prevalent physical evidences (soil, glass, fibre, hair and liquids).
Section II: Glass and paint Examination Glass: Composition (organic and inorganic elements), Analytical and chemical examination, Comparing glass fragments, glass fractures.
Section III: Forensic Paint Examination Paint: Introduction to paint chemistry, types of paints and their composition, forensic examination of paints (household and automobile).
Section IV: Soil examination Composition of soil (organic and inorganic), Properties (Colour, density, size distribution of soil particles), Collection and preservations of soil, Mineral and chemical analysis of soil, Density gradient techniques. Definition, composition, types, physical and chemical analysis of concrete and cement.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Heard, B. J., Handbook of Firearm and Ballistics, Wiley & Sons, Chichester, England, 1997.
2. James, S. H., and Nordby, J. J., Forensic Science; an Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
3. Saferstein, Richard, Criminalistics, an Introduction of Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
4. Sharma, B.R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd., New Delhi, 2001.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a comprehensive understanding of the metric system and its significance in the field of forensic science.	PO1, PO3, PO5, PO8
CO2	Gain knowledge and comprehension of the applications of physics in forensic science, focusing on selected topics.	PO1, PO3, PO5, PO8
CO3	Acquire an in-depth understanding of the physics principles underlying investigative methods employed in evidence collection and crime event reconstruction.	PO1, PO3, PO5, PO8, PO10
CO4	Demonstrate knowledge and proficiency in identifying and analyzing physical evidence such as glass, paint, and soil, using relevant scientific techniques and methodologies	PO1, PO2, PO3, PO5, PO8, PO10
CO5	Evaluate and analyze physical evidence using scientific techniques and methodologies.	PO1, PO2, PO3, PO5, PO8, PO10
CO6	Applying the knowledge of physical evidence for the purpose of investigation and law.	PO1, PO2, PO3, PO5, PO8, PO10

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS202A	CO1	3	1	3	1	3	1	1	3	2	2	2	2	2	1
	CO2	3	2	3	2	3	2	2	3	1	2	1	2	2	2
	CO3	3	2	3	1	3	2	2	3	1	3	3	1	1	1
	CO4	3	3	3	2	3	2	1	3	2	3	2	3	1	2
	CO5	3	3	3	2	3	1	2	3	1	3	2	3	3	1
	CO6	3	3	3	2	3	2	2	3	2	3	2	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS204A	**Forensic Anthropology**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	-				

Course Objective: The given course is designed to:

1. Provide the knowledge about the basics about Forensic anthropology
2. Develop comprehensive understanding of different techniques of determining the identity of unknown remains.
3. To understand the determination of height, age, sex from long bones.
4. To understand the concept of identification of age, sex, race from human skull.

Course Outcome:

1. Acquire a solid foundation in the fundamentals of Forensic Anthropology, including its principles, methodologies, and applications.
2. Develop a comprehensive understanding of various techniques used in the identification of unknown remains, including skeletal analysis, biological profiling, and forensic odontology.
3. Demonstrate proficiency in determining the height, age, and sex of individuals based on the analysis of long bones, employing established anthropological methods and statistical approaches.
4. Gain a thorough understanding of the process of identifying age, sex, and race from the examination and analysis of the human skull, utilizing established anthropological techniques and cranial morphological traits.
5. Develop a comprehensive approach for determining the identity of unknown remains using multiple techniques.
6. Assess the accuracy and validity of forensic anthropological techniques in identifying unknown remains.

Course Contents
Section I: Introduction to Forensic Anthropology: Definition, scope and application of Forensic Anthropology; and related sciences., importance and need and issues related to personal identification
Section II: Identification from bones: Attribution of Sex, Estimation of Age (humerus, radius, ulna, fibula, tibia, femur, pelvic bone, foot and hand).
Section III: Height and race determination Race and height determination from long bones and their medico legal implication. Establishment of Partial and Complete identity of skeletal material and dead bodies.
Section IV: Identification from Human skull Morphology of human skull, determining the age, race and sex of the skull and its medicolegal implications.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Krogman, W. M. and M. Y.Iscan: Human Skeleton in Forensic Medicine.
2. Modi: A Text Book of Medical Jurisprudence & Toxicology.
3. Nath, S.: Forensic Anthropology
4. Stewart, T. D.: Essentials of Forensic Anthropology.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Acquire a solid foundation in the fundamentals of Forensic Anthropology, including its principles, methodologies, and applications.	PO1, PO3, PO5, PO8
CO2	Develop a comprehensive understanding of various techniques used in the identification of unknown remains, including skeletal analysis, biological profiling, and forensic odontology	PO1, PO2, PO3, PO5, PO8
CO3	Demonstrate proficiency in determining the height, age, and sex of individuals based on the analysis of long bones, employing established anthropological methods and statistical approaches.	PO1, PO3, PO5, PO8
CO4	Gain a thorough understanding of the process of identifying age, sex, and race from the examination and analysis of the human skull, utilizing established anthropological techniques and cranial morphological traits.	PO1, PO3, PO5, PO8
CO5	Develop a comprehensive approach for determining the identity of unknown remains using multiple techniques.	PO1, PO2, PO3, PO5, PO8
CO6	Assess the accuracy and validity of forensic anthropological techniques in identifying unknown remains.	PO1, PO2, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS204A	CO1	3	2	1	1	3	1	2	3	1	1	1	2	3	1
	CO2	3	3	2	2	3	1	2	3	2	1	1	2	3	2
	CO3	3	2	1	1	3	1	2	3	1	2	2	1	3	1
	CO4	3	2	1	1	3	2	2	3	1	1	1	2	2	1
	CO5	3	3	2	2	3	2	2	3	2	2	2	2	3	2
	CO6	3	3	1	2	3	2	2	3	1	2	1	2	3	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS208A	**Chemistry IV**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	-				

Course Objective:

1. To focus on building a conceptual understanding of fundamental chemical principles.
2. To understand the reactivity and stability of an organic molecule based on structure, including conformation
3. and stereochemistry.
4. To understand the reactivity of carbonyl compounds with both hard and soft nucleophiles (carboxylic acids, aldehydes and ketones).
5. To understand the reactivity of carbonyl compounds with both hard and soft nucleophiles (carboxylic acids, aldehydes and ketones).
6. the prediction of mechanisms for organic reactions
7. To learn how to design syntheses of organic molecules

Course Objective:

1. Develop a solid conceptual understanding of fundamental chemical principles, including the principles of organic chemistry.
2. Gain knowledge and comprehension of the reactivity and stability of organic molecules based on their structures, including conformation and stereochemistry.
3. Understand the reactivity of carbonyl compounds with both hard and soft nucleophiles, such as carboxylic acids, aldehydes, and ketones, and apply this knowledge to predict reaction outcomes.
4. Demonstrate the ability to predict mechanisms for organic reactions, considering factors such as reaction conditions and the nature of reactants.
5. Acquire the skills to design syntheses of organic molecules, utilizing knowledge of organic reactions, reactivity patterns, and retrosynthetic analysis.

Course Contents
Section I: Stereochemistry of Organic Compounds Concept of isomerism. Classification of isomerism. Optical isomerism molecular chirality, enantiomers, optical activity, chiral and achiral molecules with two stereogenic centres, diastereomers. Newmann and Fischer projection. Relative and absolute configuration, sequence rules, R & S systems of nomegeometric isomers. E & Z system of nomenclature.
Section II: Alkyl and Aryl Halides: Nomenclature and classes of alkyl halides, Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions of aryl halides. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. **Alcohols:** ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Dihydric alcohols: Nomenclature, methods of formation and its chemical reactions. Phenols: Nomenclature, structure and bonding. Preparation of phenols, Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Mechanisms of Fries rearrangement, Claisen rearrangement, and Schotten and Baumann reactions.

Section III: Organic Chemistry **Aldehydes and Ketones:** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin and aldol, condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. **Carboxylic Acids and Acid Derivatives:** Nomenclature of Carboxylic acids, structure and bonding, acidity of carboxylic acids, effects of substituents on acid strength. Hell-Volhard-Zelinsky reaction. Mechanism of decarboxylation. Relative stability of acyl derivatives. Interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic).
Section IV: Organic Chemistry **Amines:** Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, Macmillan.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapping of Program Outcome**
CO1	Develop a solid conceptual understanding of fundamental chemical principles, including the principles of organic chemistry.	PO1, PO3, PO5, PO8
CO2	Gain knowledge and comprehension of the reactivity and stability of organic molecules based on their structures, including conformation and stereochemistry.	PO1, PO3, PO5, PO8
CO3	Understand the reactivity of carbonyl compounds with both hard and soft nucleophiles, such as carboxylic acids, aldehydes, and ketones, and apply this knowledge to predict reaction outcomes.	PO1, PO3, PO5, PO8
CO4	Demonstrate the ability to predict mechanisms for organic reactions, considering factors such as reaction conditions and the nature of reactants.	PO1, PO3, PO5, PO8
CO5	Acquire the skills to design syntheses of organic molecules, utilizing knowledge of organic reactions, reactivity patterns, and retrosynthetic analysis.	PO1, PO3, PO5, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS208A	CO1	3	2	3	2	3	1	2	3	1	2	1	1	2	2
	CO2	3	1	3	2	3	2	2	3	2	1	1	2	2	2
	CO3	3	2	3	2	3	1	1	3	1	2	1	3	2	1
	CO4	3	2	3	1	3	2	2	3	2	1	1	3	1	1
	CO5	3	1	3	1	3	1	2	3	2	2	1	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS215A	**Physics IV**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To understand the basic principle of laser, characteristics, types of lasers and applications.
2. To understand basic concepts of optical fibers& applications part of optical fiber into communications systems.
3. To state law of radioactivity decay and its application.
4. To explain an electrical current, circuits, construction and their use and network theorems.
5. To understand momentum, mass and energy.

Course Outcome:

1. Develop a comprehensive understanding of the basic principles of lasers, including their operation, characteristics, and types.
2. Gain knowledge of the various applications of lasers in different fields, such as medicine, industry, communication, and research.
3. Understand the basic concepts of optical fibers and their applications in communication systems, including transmission and signal processing.
4. Explain the principles of radioactivity decay and its practical applications, including radiometric dating and nuclear power.
5. Acquire knowledge of electrical current, circuits, and their construction, as well as the use of network theorems to analyze and solve electrical circuits.
6. Develop an understanding of the concepts of momentum, mass, and energy, and their interrelationships in various physical systems.

Course Contents
Section I: Laser & Fiber Optics Production of LASER, Types of LASER, Properties and applications of LASER, Optical fibres, Propagation of light through optical fibre, Angle of acceptance and numerical aperture, losses, Solar cells.
Section II: -Radio Activity Review of nuclear composition, nuclear properties and half-life, Radioactive decay schemes Applications of Radio Isotopes, Radiometric dating.
Section III: Electronics Circuits & Digital Electronics Basics of LR, CR, LCR circuits, Rectifier circuits, Timer circuits, Transistor and its characteristics, Introduction to OPAM, remote sensing and controlling, Photo-sensors, Logic gates and their applications, Flip- flops and counters.
Section IV: Conservation law of linear momentum, angular momentum and mechanical energy of a particle and a system of particles. Center of mass and equation of motion: Degree of freedom, scalar and vector field, Gauss law, Electric flux, Energy per unit volume.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Modern Physics – R. Murugesan S. Chand & Co. (2004).
6. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
7. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a comprehensive understanding of the basic principles of lasers, including their operation, characteristics, and types.	PO1, PO3, PO5, PO8
CO2	Gain knowledge of the various applications of lasers in different fields, such as medicine, industry, communication, and research.	PO1, PO3, PO5, PO8
CO3	Understand the basic concepts of optical fibers and their applications in communication systems, including transmission and signal processing.	PO1, PO3, PO5, PO8
CO4	Explain the principles of radioactivity decay and its practical applications, including radiometric dating and nuclear power.	PO1, PO3, PO5, PO8
CO5	Acquire knowledge of electrical current, circuits, and their construction, as well as the use of network theorems to analyze and solve electrical circuits.	PO1, PO3, PO5, PO8
CO6	Develop an understanding of the concepts of momentum, mass, and energy, and their interrelationships in various physical systems.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS215A	CO1	3	1	1	2	3	1	2	3	1	1	1	1	1	1
	CO2	3	2	1	2	3	1	2	3	2	1	1	2	2	2
	CO3	3	1	2	2	3	1	2	3	1	2	1	1	1	2
	CO4	3	1	2	1	3	1	2	3	1	1	1	1	1	1
	CO5	3	2	1	1	3	1	2	3	2	2	1	2	2	1
	CO6	3	1	2	2	3	1	2	3	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS206A	Biology IV	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. The course will mainly focus on the study of principal molecular events of cell incorporating DNA Replication, Transcription and Translation in prokaryotic as well as eukaryotic organisms.
2. To provide comprehensive background of Salient features of Nucleic Acids and DNA model to the course learners.
3. To impart detailed understanding of key events of molecular biology comprising of mechanism of DNA Replication, Transcription and Translation in Prokaryotes and Eukaryotes.
4. To develop comprehensive understanding regarding DNA Repair Mechanisms in the course learners.

Course Outcome:

1. Develop a comprehensive understanding of the fundamental molecular processes of DNA replication, transcription, and translation in both prokaryotic and eukaryotic organisms.
2. Gain a thorough background knowledge of nucleic acids, including their salient features and the DNA model.
3. Acquire a detailed understanding of the molecular mechanisms involved in DNA replication, transcription, and translation in prokaryotes and eukaryotes, including the enzymes and factors involved.
4. Develop a comprehensive understanding of DNA repair mechanisms, including the different pathways and processes involved in maintaining genomic integrity.
5. Apply the acquired knowledge to analyze and interpret molecular events in cellular processes and their significance in biological systems.
6. Develop critical thinking skills in assessing and evaluating the molecular events of cell biology, particularly DNA replication, transcription, translation, and DNA repair mechanisms.

Course Contents
Module I: Genetic material DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material. DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative, semi discontinuous RNA priming, Ǿ (theta) mode of replication, replication of linear, ds-DNA, replicating the 5´end of linear chromosome including replication enzymes

Module II: Transcription (Prokaryotes and Eukaryotes) Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; initiation, elongation and termination of RNA chains. Translation (Prokaryotes and eukaryotes): features of genetic code and deciphering, universality of genetic code and exceptions in some systems. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides
Module III: Regulation of gene expression Prokaryotes: Lac operon and Tryptophan operon ; and in Eukaryotes
Module IV: Apoptosis (Cell Death) & Cell Renewal Mechanism of apoptosis, Intrinsic and extrinsic pathways. Role of apoptosis in human diseases Stem Cells and Maintenance of adult tissues. Cancer; Relationship of the cell cycle to cancer, Genes and Cancer, Telomere shortening and Human Cancer. Chemicals and Radiations as carcinogen

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and References:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
7. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a comprehensive understanding of the fundamental molecular processes of DNA replication, transcription, and translation in both prokaryotic and eukaryotic organisms.	PO1, PO3, PO5, PO8
CO2	Gain a thorough background knowledge of nucleic acids, including their salient features and the DNA model.	PO1, PO3, PO5, PO8
CO3	Acquire a detailed understanding of the molecular mechanisms involved in DNA replication, transcription, and translation in prokaryotes and eukaryotes, including the enzymes and factors involved.	PO1, PO3, PO5, PO8
CO4	Develop a comprehensive understanding of DNA repair mechanisms, including the different pathways and processes involved in maintaining genomic integrity.	PO1, PO3, PO5, PO8
CO5	Apply the acquired knowledge to analyze and interpret molecular events in cellular processes and their significance in biological systems.	PO1, PO3, PO5, PO8
CO6	Develop critical thinking skills in assessing and evaluating the molecular events of cell biology, particularly DNA replication, transcription, translation, and DNA repair mechanisms.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS206A	CO1	3	1	1	2	3	1	2	3	1	1	1	3	1	2
	CO2	3	2	2	2	3	1	2	3	2	1	1	2	1	1
	CO3	3	1	1	2	3	1	2	3	1	2	1	3	2	1
	CO4	3	2	1	1	3	1	2	3	2	2	1	3	2	2
	CO5	3	1	2	1	3	1	2	3	2	2	1	3	1	1
	CO6	3	2	2	2	3	1	2	3	1	1	1	3	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS212A	Digital Forensics	L	T	P	C
Version1.0		2	0	0	2
Total Contact Hours	30 Hours				
Pre-requisites/Exposure					
Co-requisites	-				

Course Objective: The given course is designed to:

1. Research upcoming topics in digital forensics.
2. Understand how the Windows operating system and its artifacts works for the purposes of collecting evidence.
3. Understand how the Mac operating system works for the purposes of collecting evidence.
4. Explain methods of focusing investigations through analysis of multiple evidence sources.
5. Understand the concepts of web browsers and its importance in investigation.

Course Outcome:

1. Develop advanced research skills to explore and stay updated on emerging topics and trends in the field of digital forensics.
2. Acquire a comprehensive understanding of the Windows operating system and its artifacts, enabling the collection and analysis of digital evidence effectively.
3. Gain a thorough understanding of the Mac operating system, its structure, and its artifacts, enabling the collection and analysis of digital evidence in Mac-based systems.
4. Demonstrate the ability to focus investigations by analyzing and correlating evidence from multiple sources, such as digital devices, networks, and online platforms.
5. Understand the concepts and significance of web browsers in digital investigations, including the examination of browsing history, cache, cookies, and other relevant artifacts.
6. Develop critical thinking and analytical skills necessary for effectively utilizing operating system artifacts, web browser data, and multiple evidence sources in forensic investigations.
7. Apply acquired knowledge and skills to effectively collect, analyze, and interpret digital evidence within legal and ethical frameworks.
8. Demonstrate proficiency in documenting and presenting investigative findings, ensuring clarity and accuracy in reporting digital forensic analysis results.

Course Contents
Section I: Windows system Artifacts Windows system Artifacts: File system, Registry, Event logs, Shortcut Files, Executables, Alternate data streams (ADS), Hidden files, Slack space. Computer Networks: LAN, MAN, WAN, Router, Switch, Hub, Repeater, Bridge, Gateway, Modem HTML and other internet protocols, internet history, e-mail and header interpretation.
Section II: Mac OS X Systems and Linux System Artifacts Mac OS X Systems and artifacts: System start up and services, Network configuration, Hidden directories, System logs and user artifacts. Linux file system : Ownership and Permissions, Hidden files, User accounts and logs
Section III: Cyber crimes Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber- squatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking, Cyber Police stations, Crime reporting procedure, Case studies.
Section IV: Web Browsers Web Browsers : Cookies, Favourites or bookmarks, cache, session data and plugins. Email: Types of Email and protocols, Analysing the header details and tracking the email, Spoofed mails, HTML and other internet protocols, internet history, e-mail and header interpretation.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop advanced research skills to explore and stay updated on emerging topics and trends in the field of digital forensics.	PO1, PO3, PO5, PO8
CO2	Acquire a comprehensive understanding of the Windows operating system and its artifacts, enabling the collection and analysis of digital evidence effectively.	PO1, PO3, PO5, PO8
CO3	Gain a thorough understanding of the Mac operating system, its structure, and its artifacts, enabling the collection and analysis of digital evidence in Mac-based systems.	PO1, PO3, PO5, PO8
CO4	Demonstrate the ability to focus investigations by analyzing and correlating evidence from multiple sources, such as digital devices, networks, and online platforms.	PO1, PO3, PO5, PO8
CO5	Understand the concepts and significance of web browsers in digital investigations, including the examination of browsing history, cache, cookies, and other relevant artifacts.	PO1, PO3, PO5, PO8
CO6	Develop critical thinking and analytical skills necessary for effectively utilizing operating system artifacts, web browser data, and multiple evidence sources in forensic investigations.	PO1, PO3, PO5, PO8
CO7	Apply acquired knowledge and skills to effectively collect, analyze, and interpret digital evidence within legal and ethical frameworks.	PO1, PO3, PO5, PO8, PO10
CO8	Demonstrate proficiency in documenting and presenting investigative findings, ensuring clarity and accuracy in reporting digital forensic analysis results.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS212A	CO1	3	1	3	2	3	2	2	3	1	2	1	3	1	1
	CO2	3	2	3	2	3	1	2	3	2	2	1	2	1	2
	CO3	3	1	3	2	3	2	2	3	1	1	1	3	2	1
	CO4	3	2	3	1	3	2	2	3	2	2	1	3	2	2
	CO5	3	1	3	1	3	2	2	3	2	1	1	3	1	1
	CO6	3	2	3	2	3	1	2	3	1	2	1	3	1	2
	CO7	3	2	3	1	3	2	2	3	2	3	1	2	1	1
	CO8	3	2	3	2	3	2	1	3	2	2	1	1	1	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS214A	Wildlife Forensics	L	T	P	C
Version1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: During the course the students will

1. Understand and appreciate the scope of wildlife forensics.
2. Understand and appreciate the diversity and utility of a variety of animal evidences.
3. Understand the benefits of risk management & the organization structure & the role & responsibility required to drive risk management culture.
4. Understand the structure of ISO 31000:2009 standard & linkage of the 11 Risk Management Principles, Risk Framework, and the Process for Risk Management
5. Understand the framework of Risk Management & Risk policy implementation.

Course Outcome:

1. Gain a comprehensive understanding of the field of wildlife forensics, including its scope and importance.
2. Appreciate the wide range of animal evidence used in forensic investigations and its utility in solving cases.
3. Recognize the benefits of implementing effective risk management practices and understand the role and responsibilities required to promote a risk management culture.
4. Demonstrate knowledge of the ISO 31000:2009 standard, including the 11 Risk Management Principles, Risk Framework, and the Process for Risk Management
5. Apply the principles and frameworks of risk management to develop and implement effective risk policies in various contexts.

Course Contents
Section I: Introduction to wildlife forensics Introduction to Wildlife Forensics, basic elements of wildlife forensics, application of forensics in wildlife crimes. Introduction to basic analytical techniques in wildlife forensics.
Section II: Evidence examination: Identification of some endangered species of plants and animals, Wildlife life protection Act. Examination of pug marks, horn, skin, fur and hair, nail and teeth, wood etc.
Section III: Systematic Forensic examination and their reporting pattern: Important case studies, ethical issues in wildlife forensics.
Section IV : Introduction to Risk Management and its benefits Introduction Risk Management, Risk Management in organizations and risk ownership, Risk Management standards – Benefits of Risk Management.

Section: ISO 31000 - Elements of Risk Management

ISO 31000 overview, PDCA cycle - Elements and Purpose, Principles of Risk Management, Relationship between Principles, Framework and Process, Understanding the components of the Risk framework, Designing the Framework with Mandate and Commitment.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text References:

1. Simple Tools and Techniques for Enterprise Risk Management Author: Robert J. Chapman. Publisher: John Wiley & Sons (2011) India Risk Report - 2013 - FICCI + Pinkerton.
2. Risk Management: A Driver of Enterprise Value in the Emerging Environment -2011- KPMG ISO 31000 - Risk management— Principles and guidelines
3. A corporate governance, risk management and compliance (GRC) handbook -Authors: Richard M Steinberg Publishers: John Wiley & Sons
4. Richard Saferstein; Forensic Science Hand Book; Ed.; Prentice – Hall, Englewood Cliff, New jersey; (1982) Biology Methods manual.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Gain a comprehensive understanding of the field of wildlife forensics, including its scope and importance.	PO1, PO3, PO5, PO8
CO2	Appreciate the wide range of animal evidence used in forensic investigations and its utility in solving cases	PO1, PO3, PO5, PO8
CO3	Recognize the benefits of implementing effective risk management practices and understand the role and responsibilities required to promote a risk management culture.	PO1, PO3, PO5, PO8
CO4	Demonstrate knowledge of the ISO 31000:2009 standard, including the 11 Risk Management Principles, Risk Framework, and the Process for Risk Management	PO1, PO3, PO5, PO8
CO5	Apply the principles and frameworks of risk management to develop and implement effective risk policies in various contexts.	PO1, PO3, PO5, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS214A	CO1	3	1	3	2	3	2	2	3	2	1	1	3	1	1
	CO2	3	2	3	2	3	1	2	3	1	1	1	2	1	1
	CO3	3	2	3	2	3	2	2	3	1	2	1	1	1	2
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	2	2	3	1	1	1	2	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS216A	**Instrumentation**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. Understand principles and theory of NMR, chromatography, AAS, and MS.
2. Gain practical skills in instrument operation and calibration.
3. Explore applications of spectroscopy and chromatography in forensic analysis, environmental monitoring, and pharmaceuticals.
4. Understand advantages, limitations, and complementary nature of NMR spectroscopy, chromatography, AAS, and MS.
5. Familiarize with instrument components and operation for spectroscopy and chromatography.

Course Outcome:

1. Develop a comprehensive understanding of the principles and theory behind NMR, chromatography, AAS, and MS.
2. Gain practical proficiency in operating and calibrating spectroscopy and chromatography instruments.
3. Explore the wide-ranging applications of spectroscopy and chromatography in forensic analysis, environmental monitoring, and pharmaceuticals.
4. Assess the strengths, limitations, and complementary nature of NMR spectroscopy, chromatography, AAS, and MS techniques.
5. Demonstrate familiarity with the components and operational procedures of spectroscopy and chromatography instruments.
6. Evaluate the results and draw conclusions based on the data obtained from spectroscopy and chromatography experiments.

Course Contents
Section I: Spectrophotometry and its types Electromagnetic spectrum, Sources of Radiation, their utility and limitations, difference between Atomic spectrum and Molecular spectrum. **Ultra violet (UV) and visible spectrophotometry** – Types of sources and stability, wavelength selection, filters – cells and sampling devices, detectors, resolution, qualitative detection and quantitative measurements – Application in forensic science
Section II: IR , NMR Spectroscopy, AAS & MS Introduction – Properties of light, interaction of matter and light - Electromagnetic spectrum – Infrared (IR) spectroscopy, theory, instrumentation and and its application in forensic Science –Nuclear magnetic resonance (NMR) spectroscopy, theory, instrumentation and its application in forensic science. Atomic absorption spectrometry: Principle, Instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis. Introduction to Mass Spectroscopy- principles, instrumentation and applications.
Section III: Chromatographic Techniques I Definition and Concept of Chromatography, Classification of Chromatography. Basic principle, theory, Instrumentation and Forensic Applications of Paper chromatography, Thin layer chromatography and HPTLC. Types of column, Column efficiency, Pumps, Various types of detector, Development of HPLC and UPLC method, Choice of stationary and mobile phase, Difference between HPLC and UPLC, Applications, Instrumentation and Forensic Applications of Gas chromatography
Section IV: Microscopy Introduction, Types of Microscopes (Light, Compound, Comparison, Stereo & Electron), Forensic applications of microscopy.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Text & References:

1. Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.
5. Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of

organic compounds, Wiley, New York, 1974.
6. Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
7. Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
8. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a comprehensive understanding of the principles and theory behind NMR, chromatography, AAS, and MS.	PO1, PO2, PO3, PO5, PO8
CO2	Gain practical proficiency in operating and calibrating spectroscopy and chromatography instruments.	PO1, PO2, PO3, PO5, PO8
CO3	Explore the wide-ranging applications of spectroscopy and chromatography in forensic analysis, environmental monitoring, and pharmaceuticals.	PO1, PO2, PO3, PO5, PO8
CO4	Assess the strengths, limitations, and complementary nature of NMR spectroscopy, chromatography, AAS, and MS techniques.	PO1, PO2, PO3, PO5, PO8
CO5	Demonstrate familiarity with the components and operational procedures of spectroscopy and chromatography instruments	PO1, PO2, PO3, PO5, PO8
CO6	Evaluate the results and draw conclusions based on the data obtained from spectroscopy and chromatography experiments.	PO1, PO2, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS216A	CO1	3	3	3	2	3	2	2	3	2	2	1	1	1	1
	CO2	3	3	3	1	3	1	2	3	2	1	1	2	2	2
	CO3	3	3	3	2	3	2	2	3	1	2	1	2	1	2
	CO4	3	3	3	2	3	1	2	3	2	2	1	1	2	1
	CO5	3	3	3	2	3	1	1	3	2	2	1	1	2	1
	CO6	3	3	3	1	3	2	1	3	1	2	1	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

Forensic Practical IV

Course Code: BSFS252A
Credit Units: 03

Course Objective: The students will understand & perform experiments relating to:

1. Determine age, sex and stature from skull
2. Determine age, sex and stature from long bones of human body
3. To estimate the refractive index and density of given glass and soil sample.
4. To understand the safety precaution adopted in the forensic lab and proper examination of evidences.

Course Outcome:

1. Apply methods to determine age, sex, and stature from skull remains.
2. Apply methods to determine age, sex, and stature from long bones of the human body.
3. Calculate the refractive index and density of glass and soil samples.
4. Demonstrate knowledge of safety precautions in the forensic lab and proper examination of evidence.
5. Demonstrate an understanding of the safety precautions necessary in the forensic lab and the proper examination of evidence.
6. Evaluate the accuracy and reliability of the methods used to determine age, sex, and stature from long bones.

Course Contents
Forensic Anthropology 1. Identification of human skeleton system. 2. Identification of various bones (Pelvic and skull bones). 3. Estimation of height using long bones. 4. Determination of sex from skull, pelvis and mandibular bone. Determination of age using skull **Forensic Physics** 1. Safety, working manual and calibration of the instruments used for evidence examination and analysis. 2. Collection, preservation and labeling, chain of custody , covering letter, sample seal and taking control samples of trace evidence like glass, soil and paint samples. 3. Examination of different layers in a paint chip. 4. Determination of specific gravity of glass pieces and its interpretation. 5. Density gradient analysis of soil samples and its interpretation. 6. Physical matching of broken glass fragments.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
2. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
3. A. I. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis
4. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
5. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals Isolation and identification of Drugs by E.G.C. Clark

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply methods to determine age, sex, and stature from skull remains.	PO1, PO3, PO5, PO8
CO2	Apply methods to determine age, sex, and stature from long bones of the human body.	PO1, PO3, PO5, PO8
CO3	Calculate the refractive index and density of glass and soil samples.	PO1, PO3, PO5, PO8
CO4	Demonstrate knowledge of safety precautions in the forensic lab and proper examination of evidence.	PO1, PO3, PO5, PO8
CO5	Demonstrate an understanding of the safety precautions necessary in the forensic lab and the proper examination of evidence.	PO1, PO3, PO5, PO8
CO6	Evaluate the accuracy and reliability of the methods used to determine age, sex, and stature from long bones.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS252A	CO1	3	1	3	2	3	2	2	3	2	1	1	3	1	1
	CO2	3	2	3	2	3	1	2	3	1	1	1	2	1	1
	CO3	3	2	3	2	3	2	2	3	1	2	1	1	1	2
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	2	2	3	1	1	1	2	1	1
	CO6	3	2	3	2	3	1	2	3	1	1	1	2	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

SYLLABUS-FIFTH SEMESTER

BSFS301A	Forensic Medicine	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives: The student will understand

1. About the scope of different types of injuries, causes and manner of death and their medico legal significance
2. About the utility of the injury assessment in medico legal cases

Course Outcomes:

1. Develop a comprehensive understanding of the scope of different types of injuries, including their causes and manner of death, and their medico-legal significance.
2. Recognize the utility and importance of injury assessment in medico-legal cases.
3. Analyze and interpret injury patterns to determine the potential cause and manner of death in forensic investigations.
4. Evaluate the significance of injuries in the context of legal proceedings and their impact on medico-legal opinions.
5. Assess the reliability and validity of injury-related evidence in forensic investigations.
6. Evaluate the utility and importance of injury assessment in medico-legal cases.

Course Contents
Section I: Changes after Death Immediate change, Early changes (Rigor mortis-postmortem hypostasis-Body cooling), Estimation of time of Death, Late Changes- (Decomposition, Adipocere, Mummification) Medico-legal aspects of death. Causes of death.
Section II: Asphyxial Deaths Important Terms in Asphyxial deaths (Hypoxia, Anoxia, Anoxic anoxia, Anemic anoxia, Histotoxic anoxia), Types and stages of Asphyxia, Signs of asphyxia deaths., stages of asphyxia deaths **Types of Asphyxial deaths**- Hanging and its types, Strangulation, Suffocation, Smothering, Drowning and its classification.
Section III: Autopsy and introduction to wounds Ante and Post – mortem examinations; external examination; internal examination; collection, preservation and packaging of viscera, Assessing and determining the time and cause of Death, Study of burnt bones and bone fragments. Introduction to wounds; definition, Mechanism of wound production & healing, Determining the age of the injury, and its medico - legal aspects.
Section IV: Injuries due to Blunt and sharp forces Abrasions, Bruises, Lacerations; causes, dimensions, ante – mortem & post – mortem injuries and its medico - legal aspects, Incised, Stab, Punctured wounds - causes, dimensions, ante – mortem& post – mortem injuries ante – mortem& post – mortem injuries.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and References:

1. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Third reprint, 2009, LexisNexis, Butterworth, New Delhi
2. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.
3. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
4. Keith Simpson's , Forensic Medicine
5. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a comprehensive understanding of the scope of different types of injuries, including their causes and manner of death, and their medico-legal significance.	PO1, PO3, PO5, PO8
CO2	Recognize the utility and importance of injury assessment in medico-legal cases.	PO1, PO3, PO5, PO8
CO3	Analyze and interpret injury patterns to determine the potential cause and manner of death in forensic investigations	PO1, PO3, PO5, PO8
CO4	Evaluate the significance of injuries in the context of legal proceedings and their impact on medico-legal opinions.	PO1, PO3, PO5, PO8
CO5	Assess the reliability and validity of injury-related evidence in forensic investigations.	PO1, PO3, PO5, PO8
CO6	Evaluate the utility and importance of injury assessment in medico-legal cases.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS301A	CO1	3	1	3	2	3	2	2	3	1	1	1	1	1	2
	CO2	3	2	3	1	3	1	2	3	2	2	2	2	2	1
	CO3	3	2	3	2	3	2	2	3	1	2	2	2	1	1
	CO4	3	1	3	2	3	1	2	3	2	1	1	1	2	2
	CO5	3	2	3	2	3	1	1	3	2	2	1	1	1	1
	CO6	3	1	3	2	3	2	2	3	1	1	2	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS303A	Forensic Chemistry & Toxicology	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives:

1. The students will understand about the chemical tests that used in Forensic Chemistry.
2. It will also provide information about the general chemistry and analysis of legal and illegal alcoholic substances, evidences related to petroleum products and drugs of abuse.
3. The students will learn about the medico legal aspects of different types of toxins and drugs.
4. Student will learn how to classify and characterize of the narcotics, drugs and psychotropic substances.
5. Student will understand the methods of analyzing contaminants in petroleum products

Course Outcomes:

1. Understand chemical tests in Forensic Chemistry.
2. Analyze alcoholic substances, petroleum products, and drugs of abuse.
3. Explore medico-legal aspects of toxins and drugs.
4. Classify and characterize narcotics and psychotropic substances.
5. Analyze contaminants in petroleum products.
6. Develop critical thinking and problem-solving skills in forensic chemical analysis.
7. Apply ethical and professional standards in analysis and reporting.

Course Contents
Section I: Forensic Chemistry Introduction, Colour & Spot test, microcrystal tests, inorganic and organic analysis. Analysis of Beverages: alcoholic and nonalcoholic beverages, country made liquor, illicit liquors, detection and estimation of ethanol. Breathe alcohol analyzer. Analysis of trace evidence – cosmetics dyes, pigments, clues of trap cases. **Fire and Arson-** Chemistry of Fire, Combustion reaction, Fire Triangle, Fire Tetrahedron, Conditions for fire, Backdraft, Accelerants & types of accelerants, Combustible and Flammable liquids, Flash point, Fire point, Ignition point, Auto Ignition point, vapour density, vapour pressure, Fire extinguisher. **Arson**: Legal Definition, Arson motives, Degrees of Arson, Forensic and legal Concepts, Determining origin and cause; Fire patterns, Collection/Preservation of Arson Evidences, Extraction of samples from debris.
Section II: Analysis of Petroleum Products: Analysis of petrol, kerosene, diesel, lubricants by BIS methods and ASTM methods. Detection of adulterants of Gasoline, Diesel and Engine oils. - including parameters like-Flash point, distillation range, density, kinematic -viscosity, smoke point, aniline point. Commodity Act & Petroleum Act. Arson Investigation: chemistry of fire, fire pattern, Extraction of fire accelerants from fire debris

Section III: Forensic Toxicology: Introduction and scope of forensic toxicology, classification of poisons, legal aspects of poisoning, types of poisoning. sign and symptoms of common poisons. **Drug of Abuse**: classification of drugs, drug of abuse in sports. Narcotic drugs and psychotropic substances such as cocaine, cannabis, barbiturates, benzodiazepines, amphetamine, opium, designer drugs. NDPS act.
Section IV: General studies and Analysis of vegetable poisons: Abrus, Dhatura, Marking nuts, Nux-vomica, Oleander and Aconite. Snake venoms and insect poisons, Irrespirable gases, food poisoning **Insecticides and Metallic Poisons:** types of agriculture posions, Organo-phosphorous compound, organocholorinated compound, carbamats, pyrethroids, aluminium phosphite and zinc phosphite. arsenic, mercury, phosphorous: poisoning charecteristics and analysis.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and References:

1. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Third reprint, 2009, LexisNexis, Butterworth, New Delhi
2. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.
3. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
4. Keith Simpson's , Forensic Medicine
5. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand chemical tests in Forensic Chemistry.	PO1, PO3, PO5, PO8
CO2	Analyze alcoholic substances, petroleum products, and drugs of abuse.	PO1, PO3, PO5, PO8
CO3	Explore medico-legal aspects of toxins and drugs.	PO1, PO3, PO5, PO8
CO4	Classify and characterize narcotics and psychotropic substances.	PO1, PO3, PO5, PO8
CO5	Analyze contaminants in petroleum products.	PO1, PO3, PO5, PO8
CO6	Develop critical thinking and problem-solving skills in forensic chemical analysis.	PO1, PO3, PO5, PO8
CO7	Apply ethical and professional standards in analysis and reporting.	PO1, PO3, PO5,PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS303A	CO1	3	1	3	2	3	2	2	3	1	1	1	1	2	1
	CO2	3	2	3	1	3	1	2	3	2	2	2	2	1	1
	CO3	3	1	3	2	3	2	2	3	1	1	2	1	1	2
	CO4	3	2	3	2	3	1	2	3	2	1	1	1	2	2
	CO5	3	2	3	2	3	1	1	3	1	2	1	2	1	1
	CO6	3	1	3	2	3	2	2	3	2	2	2	2	2	2
	CO7	3	2	3	1	3	2		3	1	1	1	2	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS309A	Physics V	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives:

1. To understand the concept of physics and applications in forensic science.
2. To understand the concept of geometrical optic.
3. To learn Statistical mechanics and its postulates.

Course Outcomes:

1. Apply principles of physics in forensic science applications.
2. Understand the concepts of geometrical optics and its applications in forensic investigations.
3. Analyze statistical mechanics and its postulates for understanding physical systems.
4. Apply statistical mechanics principles to analyze forensic evidence.
5. Develop critical thinking and problem-solving skills in applying physics concepts to forensic science.
6. Enhance laboratory techniques for accurate measurements and data analysis in forensic physics.

Course Contents
Section I: Geometrical optics: Matrix method in paravial optics, effect of translation and refraction. Derivations of thin and thick lens formula, unit plane, Nudal plane, system of thin lenses. Interference: Interference by division of wave font, fressnel by prism and its application to determine of wavelength of any light. Lloyd mirror.
Section II: Statistical mechanics: some probability consideration, combination possess maximum and minimum probability. Distribution of particles in two boxes, phase space, micro state and macro states, thermodynamical probability.
Section III: Postulates of statistical mechanics: Division of phase space into cells, condition of equilibrium between two system in thermal contact, entropy, Boltzman distribution law, evaluation of Einstein coefficient, Plank's radiation law.
Section IV: Fermicdirac statistics and Bose Einstein statistics (B-E condensation), zero-point energy, electron gas in metals

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and References:

1. Allied Physics – Prof. Dhanalakshmi and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Physics – R. Murugesan S. Chand & Co. (2004).
4. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
5. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply principles of physics in forensic science applications.	PO1, PO3, PO5, PO8
CO2	Understand the concepts of geometrical optics and its applications in forensic investigations.	PO1, PO3, PO5, PO8
CO3	Analyze statistical mechanics and its postulates for understanding physical systems.	PO1, PO3, PO5, PO8
CO4	Apply statistical mechanics principles to analyze forensic evidence.	PO1, PO3, PO5, PO8
CO5	Develop critical thinking and problem-solving skills in applying physics concepts to forensic science.	PO1, PO3, PO5, PO8
CO6	Enhance laboratory techniques for accurate measurements and data analysis in forensic physics.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS309A	CO1	3	1	3	2	3	2	2	1	1	1	1	2	1	3
	CO2	3	2	3	1	3	1	2	2	2	1	2	1	1	2
	CO3	3	2	3	2	3	2	2	1	1	2	2	2	1	2
	CO4	3	1	3	2	3	1	2	2	2	1	1	1	2	2
	CO5	3	1	3	2	3	1	1	1	1	3	1	2	1	2
	CO6	3	2	3	2	3	2	2	2	2	3	2	2	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS307A	**Chemistry V**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The objectives of the course are:

1. To get familiarity with different dilute solutions.
2. To get the knowledge of functioning of various sensors, electrochemical techniques and various types of batteries.
3. To impart knowledge on the fundamentals of chemical kinetics.
4. To study the kinetics of different types of reactions and methodologies

Course Outcome:

1. Understand the properties and behavior of dilute solutions.
2. Gain knowledge of sensors, electrochemical techniques, and batteries.
3. Comprehend the fundamentals of chemical kinetics.
4. Analyze the kinetics of various reactions.
5. Apply different methodologies to study reaction kinetics.
6. Develop skills in experimental techniques for kinetics analysis.

Course Contents
Section I: Dilute solutions Colligative properties. Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point, Osmosis, osmotic pressure, experimental determination, Abnormal Colligative properties- Van't Hoff factor.
Section II: Electrochemistry-I Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law. DebyeHuckel-Onsagar's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorfs method. Application of conductivity measurements- conductometric titrations.
Section III: Electrochemistry-II Single electrode potential, sign convention, Reversible and irreversible cells Nernst Equation-Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements - Potentiometric titrations
Section IV: Chemical kinetics Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Text & References:

1. Benjamin, D. M., Forensic Pharmacology. In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice-Hall, Englewood Cliffs, New Jersey, 1993.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the properties and behavior of dilute solutions.	PO1, PO3, PO5, PO8
CO2	Gain knowledge of sensors, electrochemical techniques, and batteries.	PO1, PO3, PO5, PO8
CO3	Comprehend the fundamentals of chemical kinetics.	PO1, PO3, PO5, PO8
CO4	Analyze the kinetics of various reactions.	PO1, PO3, PO5, PO8
CO5	Apply different methodologies to study reaction kinetics.	PO1, PO3, PO5, PO8
CO6	Develop skills in experimental techniques for kinetics analysis.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS307A	CO1	3	2	3	2	3	1	2	3	2	2	1	2	2	1
	CO2	3	2	3	2	3	1	2	3	2	2	1	1	2	1
	CO3	3	1	3	2	3	2	2	3	1	2	1	1	1	1
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	1	3	2	3	1	2	3	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS305A	**Biology V**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To understand the importance of macromolecules.
2. To understand metabolism of protein, lipid and carbohydrates.
3. To understand the existence of different types of enzymes and their characteristics.
4. To understand and learn about immune system including organs, cells and receptors.
5. To learn s about molecular basis of antigen recognition, hypersensitivity reaction, antigen-antibody reactions.

Course Outcome:

1. Comprehend the significance of macromolecules in biological systems.
2. Understand the metabolic processes of proteins, lipids, and carbohydrates.
3. Gain knowledge about various types of enzymes and their properties.
4. Acquire understanding of the immune system, including its organs, cells, and receptors.
5. Learn about the molecular basis of antigen recognition, hypersensitivity reactions, and antigen-antibody interactions.
6. Apply the acquired knowledge to analyze and interpret immune system-related phenomena.

Course Contents
Section I: Carbohydrate & Lipid Metabolism Carbohydrates: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism. Lipid: Biosynthesis and β-oxidation of palmatic acid
Section II: Protein Metabolism & Enzymes Transamination, Deamination and Urea cycle. Enzymes; Introduction, kinetics, mechanism of action, inhibition, allosteric enzymes and Regulation
Section III: Oxidative Phosphorylation: Electron transport chain, Oxidative phosphorylation and ATP synthase
Section IV: Overview of Immune System, Antigens, Immunoglobins, HCC Historical perspective of Immunology, Early theories of Immunology, Innate, Adaptive (cell mediated and humoral) - Passive: Artificial and Natural Immunity, Active: Artificial and Natural Immunity Cells and Organs of the Immune System; Haematopoesis, Cells of the immune system, Organs of the Immune system: Primary and Secondary lymphoid organs, Lymphatic system Antigens; Properties of antigens, Adjuvants and Haptens Immunoglobulins; Basic structure, classes and function, Polyclonal sera, Monoclonal antibodies Major Histocompatibility Complex; Structure and functions Antigen Processing and Presentation; Endogenous pathway and exogenous pathway of antigen presentation

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text and References:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Comprehend the significance of macromolecules in biological systems.	PO1, PO3, PO5, PO8
CO2	Understand the metabolic processes of proteins, lipids, and carbohydrates	PO1, PO3, PO5, PO8
CO3	Gain knowledge about various types of enzymes and their properties.	PO1, PO3, PO5, PO8
CO4	Acquire understanding of the immune system, including its organs, cells, and receptors.	PO1, PO3, PO5, PO8
CO5	Learn about the molecular basis of antigen recognition, hypersensitivity reactions, and antigen-antibody interactions.	PO1, PO3, PO5, PO8
CO6	Apply the acquired knowledge to analyze and interpret immune system-related phenomena.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS305A	CO1	3	2	3	2	3	1	2	3	2	2	1	2	2	1
	CO2	3	2	3	2	3	1	2	3	2	2	1	1	2	1
	CO3	3	1	3	2	3	2	2	3	1	2	1	1	1	1
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	1	3	2	3	1	2	3	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS311A	Cyber Forensics III	L	T	P	C
Version1.0		2	0	0	2
Total Contact Hours	30 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The given course is designed to:

1. Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Mobile Forensics.
2. To correctly define and cite appropriate instances for the application of mobile forensics Correctly collect and analyze computer forensic evidence.

Course Outcome:

1. Demonstrate proficiency in identifying and understanding the key concepts, algorithms, protocols, tools, and methodologies of Mobile Forensics.
2. Apply critical thinking skills to appropriately select and cite relevant instances for the application of mobile forensics.
3. Successfully collect and analyze computer forensic evidence with accuracy and adherence to proper procedures.
4. Utilize effective problem-solving techniques to overcome challenges and obstacles encountered in mobile forensics.
5. Demonstrate knowledge of legal and ethical considerations associated with mobile forensics.
6. Communicate findings and conclusions effectively through comprehensive reports and presentations in the field of mobile forensics.

Course Contents
Section I: Data privacy and security Defining data, meta-data, big data, non- personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.
Section II: Social media forensics I Introduction to Social Media, Security Issues in Social Media, Types of crimes of Social Media – Cyberbullying, Online Grooming, Cyberstalking. Social Media and its impact on Business, Politics, Law and Revolutions, Emerging Trends in social media.
Section III: Social media forensic II Sources for social media evidence, Types of Data Available on Social Networking Sites, Different evidence collection methods from social networking sites, Intelligence gathering from Social Media- Tools and technique for intelligence gathering– indirect method, direct method with login, direct method without login.

Section IV: IT Acts

Provision in Indian laws in dealing with cyber crimes and its critical analysis, IT act 2000, Penalties under IT act, Offences under IT act, Establishment of authorities under IT act and their functions, power etc.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Demonstrate proficiency in identifying and understanding the key concepts, algorithms, protocols, tools, and methodologies of Mobile Forensics.	PO1, PO2, PO3, PO5, PO8
CO2	Apply critical thinking skills to appropriately select and cite relevant instances for the application of mobile forensics.	PO1, PO2, PO3, PO5, PO8
CO3	Successfully collect and analyze computer forensic evidence with accuracy and adherence to proper procedures.	PO1, PO2, PO3, PO5, PO8
CO4	Utilize effective problem-solving techniques to overcome challenges and obstacles encountered in mobile forensics	PO1, PO2, PO3, PO5, PO8
CO5	Demonstrate knowledge of legal and ethical considerations associated with mobile forensics.	PO1, PO2, PO3, PO5, PO8
CO6	Communicate findings and conclusions effectively through comprehensive reports and presentations in the field of mobile forensics.	PO1, PO2, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS311A	CO1	3	3	3	2	3	1	2	3	2	2	1	2	2	1
	CO2	3	3	3	2	3	1	2	3	2	2	1	1	2	1
	CO3	3	3	3	2	3	2	2	3	1	2	1	1	1	1
	CO4	3	3	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	3	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	3	3	2	3	1	2	3	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS313A	Quality Management and Ethics	L	T	P	C
Version1.0		3	0	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The objectives of the course:

1. To focus on building a conceptual understanding of quality management in forensic science laboratories.
2. To understand quality control process used in forensic science laboratory.
3. To understand the concept of ethics and its importance in forensic science.

Course Outcome:

1. Develop a conceptual understanding of quality management in forensic science laboratories.
2. Gain knowledge of the quality control process used in forensic science laboratories.
3. Understand the importance of ethics in forensic science.

Course Contents
Section I: Quality Management System Quality, Total Quality, Quality assurance, Quality control, Quality Planning, Quality Audit: Internal and External Audit, Accreditation, NABL, ISO, IEC, BIS. **Quality Management of Laboratories:** General requirements for the competence of testing and calibration laboratories – Introduction, Scope, Management requirements: Organization, Quality System, Document Control.
Section II: Quality Control Process **Management Requirements:** Organizational, document control, subcontracting of tests and calibrations control of Non-conforming testing / calibration work, corrective and preventive actions, Management Review. **Technical Requirements:** Test and calibration methods and their validation, measurements, standards and reference material, traceability, sampling. **Good Laboratory Practices (GLP):** Fundamental principles of GLP, Organizational Setup, Resources, Raw data and data collection, SOPs, Archives.
Section III: Ethics **Ethics:** Definition, concept of ethics, Ethics in science, Development of a Code of Ethics for Forensic Science. **Ethics in Forensic Science:** Duties of Forensic Scientist, Qualification of Forensic Scientist. Ethical duties of attorney and experts. Ethics in testimony. Criminal investigation ethics. Ethics in laboratory and in crime scene investigation.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Text & References:

1. Barnett P.D. (2001), Ethics in Forensic Science: Professional Standards for the Practice of Criminalistics, CRC press.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Develop a conceptual understanding of quality management in forensic science laboratories.	PO1, PO3, PO5, PO8
CO2	Gain knowledge of the quality control process used in forensic science laboratories.	PO1, PO3, PO5, PO8
CO3	Understand the importance of ethics in forensic science.	PO1, PO3, PO5, PO8
CO4	Apply quality management principles in the context of forensic science laboratories.	PO1, PO3, PO5, PO8
CO5	Apply ethical principles and guidelines in forensic science practice.	PO1, PO3, PO5, PO8
CO6	Evaluate and assess the effectiveness of quality control measures in ensuring reliable forensic analyses	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS313A	CO1	3	2	3	2	3	1	2	3	2	2	1	2	2	1
	CO2	3	2	3	2	3	1	2	3	2	2	1	1	2	1
	CO3	3	1	3	2	3	2	2	3	1	2	1	1	1	1
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	1	3	2	3	1	2	3	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

Forensic Practical V

Course Code: BSFS351A
Credits: 3

Course Objective: The students will understand & perform experiments relating to:

1. Understand chemical tests in Forensic Chemistry.
2. Analyze alcoholic substances, petroleum products, and drugs of abuse.
3. Analyze contaminants in petroleum products.
4. Analysis of various metallic, vegetable, volatile and non-volatile poisons.
5. Perform TLC of poisons, drugs, and inks.

Course Outcome:

1. Understand chemical tests in Forensic Chemistry.
2. Analyze alcoholic substances, petroleum products, and drugs of abuse.
3. Analyze contaminants in petroleum products.
4. Analysis of various metallic, vegetable, volatile and non-volatile poisons.
5. Perform TLC of poisons, drugs, and inks.

Course Contents
Chemistry and Toxicology 1. Colour/spot tests for common drugs of abuse 2. Determination of boiling and melting points. 3. Analysis of phenolphthalein in trap cases. 4. Analysis of Cations (Arsenic, Copper, Lead, Zinc, Barium, Aluminium) 5. Analysis of Anions (Nitrate, Phosphates, oxalate, chloride, iodide, sulphates)

Cyber Forensics

Examination Scheme:

IA		EE	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
2. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition

A. I. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis

3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals Isolation and identification of Drugs by E.G.C. Clark

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand chemical tests in Forensic Chemistry.	PO1, PO3, PO5, PO8
CO2	Analyze alcoholic substances, petroleum products, and drugs of abuse.	PO1, PO3, PO5, PO8
CO3	Analyze contaminants in petroleum products.	PO1, PO3, PO5, PO8
CO4	Analysis of various metallic, vegetable, volatile and non-volatile poisons.	PO1, PO3, PO5, PO8
CO5	Perform TLC of poisons, drugs, and inks.	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS351A	CO1	3	2	3	2	3	1	2	3	2	2	1	2	2	1
	CO2	3	2	3	2	3	1	2	3	2	2	1	1	2	1
	CO3	3	1	3	2	3	2	2	3	1	2	1	1	1	1
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	1	2	3	1	2	1	2	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

SYLLABUS-SIXTH SEMESTER

BSFS302A	Criminology and Penology	L	T	P	C
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The course focuses on following objectives-

1. Developing an understanding and appreciation for the scope of Criminology and criminal laws.
2. Develop an understanding on concepts of crime, types of crime and criminal behavior.
3. Brief description on Juvenile delinquency, types, classification and factors responsible.
4. Develop comprehensive knowledge on Role of Police with regard to criminals, society and custodial crimes

Course Outcome:

1. Gain an understanding and appreciation for the scope of Criminology and criminal laws.
2. Develop knowledge of crime concepts, types of crime, and criminal behavior.
3. Understand the concept of Juvenile delinquency, its types, classification, and contributing factors.
4. Acquire comprehensive knowledge of the role of Police in relation to criminals, society, and custodial crimes.
5. Evaluate the effectiveness of criminal laws in addressing and preventing crimes.
6. Apply theoretical frameworks to explain criminal behavior and its implications.

Course Contents
Section I: Criminology and Criminal Behavior Definition: Crime, Criminal and Criminology; Criminology as Science, The field and scope of Criminology; Methods and Techniques in Criminology; Concept of a criminal and classification of criminals. Organized crime; White – collar crimes/ Occupational crimes; Serial Crimes; Crime against women and children
Section II: Basics Of Code Of Criminal Procedure Bailable, and non-bailable, cognizable, non-cognizable, warrant issue, Summon, Trail before courts, Provisions related to Bail and Bonds
Section III: Components Of Indian Evidence Act Salient features of the Act ,Types of Evidence ,Fact in issue and relevant Facts, Relevancy Of state of Mind and State of body and bodily feeling , Identification , Opinion as to Handwriting(Sec 47) , Comparison of Signature , writing or seal with others admitted or proved(Sec 73), electronic evidences.
Section IV: Components Of Indian Penal Code Elements Of Crime, Offences related to Human Body (Sec 299 – Sec 377) , Kinds of Punishment. Offences against property (Sec 378- 403, 405, 410, 415, 416, 425, 441. 442, 443, 444)

Examination Scheme:

Compone nts	A	C T	S/V /Q	H A	E E
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Ellis, L. and Walsh, Anthony, Criminology – A Global Perspective, Allyn and Bacon, Boston, 2000.
2. Morris, E. K., and Braukman, C. J. (Eds.), Behavioral Approaches to Crime and Delinquency- A Hand book of Application, Research and Concepts, Plennum Press, New York, 1987.
3. Abaadinsky, H., Organised Crime (2nd Edn.), Nelson – Hall, Chicago, 1998.
4. Adler, F., Mueller, G. O. W. and Laufer, W. S., Criminology, McGraw – Hill, Boston, 1991.
5. Maguire, M.: Morgan, R and Reiner, R., The Oxford Handbook of Criminology (3rd Edn.), Oxford University Press, Oxford, 2002.
6. Ahuja, R., Criminology, Rawat Publication, ND, 2000.
7. Bajpai, G. S., Development without Disorders. Vishwavidyala, Prakashan, Sagar (M. P.), 2002.
8. Maguire, M.: Morgan, R and Reiner, R., The Oxford Handbook of Criminology (3rd Edn.), Oxford University Press, Oxford, 2002.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Gain an understanding and appreciation for the scope of Criminology and criminal laws.	PO1, PO3, PO5, PO8
CO2	Develop knowledge of crime concepts, types of crime, and criminal behavior	PO1, PO3, PO5, PO8
CO3	Understand the concept of Juvenile delinquency, its types, classification, and contributing factors.	PO1, PO3, PO5, PO8
CO4	Acquire comprehensive knowledge of the role of Police in relation to criminals, society, and custodial crimes.	PO1, PO3, PO5, PO8
CO5	Evaluate the effectiveness of criminal laws in addressing and preventing crimes.	PO1, PO3, PO5, PO8
CO6	Apply theoretical frameworks to explain criminal behavior and its implications.	PO1, PO3, PO5, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS302A	CO1	3	2	3	2	3	1	2	3	2	2	1	2	2	1
	CO2	3	2	3	2	3	1	2	3	2	2	1	1	2	1
	CO3	3	1	3	2	3	2	2	3	1	2	1	1	1	1
	CO4	3	1	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	2	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	1	3	2	3	1	2	3	1	2	1	1	2	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS304A	**Forensic Psychology**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Pre-requisites/Exposure	Basics knowledge of punishments				
Co-requisites	--				

Course Objectives:

To provide students with a foundational understanding of the principles, theories, and applications of forensic psychology, enabling them to apply psychological concepts and methods to the legal and criminal justice systems

Course Outcome:

1. Define forensic psychology and its role in the legal system.
2. Understand the ethical considerations and professional guidelines in forensic psychology.
3. Analyze the psychological factors contributing to criminality, such as personality disorders, psychopathy, and substance abuse.
4. Understand the application of psychology in criminal investigations, including offender profiling and crime scene analysis.
5. Explore the techniques used in criminal profiling and the limitations of these approaches.
6. Apply psychological concepts and theories to real-life case scenarios in forensic psychology.

Course content
Section I Basics: Forensic Psychology and the Law, Ethical Issues in Forensic Psychology, Civil and criminal case assessment, Assessing mental competency, Mental disorders and Forensic Psychology, Eye witness testimony, Criminal profiling- need and types, Forensic Scientific evidence, Crime and Psychopathology, Genetics and Crime, Serial murders, Modus Operandi.
Section II Psychological Assessment: Psychological Assessment Tools, Detection of deception, Various methods for detection of deception, Interview, Non-verbal detection, statement assessment, Hypnosis, Psychological assessment, voice stress analyzer, Polygraph, thermal imaging, Brain Electrical Oscillation Signature Profiling, Functional Magnetic Resonance study, Current research in detection of deception/truth finding mechanisms
Section III Polygraph: Historical aspects of Polygraph, Principles of polygraph, psycho physiological aspects, operational aspects, Question formulation techniques, Interviewing technique procedure, The Art-Polygraph, Legal and Ethical aspects, Human rights of individual.
Section IV Narco-Analysis: Historical aspects, Principle and Theory, General Procedure –Legal and Ethical aspects, Human rights of individual. Brain Electrical Oscillation Signature (BEOS) Profiling: Principle and Theory, General Procedure – Legal and Ethical aspects, Human rights of individual.

Text and references:

1. Forensic Science in Criminal Investigation & Trials – B.R.Sharma.
2. The Hand Book of Forensic Psychology – Weiner Hass
3. Hand Book of Forensic Psychology – O' Donohue Levensky s
4. Brain Experience – C.R.Mukun
5. Criminal Profilling – B.Turvey
6. Investigative Forensic Hypnosis – J. Niehans
7. Art & Science of the Polygraph Techniques – J.A.Matte
8. Hand Book of Polygraph Testing – M.Kloinen 9.Detecting Lies & Deceit – A.Vri

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz/Assignment	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Define forensic psychology and its role in the legal system.	PO1, PO3, PO5, PO8
CO2	Understand the ethical considerations and professional guidelines in forensic psychology.	PO1, PO3, PO5, PO8
CO3	Analyze the psychological factors contributing to criminality, such as personality disorders, psychopathy, and substance abuse.	PO1, PO3, PO5, PO8
CO4	Understand the application of psychology in criminal investigations, including offender profiling and crime scene analysis.	PO1, PO3, PO5, PO8
CO5	Explore the techniques used in criminal profiling and the limitations of these approaches.	PO1, PO3, PO5, PO8
CO6	Apply psychological concepts and theories to real-life case scenarios in forensic psychology	PO1, PO3, PO5, PO8

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS304A	CO1	3	2	3	1	3	1	2	3	1	2	1	2	1	2
	CO2	3	2	3	2	3	1	2	3	1	1	2	1	2	1
	CO3	3	2	3	1	3	1	2	3	2	1	1	1	1	2
	CO4	3	2	3	1	3	2	2	3	1	2	2	1	2	1
	CO5	3	2	3	2	3	2	2	3	2	1	1	2	1	2
	CO6	3	2	3	1	3	2	2	3	1	2	1	1	2	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS308A	**Chemistry VI**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: The objectives of the course are:

1. To provide student with practical understanding of the various instrumentation and control systems, instrumentation equipment and troubleshooting skills used in the forensic science laboratory.
2. To develop a basic principles and concepts related to laboratory instruments used in chemistry.
3. To learn the theory behind the operations of laboratory instruments.
4. To understand the applications of laboratory instruments used in chemical analysis.

.

Course Outcome:

1. Gain practical understanding of various instrumentation and control systems, equipment, and troubleshooting skills in forensic science laboratories.
2. Develop a strong foundation in the principles and concepts related to laboratory instruments used in chemistry.
3. Acquire theoretical knowledge about the operations of laboratory instruments.
4. Understand the practical applications of laboratory instruments in chemical analysis.
5. Analyze the functioning and capabilities of different laboratory instruments used in chemical analysis.
6. Integrate theoretical knowledge with practical applications to effectively operate and utilize laboratory instruments in chemical analysis.

Course Contents
Section I: Introduction to basic Laboratory Instruments Introduction to laboratory instruments, Their classification, laboratory safety protocols. **Balances and Weighing Techniques-** principle of balance operation, types of balance, weighing techniques and sources of error.
Section II: Volumetric glassware, their types, calibration and use of volumetric glassware in chemical analysis, source of error in volumetric glassware. **Thermal Analysis-** principles of thermal analysis, types and its application.
Section III: Introduction to advanced laboratory instruments Classification of advanced laboratory instruments. **Hot air oven and Incubators-** Principle of hot air oven and incubators, their applications in chemistry, maintenance and calibrations of hot air oven and incubators. **Hot Plates and Magnetic Stirrers-** Principle and mechanics of hot plate and magnetic stirrer, types, their application in chemistry, , maintenance and calibrations.
Section IV: Distillation Units Principle of distillation, types of distillation units (simple, fractional, steam, Vacuum, Zone), role of Raoult's law and Daltons Law, procedure involved in distillation, application in chemistry,

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

1. Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.
5. Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of organic compounds, Wiley, New York, 1974.
6. Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
7. Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
8. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Gain practical understanding of various instrumentation and control systems, equipment, and troubleshooting skills in forensic science laboratories	PO1, PO2, PO3, PO5, PO8
CO2	Develop a strong foundation in the principles and concepts related to laboratory instruments used in chemistry	PO1, PO2, PO3, PO5, PO8
CO3	Acquire theoretical knowledge about the operations of laboratory instruments.	PO1, PO2, PO3, PO5, PO8
CO4	Understand the practical applications of laboratory instruments in chemical analysis.	PO1, PO2, PO3, PO5, PO8
CO5	Analyze the functioning and capabilities of different laboratory instruments used in chemical analysis.	PO1, PO2, PO3, PO5, PO8
CO6	Integrate theoretical knowledge with practical applications to effectively operate and utilize laboratory instruments in chemical analysis.	PO1, PO2, PO3, PO5, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS308A	CO1	1	2	1	1	2	1	2	3	2	1	3	2	1	2
	CO2	1	2	1	1	2	1	2	3	2	1	3	2	1	1
	CO3	1	2	1	1	2	1	2	3	2	1	3	3	1	2
	CO4	2	2	1	1	2	2	2	3	1	2	3	3	1	1
	CO5	1	2	1	2	2	2	2	3	2	2	3	3	1	2
	CO6	2	2	1	1	2	2	2	3	1	2	3	3	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS310A	**Physics VI**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives:

1. To learn the fundamental laws of thermodynamics.
2. To understand the concept of gases, their kinetic theory, speed, and heat capacity of different types of gas molecule.
3. To understand the hierarchy of atomic and molecular energy levels by different models.
4. To understand the concepts of electromagnetism.

Course Outcome:

1. Gain a thorough understanding of the fundamental laws of thermodynamics.
2. Comprehend the concepts of gases, including their kinetic theory, speed, and heat capacity for different types of gas molecules.
3. Acquire knowledge about the hierarchy of atomic and molecular energy levels using various models.
4. Develop a solid understanding of electromagnetism and its principles.

Course Contents
Section I: Thermodynamics: Thermal equilibrium and definition of heat, Internal energy and work, specific heat capacity, Isothermal process, Isochoric process, Isobaric process, First law of thermodynamics and its demerits, Heat engines, Refrigerator and heat pump, second law of thermodynamics
Section II: Kinetic theory: Equation of state of perfect gas, Behavior of gases, Ideal gas, Kinetic theory of gases, Assumption concept of pressure, Kinetic interpretation of temperature, speed of gas molecule, law of equilibrium of energy, specific heat capacity of monoatomic, diatomic and polyatomic gases, concept of free mean path.
Section III: Atoms and nuclei: Rutherford model of atom, Drawback of Rutherford model. Model of hydrogen atom, Bohr's radius, Energy level of hydrogen atoms, size of nucleons, Isotopes, Isobars, Isotones, Mass- energy relation, Nuclear binding energy, Binding energy curves.
Section IV: Electromagnetic induction: Faraday's law of EMI, Self and Mutual induction, Energy stored in magnetic field. AC circuits: AC circuit analysis using complex variables, AC circuit with (i) R and C, (ii) R-L (iii) R,L and C in series and parallel, Resonance circuit, Quality factor and its importance.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination A: Attendance

Text and References:

1. Allied Physics – Prof. Dhanalakshmi and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Physics – R. Murugesan S. Chand & Co. (2004).
4. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
5. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).]

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Gain a thorough understanding of the fundamental laws of thermodynamics.	PO9
CO2	Comprehend the concepts of gases, including their kinetic theory, speed, and heat capacity for different types of gas molecules.	PO9
CO3	Acquire knowledge about the hierarchy of atomic and molecular energy levels using various models	PO9
CO4	Develop a solid understanding of electromagnetism and its principles.	PO9

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS310A	CO1	1	2	1	1	2	1	2	3	2	1	3	2	1	2
	CO2	1	2	1	1	2	1	2	3	2	1	3	2	1	1
	CO3	1	2	1	1	2	1	2	3	2	1	3	3	1	2
	CO4	2	2	1	1	2	2	2	3	1	2	3	3	1	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS306A	**Biology VI**	**L**	**T**	**P**	**C**
Version1.0		2	1	0	3
Total Contact Hours	45 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To understand the epidemiology of infectious diseases, their transmission and prevention.
2. To gain the knowledge of food and industrial microbiology.
3. To understand different molecular techniques in used in gene manipulation.
4. To learn about genes at molecular level, DNA, RNA and their replication, mutations, DNA repair mechanism
5. The course prepares the student to learn the applications of biotechology and transgenic plants and animals in medicines, vaccines, gene therapy.

Course Outcome:

1. Gain a comprehensive understanding of the epidemiology of infectious diseases, including their transmission and prevention strategies.
2. Acquire knowledge of food and industrial microbiology, including the roles of microorganisms in these contexts.
3. Understand various molecular techniques used in gene manipulation and their applications.
4. Develop a thorough understanding of genes at the molecular level, including DNA, RNA, replication, mutations, and DNA repair mechanisms.
5. Learn about the applications of biotechnology, including the use of transgenic plants and animals in areas such as medicine, vaccines, and gene therapy.

Course Contents
Section I: Human diseases Epidemiology of infectious disease, transmission, prevention and control of human diseases-Tuberculosis, Amoebiasis, Dengue, Malaria, Filariasis, Japanese encephalitis
Section II: Food and industrial microbiology Microbiology of fermented food and food-borne diseases, food preservation, Micro-organism as food (e.g. SCP), Major products of industrial microbiology-antibiotics, amino acids, organic acids, vitamins, pharmaceuticals.
Section III: **Molecular Techniques in Gene manipulation** Introduction to the concept of Recombinant DNA Technology, Cloning vectors, Restriction and modifying enzymes, Transformation techniques (microbial, plants and animals), Construction and screening of DNA libraries, Agarose and Polyacrylamide Gel Electrophoresis, Molecular analysis of DNA, RNA and Proteins (i.e., Southern, Northern and Western blotting), DNA sequencing (Maxam-Gilbert and Sanger methods), Polymerase chain reaction and DNA microarrays.
Section IV: Applications of Biotechnology Molecular diagnosis of genetic diseases (Cystic fibrosis, Huntington's disease and Sickle cell anemia), Recombinant vaccines, Recombinant DNA in medicines (Recombinant insulin and Human growth hormone), Gene therapy (ADA and Cystic fibrosis) and Stem Cells, Bioremediation, Production and applications of transgenic plants (biotic, abiotic and improvement of nutritional quality) and transgenic animals (generation of medicines and hormones), Ethics and regulation of GM organisms**.**

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination, A: Attendance

Text and References:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked. phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Gain a comprehensive understanding of the epidemiology of infectious diseases, including their transmission and prevention strategies.	PO9
CO2	Acquire knowledge of food and industrial microbiology, including the roles of microorganisms in these contexts.	PO9
CO3	Understand various molecular techniques used in gene manipulation and their applications	PO9
CO4	Develop a thorough understanding of genes at the molecular level, including DNA, RNA, replication, mutations, and DNA repair mechanisms.	PO9
CO5	Learn about the applications of biotechnology, including the use of transgenic plants and animals in areas such as medicine, vaccines, and gene therapy.	PO9

Course Code	**Course Outcome**	**PO**										**PSO**			
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**	**3**	**4**
BSFS306A	CO1	1	2	1	1	2	1	2	3	2	1	3	2	1	2
	CO2	1	2	1	1	2	1	2	3	2	1	3	2	1	1
	CO3	1	2	1	1	2	1	2	3	2	1	3	3	1	2
	CO4	2	2	1	1	2	2	2	3	1	2	3	3	1	1
	CO5	1	2	1	2	2	2	2	3	2	2	3	3	1	2

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

BSFS312A	Advanced Digital Forensics	L	T	P	C
Version1.0		2	0	0	2
Total Contact Hours	30 Hours				
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective: Upon completing this course, students will:

1. To learn the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics.
2. To explain methods of focusing investigations through analysis of multiple evidence sources.
3. To understand the concept of cryptographic techniques and security issues.
4. To understand the concept of symmetric cryptosystem and hashing.

Course Outcome:

1. Gain a comprehensive understanding of the essential concepts, algorithms, protocols, tools, and methodologies used in Computer Forensics.
2. Develop skills in focusing investigations by analyzing multiple sources of evidence.
3. Understand cryptographic techniques and the associated security issues.
4. Gain knowledge about symmetric cryptosystems and hashing algorithms.
5. Apply cryptographic concepts to enhance data security and protection.
6. Analyze and interpret digital evidence using computer forensic tools and techniques.
7. Develop proficiency in identifying and investigating cybercrimes.
8. Demonstrate the ability to effectively document and present findings from computer forensic investigations.

Course Contents
Section 1: Tools and technologies Computer Virus: Definition, types of viruses, Characteristics of viruses, virus and trojan infections, different types of attack, internet research and investigative tools, Anti-virus software. Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.
Section II: Cyber Security Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.

Section III: Cryptography Introduction to Cryptography, Symmetric and Asymmetric Cryptosystem Encryption Techniques– Substitutional Cipher and Transpositional Ciphers. Types of keys – Public Key and Private Key. Advanced Encryption Techniques and Security Issues. Various types of attacks including Cipher Text-Only attack, Known-Plaintext Attack, Chosen-Plaintext Attack, Chosen-Cipher text Attack.
Section IV: Symmetric Cryptosystem Symmetric Cryptosystem – AES, DES, RC4, Blowfish. Asymmetric Cryptosystems – RSA, DSA, Elliptic Curve cryptography. Introduction to Cryptanalysis – Differential and Linear Cryptanalysis. Hashing Algorithms – MD5, SHA-1, SHA-2, SHA-3, One-Way Hash, Hash Message Authentication Code.

Examination Scheme:

Components	**At**	**CT**	**EE**
Weightage (%)	**5**	**5**	**40**

CT: Class Test, , EE: End Semester Examination; Att: Attendance

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Gain a comprehensive understanding of the essential concepts, algorithms, protocols, tools, and methodologies used in Computer Forensics.	PO1, PO2, PO8, PO10
CO2	Develop skills in focusing investigations by analyzing multiple sources of evidence.	PO1, PO2, PO8, PO10
CO3	Understand cryptographic techniques and the associated security issues.	PO1, PO2, PO8, PO10
CO4	Gain knowledge about symmetric cryptosystems and hashing algorithms.	PO1, PO2, PO8, PO10
CO5	Apply cryptographic concepts to enhance data security and protection.	PO1, PO2, PO8, PO10
CO6	Analyze and interpret digital evidence using computer forensic tools and techniques.	PO1, PO2, PO8, PO10
CO7	Develop proficiency in identifying and investigating cybercrimes.	PO1, PO2, PO8, PO10
CO8	Demonstrate the ability to effectively document and present findings from computer forensic investigations.	PO1, PO2, PO8, PO10

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS312A	CO1	3	3	3	1	3	2	1	3	1	2	1	1	2	1
	CO2	3	3	3	2	3	1	2	3	2	1	1	1	2	1
	CO3	3	3	3	1	3	2	2	3	1	2	1	1	1	1
	CO4	3	3	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	3	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	3	3	2	3	1	2	3	1	2	1	1	2	2
	CO7	3	3	3	2	3	1	2	3	2	2	1	2	2	1
	CO8	3	3	3	2	3	1	2	3	2	2	1	1	2	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

Forensic Practical VI

Course Code: BSFS352A **Credit Units: 03**

Course Objective: The students will understand & perform experiments relating to:

1. To use scientific knowledge of different apparatus to interpret and provide rationale to the psychological phenomena.
2. To develop experimental expertise in Forensic Psychology students so that they understand the significance of designing and conducting experiments

Course Outcome:

1. Apply scientific knowledge to interpret psychological phenomena.
2. Develop expertise in experimental design in Forensic Psychology.
3. Use scientific methods to analyze psychological phenomena in forensics.
4. Design and conduct experiments in forensic psychology.
5. Analyze experimental data and draw valid conclusions.
6. Evaluate research findings in forensic psychology.
7. Apply ethical guidelines in psychological experiments.
8. Communicate research findings effectively in forensic psychology.

Course Contents
1. Type A/ Type B personality Test
2. Social Problem Scale
3. Eysenck's Personality Questionnaire
4. Raven's Standard Progressive Matrices.
5. Bhatia's Performance Scale of Intelligence.
6. Buss Perry- Aggression Scale
7. Parenting Scale
8. Free Association Test

Examination Scheme:

IA				EE	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
3. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
4. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
5. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals
6. G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply scientific knowledge to interpret psychological phenomena.	PO1, PO2, PO3, PO5, PO8
CO2	Develop expertise in experimental design in Forensic Psychology.	PO1, PO2, PO3, PO5, PO8
CO3	Use scientific methods to analyze psychological phenomena in forensics	PO1, PO2, PO3, PO5, PO8
CO4	Design and conduct experiments in forensic psychology	PO1, PO2, PO3, PO5, PO8
CO5	Analyze experimental data and draw valid conclusions.	PO1, PO2, PO3, PO5, PO8
CO6	Evaluate research findings in forensic psychology.	PO1, PO2, PO3, PO5, PO8
CO7	Apply ethical guidelines in psychological experiments.	PO1, PO2, PO3, PO5, PO8
CO8	Communicate research findings effectively in forensic psychology.	PO1, PO2, PO3, PO5, PO8

Course Code	Course Outcome	PO										PSO			
		1	2	3	4	5	6	7	8	9	10	1	2	3	4
BSFS352A	CO1	3	3	3	1	3	2	1	3	1	2	1	1	2	1
	CO2	3	3	3	2	3	1	2	3	2	1	1	1	2	1
	CO3	3	3	3	1	3	2	2	3	1	2	1	1	1	1
	CO4	3	3	3	1	3	1	2	3	2	2	1	2	2	2
	CO5	3	3	3	1	3	1	2	3	1	2	1	2	1	1
	CO6	3	3	3	2	3	1	2	3	1	2	1	1	2	2
	CO7	3	3	3	2	3	1	2	3	2	2	1	2	2	1
	CO8	3	3	3	2	3	1	2	3	2	2	1	1	2	1

1=weakly mapped, 2= moderately mapped, 3=strongly mapped

PROJECT

Course Code: BSFS314A **Credit Units: 03**

Course objective:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1. **Cover Page:** This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.
2. **Acknowledgement:** Various organizations and individuals who might have provided assistance
   /co-operation during the process of carrying out the study.
3. **Table of Content:** Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4. **Body of the Report:** The body of the report should have these four logical divisions
   a. ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
   b. ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
   c. ***Presentation of Data, Analysis and Findings*** **:**(using the tools and techniques mentioned in the methodology).
   d. ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5. **Bibliography or References:** This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6. **Annexures**: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

Steps of a Project Report

STEP I: Selection of the topic for the project by taking following points into consideration:

1. Suitability of the topic.
2. Relevance of the topic
3. Time available at the disposal.
4. Feasibility of data collection within the given time limit.
5. Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

STEP II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

STEP III: Collection of information and data relating to the topic and analysis of the same.

STEP IV: Writing the report dividing it into suitable chapters, viz.

Chapter 1: Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Chapter 5: Bibliography

STEP V: The following documents are to be attached with the Final Project Report.

i. Approval letter from the supervisor (Annexure-IA)
ii. Student's declaration (Annexure-IB)
iii. Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

1. Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
2. Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
3. Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva- Voce Examination in the subsequent years (within the time period as per University Rules).
4. No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
5. Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate. The evaluation scheme shall be as follows:

Project Report	**Power Point Presentation & Viva**
75 marks	25 marks