



# VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR

(Established by Act 11/2012 of Rajasthan Govt. Covered u/s 2(f) of UGC Act,1956)

## FACULTY OF BASIC AND APPLIED SCIENCES

### SCHEME & SYLLABUS FOR B.Sc. (HONOURS) FORENSIC SCIENCE

Version	1.1
Date of BOS/BOF/AC	BOS-26/03/2021/BOF-26/03/2021 AC Meeting 1 <sup>st</sup> April 2021
Implemented from (Session)	Session 2021-22
Scheme and Syllabus Page Number	Scheme- 8 to 12, Syllabus - 15 to 112

#### Six Semesters/ Three Years

Sem	I	II	III	IV	V	VI	Total
Credits	22	24	26	24	22	26	144

#### SESSION: 2021-22

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## PROGRAMME DETAILS

<b>Name of programme</b>	B.Sc.(Honours) Forensic Science
<b>Duration of Programme</b>	3 Years
<b>Programme Objectives (POs):</b>	<p>PO 1- The graduates will become successful professionals by demonstrating logical and analytical thinking abilities. applying forensic science principles.</p> <p>PO 2- The graduates will work and communicate effectively in inter-disciplinary environment, either independently or in a team, and demonstrate leadership qualities.</p> <p>PO 3- The graduates will engage in life-long learning and professional development through self-study, continuing education or professional and doctoral level studies.</p> <p>PO 4- To impart students a broad outline of the methodology of science and will learn the important analytical and instrumental tools used for practicing science.</p> <p>PO 5- Acquire knowledge and understanding of essential facts, concepts, principles and theories relating to the subject areas identified.</p> <p>PO 6- Develop skills to evaluate, analyse and interpret the chemical information and data.</p> <p>PO 7- Solve problems competently by identifying the essential parts of a problem and formulating a strategy for solving the problem.</p> <p>PO 8- Think creatively (divergently and convergent) to propose novel ideas in explaining facts and figures or providing new solution to the problems.</p> <p>PO 9- To develop student skill in critical thinking and analytical reasoning.</p> <p>PO 10- To prepare the students to pursue higher studies and to develop sustainable innovative solutions for the nation.</p>

<b>Programme Specific Outcomes (PSOs):</b>	PSO 1- Understand application of Forensic Science, Photography and Crime Scene Management. PSO 2- Techniques of Forensic Physics, Forensic Ballistics, Forensic Chemistry and Toxicology. PSO 3- Study Forensic Dermatoglyphics and other impressions. All PSOs are helpful in forensic identification with reference to various crimes.
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### Total Credit of the Program

<b>Sem</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>Total</b>
<b>Credits</b>	<b>22</b>	<b>24</b>	<b>26</b>	<b>24</b>	<b>22</b>	<b>26</b>	<b>144</b>



# VIVEKANANDA GLOBAL UNIVERSITY, JAIPUR

(Established by Act 11/2012 of Rajasthan Govt. Covered u/s 2(f) of UGC Act, 1956)

## Approved Scheme and Syllabus of programme

### B.Sc. (Honours) Forensic Science

#### Under Faculty of

#### Basic and Applied Sciences

#### For Session

**2021-22**

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Convener BOS/ HoD, Department

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Convener BOF/ Dean Faculty

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President (VGU)

## **Teaching and Examination Scheme**

**For**

### **B.Sc. (Honours) Forensic Science**

#### **Teaching and Examination for Bachelor of Science Honours Forensic Science:**

Courses, Periods of Study And Course s of Examination Will Be Choice Based Credit System For BSc (Honours) Forensic Science

The Bachelor of Science (Honours) Forensic Science is a regular programme and is conducted on-campus at Jaipur.

<b>Duration of the Program</b>	
<b>Course</b>	<b>Normal</b>
B.Sc. (Hons.) Forensic Science	Full time Three Years (Six Semesters)

The Credit Distribution for Six Semesters of BSc Honours Forensic Science is given below:

#### **Credit Distribution for B.Sc. (Honours) Forensic Science- Six Semesters/ Three Years**

**(Batch 2019- 2022)**

<b>Sem</b>	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>	<b>V</b>	<b>VI</b>	<b>Total</b>
<b>Credits</b>	<b>22</b>	<b>24</b>	<b>26</b>	<b>24</b>	<b>22</b>	<b>26</b>	<b>144</b>

**Evaluation Scheme**

<b>Evaluation Component</b>	<b>Weightage to be given</b>	<b>Exam Duration</b>
<b>Theory Paper</b>		
Mid Term 1	10%	1.5 Hrs
Mid Term 2	10%	1.5 Hrs
Sessional Components A1, A2, A3, A4, A5, A6, A7, A8 (Average from each unit 1-5 out of 5% of each as Quiz, Assignment, Seminars, Presentations, Attendance, Case study, Surprise class test, Lab record, Viva, Projects, and Observation Book)	8 x 2.5% = 20%	
End Term Exam	60%	3 Hrs
<b>Practical Paper</b>		
Mid Term 1	15%	1.5 Hrs
Mid Term 2	15%	1.5 Hrs
Assignments, Projects, and other 8 components	8 x 3.75% = 30	-
End Term Practical Exam	40%	3 Hrs

**Scheme & Syllabus**  
**For**  
**B.Sc. (Honours) Forensic Science**  
  
**Semester I - VI**



B.Sc. (HONS.) FORENSIC SCIENCE SCHEME WEF 2021-22						
SEMESTER I						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 101	Core Theory	Introduction to Forensic Science	4	0	0	4
FSH 103	Core Theory	Crime and Society	4	0	0	4
FSH 102	Core Practical	Introduction to Forensic Science Lab	0	0	4	2
FSH 104	Core Practical	Crime and Society Lab	0	0	4	2
ZOO 152	Generic Elective Course-1	Zoology	3	0	0	3
PHY 280		Physics	3	0	0	3
ZOO 153		Zoology Lab	0	0	2	1
PHY 281		Physics Lab	0	0	2	1
CHY 103	Core Ability Enhancement	Environmental Science	2	0	0	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>12</b>	<b>22</b>

B.Sc.(HONS.) FORENSIC SCIENCE SCHEME WEF 2021-22						
SEMESTER II						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 105	Core Theory	Criminal Law	4	0	0	4
FSH 107	Core Theory	Forensic Psychology	4	0	0	4
FSH 106	Core Practical	Criminal Law Lab	0	0	4	2
FSH 108	Core Practical	Forensic Psychology Lab	0	0	4	2
BOT 173	Generic Elective Course-2	Botany	3	0	0	3
BOT 174		Botany Lab	0	0	2	1
CHY 255		Chemistry	3	0	0	3
CHY 256		Chemistry Lab	0	0	2	1
ENG 106	Core Ability Enhancement	Professional Communication	2	0	0	2
ENG 107		Communication Tech Lab	0	0	2	1
SEP 200	Skill Enhancement Practical	Extra-Curricular Activity (NSS/NCC/Scouting/ club activity)	0	0	2	1
<b>Total</b>			<b>16</b>	<b>0</b>	<b>16</b>	<b>24</b>

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME WEF 2021-22						
SEMESTER III						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 109	Core Theory	Forensic Dermatoglyphics	4	0	0	4
FSH 111	Core Theory	Technological Methods in Forensic Science	4	0	0	4
FSH 113	Core Theory	Criminalistics	4	0	0	4
FSH 110	Core Practical	Forensic Dermatoglyphics Lab	0	0	4	2
FSH 112	Core Practical	Technological Methods in Forensic Science Lab	0	0	4	2
FSH 114	Core Practical	Criminalistics Lab	0	0	4	2
MGT109*	Core Ability Enhancement	Business Ethics & Corporate Social Responsibility	2	0	0	2
FSH 137	Generic Elective Course	Digital Forensics	4	0	0	4
FSH 141	Core Ability Enhancement	Introduction to Biometry	2	0	0	2
<b>Total</b>			<b>20</b>	<b>0</b>	<b>12</b>	<b>26</b>

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME WEF 2021-22						
SEMESTER IV						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 115	Core Theory	Introduction to Forensic Chemistry	4	0	0	4
FSH 117	Core Theory	Questioned Documents	4	0	0	4
FSH 119	Core Theory	Forensic Biology	4	0	0	4
FSH 116	Core Practical	Introduction to Forensic Chemistry Lab	0	0	4	2
FSH 118	Core Practical	Questioned Documents Lab	0	0	4	2
FSH 120	Core Practical	Forensic Biology Lab	0	0	4	2
FSH 142	Generic Elective Course	Economics	4	0	0	4
FSH 146	Core Ability Enhancement	Handwriting Identification and Recognition	2	0	0	2
<b>Total</b>			<b>18</b>	<b>0</b>	<b>12</b>	<b>24</b>

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME WEF 2021-22	
SEMESTER V	

Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 121	Core Theory	Forensic Ballistics	4	0	0	4
FSH 123	Core Theory	Forensic Toxicology	4	0	0	4
FSH 122	Core Practical	Forensic Ballistics Lab	0	0	4	2
FSH 124	Core Practical	Forensic Toxicology Lab	0	0	4	2
FSH 147	Discipline Specific Course-1	Forensic Physics	4	0	0	4
FSH 149	Discipline Specific Course-2	Economic Offences				
FSH 151	Discipline Specific Course- 3	Forensic Serology				
FSH 148	Discipline Specific Course Lab-1	Forensic Physics Lab	0	0	4	2
FSH 150	Discipline Specific Course Lab-2	Economic Offences Lab				
FSH 152	Discipline Specific Course Lab - 3	Forensic Serology Lab				
FSH 153	Skill Enhancement Course	Research Methodology	2	0	0	2
FSH 154	Core Course	Seminar	2	0	0	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>12</b>	<b>22</b>

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME WEF 2021-22

**SEMESTER VI**

Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 127	Core Theory	Forensic Anthropology	4	0	0	4
FSH 129	Core Theory	Forensic Medicine	4	0	0	4
FSH 128	Core Practical	Forensic Anthropology Lab	0	0	4	2
FSH 130	Core Practical	Forensic Medicine Lab	0	0	4	2
FSH 155	Discipline Specific Course-4	DNA Profiling	4	0	0	4
FSH 157	Discipline Specific Course-5	Accident Investigation				
FSH 156	Discipline Specific Course Lab-4	DNA Profiling Lab	0	0	4	2
FSH 158	Discipline Specific Course Lab-5	Accident Investigation Lab				
FSH 159	Core Course	Dissertation/ Internship	6	0	0	6
FSH 160	Skill Enhancement Course	Universal Human Values And Ethics	2	0	0	2
<b>Total</b>			<b>20</b>	<b>0</b>	<b>12</b>	<b>26</b>

**Theory – 2 Midterm Exams and Course Work\* (40%) End Term Exam (60%)**

**Practical- 2 Midterm Exams and Course Work\* (60%) End Term Exam (40%)**

\*Class work shall include: Quiz, Assignment, Seminars, Presentations, Attendance, Case study, Surprise class test, Lab record, Viva, Projects, and Observation Book

### LIST OF GENERIC ELECTIVE COURSES

S.No	Course Code	Course Name
1	ZOO 152	Zoology
2	PHY 280	Physics
3	ZOO 153	Zoology Lab
4	PHY 281	Physics Lab
5	BOT 173	Botany
6	BOT 174	Botany Lab
7	CHY 255	Chemistry
8	CHY 256	Chemistry Lab
9	FSH 137	Digital Forensics
10	FSH 142	Economics

# Semester I

B.Sc. (HONS.) FORENSIC SCIENCE SCHEME WEF 2021-22						
SEMESTER I						
<i>Course Code</i>	<i>University Course Type</i>	<i>Course Name</i>	<i>Teaching Scheme</i>			
			<i>L</i>	<i>T</i>	<i>P</i>	<i>C</i>
FSH 101	Core Theory	Introduction to Forensic Science	4	0	0	4
FSH 103	Core Theory	Crime and Society	4	0	0	4
FSH 102	Core Practical	Introduction to Forensic Science Lab	0	0	4	2
FSH 104	Core Practical	Crime and Society Lab	0	0	4	2
ZOO 152	Generic Elective Course-1 (GEC)	Zoology	3	0	0	3
PHY 280		Physics	3	0	0	3
ZOO 153		Zoology Lab	0	0	2	1
PHY 281		Physics Lab	0	0	2	1
CHY 103	Core Ability Enhancement	Environmental Science	2	0	0	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>12</b>	<b>22</b>

## **FSH 101 INTRODUCTION TO FORENSIC SCIENCE**

**L-T-P-C Structure 4-0-0-4****Course Type: Core Theory****COURSE OBJECTIVES:** The objective of this course is to

CO1: Introduce the concept of forensic science, its development and progress over time.

CO2: It will also familiarize students with the organizational setting and working set up of forensic laboratories.

CO3: It aims to introduce different techniques used in forensic investigations with the principles involved.

CO4: Understanding Duties of Forensic Scientists

CO5: Understanding of Ethical issue in Forensic Science

### **MODULE I**

**Basic of Forensic Science:** Introduction, Definition, need, signification and scope of Forensic Science. Principles of Forensic Science, Multi professional and multi personal aspects of forensic science. Domains in Forensic Science: Forensic Biology, Forensic Medicine, Forensic Toxicology, Forensic Osteology and Odontology, Forensic Physics, Forensic Photography, Ballistics, Fingerprint, Forensic Psychology, Forensic Anthropology, Wild life Forensic, DNA profiling, Computer Forensic etc., Functions of Forensic Scientist, Police officers.

### **MODULE II**

**History of Development of Forensic Science in India**

Functions of forensic science. Historical aspects of forensic science, concepts in forensic science. Ethical issue in Forensic Science: Definition of ethics, professional standards for practice of Criminalistics

### **MODULE III**

**Tools and Techniques in Forensic Science**

Forensic science in international perspectives, including set up of INTERPOL and FBI, Problem of proof in forensic science. Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Medico legal expert officers, Corpus delicti, modal operandi.

### **MODULE IV**

**Duties of forensic scientists** Code of conduct for forensic scientists. Qualifications of forensic scientists, Data depiction. Report writing, Physical evidences and its importance in Forensic Science.

### **MODULE V**

**Organizational set up of Forensic Science Laboratories in India**

Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Directorate of Forensic Science and Mobile Crime Laboratories. Police Academies. Services of crime laboratories. Basic services and optional services.



**Text Books:**

- 1) B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).
- 2) M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).

**Reference Books:**

- 1) S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
- 2) W.G. Eckert and R.K. Wright in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
- 3) R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- 4) W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

**Digital Reference**

1. <https://sites.google.com/site/introductiontoforensicscience/file-cabinet>
2. <https://www.studocu.com/en-ca/document/university-of-windsor/introduction-to-forensic-science/lecture-notes/chapter1-overview-of-forensic-science/478262/view>
3. <https://www.slideshare.net/dr bhargava5745/introduction-to-forensic-science-labs-in-india>
4. [https://www.youtube.com/watch?v=nNvy7\\_73ecc](https://www.youtube.com/watch?v=nNvy7_73ecc)
5. <https://pressbooks.bccampus.ca/criminalinvestigation/chapter/chapter-10-forensic-sciences/>

**FSH 103**  
**CRIME AND SOCIETY**

**L-T-P-C Structure 4-0-0-4****Course Type: Core Theory****COURSE OBJECTIVES:** The objective of this course is to

CO1: Introduce the concept and scope of crime.

CO2: Familiarize students with types of crime and its effects as well its prevention.

CO3: The course would highlight about criminal behaviour and related theories.

CO4: It will disseminate information to students with Basics of Criminology, Crime, Criminal behaviour,

CO5: Human rights and criminal justice system in India.

**MODULE-I**

**Basics of Criminology**

Definition, aims and scope. Theories of criminal behaviour – classical, positivist, sociological. Criminal anthropology, Criminal profiling, Understanding modus operandi, Investigative strategy, Role of media.

**MODULE-II**

**Crime**

Elements, nature, causes and consequences of crime. Deviant behaviour. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence.

White collar crimes Victimology. Juvenile delinquency. Social change and crime.

Psychological Disorders and Criminality. Situational crime prevention.

**MODULE-III**

**Criminal behaviour:** Introduction of criminal behaviour, theories of criminal behaviour: classical and non-classical theories, biological theories, physiological theories, psychogenic theory, economic theory, geographical theories, and sociological theories.

**MODULE-IV**

**Crime detection agency :** Organization set up, National Institute of Criminology and Forensic science, Crime Investigation department, Central Bureau of Investigation, National Investigation Agency , World Anti-Doping Agency, National Drug Testing Laboratory, Centre for Cellular and Molecular Biology, Intelligence Bureau, Research Analysis Wing, Bureau of Police Research & Development, Defence Research and Development Organization, Central Police Organization, Central Detective Training School, Fingerprint Bureau Investigation, Crime Investigation Agency, Crime Scene Investigation, Drug Enforcement Administrator & Interpol, OCTOPUS etc.

**MODULE-V**

**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:** Human rights, principal sectors of human rights abuses (Crime, Police, Courts, Prisons, states and others), Suggestions for improving the system of criminal justice.

**Text Books:**

- 1) S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
- 2) D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton (2002).

**Books Suggested:**

- 1) R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- 2) J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester (1997).
- 3) R. Gupta, *Sexual Harassment at Workplace*, LexisNexis, Gurgaon (2014).

**Digital Reference**

1. <https://www.studocu.com/en-ca/document/simon-fraser-university/introduction-to-criminology/lecture-notes/introduction-to-criminology-lecture-notes-lecture-week-1-to-11/856713/view>
2. <https://www.slideshare.net/jenvogt/criminology-and-crime-notes>
3. <https://sites.google.com/site/introductiontoforensicscience/file-cabinet>
4. <http://www2.cruzio.com/~zdino/psychology/criminal.behavior.htm>
5. <http://14.139.60.114:8080/jspui/bitstream/123456789/721/15/Human%20Rights%20and%20the%20Administration%20of%20Criminal%20Justice.pdf>

**FSH 102**  
**INTRODUCTION TO FORENSIC SCIENCE LAB**

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical****COURSE OBJECTIVES:** The objective of this course is to

CO1: Understand the basic concept, meaning, significance and development of Forensic science.

CO2: To elucidate research methodologies and techniques used in the formation of research design on a specific problem.

CO3: Describe Crime scene investigations,

CO4: Reconstruction of scene of crime,

CO5: Basic principles of photography and its relevance.

- 1.To study the history of crime cases from forensic science perspective.
- 2.To cite examples of crime cases in which apprehensions arose because of Daubert standards.
- 3.To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements if any.
- 4.To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.
5. To write report on different type of crime cases.
6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
- 7.To examine the hierarchical set up of different forensic science establishments and suggest improvements.
- 8.To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
9. To compare and contrast the role of a Police Academy and a Police Training School.
- 10.To compare the code of conduct prescribed by different establishments for forensic scientists.
11. What are physical evidences and types of physical evidences.
12. How to collect preserved and transport blood stain from the surface.
13. How to collect preserved hair, fibre (trace evidences) from the scene of crime.

**Text Books:**

- 1) B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).
- 2) M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).
- 3) S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

**Books Suggested:**

- 1) W.G. Eckert and R.K. Wright in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
- 2) R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- 3) W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

**FSH 104**  
**CRIME AND SOCIETY LAB**

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: To understand concept of crime and recent development in its control and prevention.

CO2: Study the aim and scope of criminology.

CO3: To elucidate Criminal profiling and modus operandi, portrait parley, voice stress analysis

CO4: To describe History and development of police administration; Police duties, responsibilities and powers.

CO5: Learn how rising standards of living affect crime rate.

1. To review past criminal cases and elucidate which theory best explains the criminal behaviour of the accused
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressure group.
4. To evaluate the post-trauma stress amongst victims of racial discrimination.
5. To correlate deviant behaviour of the accused with criminality (take a specific example).
6. To evaluate victimology in a heinous crime.
7. To examine a case of juvenile delinquency and suggest remedial measures.
8. To evaluate how rising standards of living affect crime rate.
9. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.
10. To visit a 'Model Police Station' and examine the amenities vis-à-vis conventional police stations.
11. To examine steps being taken for rehabilitation of former convicts and suggest improvements.
12. To prepare a report on interrogation cells and suggest improvements.

**Text Books:**

1) S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

2) D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton (2002).

**Books Suggested:**

1) R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).

2) J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester (1997).

3) R. Gupta, *Sexual Harassment at Workplace*, LexisNexis, Gurgaon (2014).

**ZOO 152  
ZOOLOGY****L-T-P-C Structure 3-0-0-3****Course Type: GE Theory****COURSE OBJECTIVE:** Upon successful completion, student will be able

CO1: Understand the role, structure and importance of the bio molecules associated with plant life.

CO2: Learn Ultra structure and functioning of cell in the sub-microscopic and molecular level.

CO3: Understand applications of basic techniques in Mendelism.

CO4: To explain general characters of insects.

CO5: Understand the wildlife conservation.

**MODULE-I****Introduction**

The cell, Human anatomy and physiology, structural unit of life, History of cell organization, Prokaryotic and eukaryotic cell, cell cycle, Mitosis and meiosis, Integumentary, Respiratory system, digestive system, excretory system, Cardiovascular system and reproductive system.

**MODULE-II****Entomology in Forensic Science**

Phylum Arthropoda, class insecta, General Entomology: Significance of Terrestrial and Aquatic insects in Forensic Science.

Role of Insects in investigation, determine the time since death and use of insects in Forensic science.

**MODULE-III****Human Biochemistry**

Protein structure and its functions; Carbohydrate structure, function, properties; Lipid's structure, properties and functions, Types of micronutrients and macronutrients in the body. Hormonal functions and Stimulations.

**MODULE-IV****Wildlife Forensic Science**

Introduction and importance of wildlife, Protection acts, Endangered Species of animals, wildlife Environment Protection Act, animal parts and organs, which are significant in Wildlife, Wildlife laboratories and its Organization and Wildlife conservation act.

**MODULE-V****Mendelism**

Mendel's Law, Exceptions to Mendel's Law, DNA & RNA: Structure, functions, types and Discovery, Morphological structure and organization, Special type of Chromosome, Salivary glands, Lamp brush Chromosome, supernumerary Chromosome, mutations, Definition & types mutagens (Physical & Chemical)

**Text Books:**

- 1) Ruppert and Barnes, R.D. Invertebrate Zoology, VIII Edition. Holt Saunders International Edition (2006)
- 2) Gupta P.K. 2004. Cytology, Genetics and evolution. Rastogi Publications, Meerut. (Hindi Edition)
- 3) Campbell, MK (2012) Biochemistry, 7<sup>th</sup> ed., Published by Cengage Learning.
- 4) Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2<sup>nd</sup> ed., W.H. Freeman

**Reference Books:**

- 1) Kaushik, M.P. 2003. A text Book of Modern Botany. Prakash publications, Muzaffarnagar (UP)
- 2) Klug, W.W. and Cummings, M.R. 2005. Concepts of genetics Pearson Education (Singapore) pvt. Ltd., Indian Branch, Pratap Ganj, New Delhi.
- 3) Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company
- 4) Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5<sup>th</sup> Edition., W.H. Freeman and Company.
- 5) Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. The Invertebrates: A New Synthesis, III Edition, Blackwell Science (2002).
- 6) Young, J. Z. The Life of Vertebrates. III Edition. Oxford university press (2004).  
Pough H. Vertebrate life, VIII Edition, Pearson International

**Digital Reference**

1. <http://www.nslc.wustl.edu/courses/bio101/cruz/Organelles/Organelle.htm>
2. <https://www.biologydiscussion.com/biochemistry/bioenergetics/essay-on-bioenergetics-biochemistry/42121->
3. <https://www.youtube.com/watch?v=X5VikohUKmg>
4. [http://depts.washington.edu/genetics/courses/genet371b-aut99/overheads/pdfs/all\\_lect.pdf](http://depts.washington.edu/genetics/courses/genet371b-aut99/overheads/pdfs/all_lect.pdf)
5. <https://microbenotes.com/non-mendelian-inheritance/>

**PHY 280  
PHYSICS****L-T-P-C Structure 3-0-0-3****Course Type: GE Theory****COURSE OBJECTIVES:** The objective of this course is to

CO1: Understand the fundamentals of Newton's law of motion, Elasticity &amp; fluid dynamics and solve the basic numerical problem based on it.

CO2: Understand the fundamentals of sound and light wave's propagation in homogeneous and guided medium.

CO3: Understand how LASER works and basic properties of LASER light and how it differs from ordinary light

CO4: Understand the nuclear properties and half-life, Conservation laws in nuclear reactions, Biological effects of nuclear radiations.

CO5: Understand the working of transducers, Photo sensors, Logic gates, Flip- flops and counters and their use in different applications.

**MODULE-I****Newton's Law of Motion, Elasticity & Fluid Dynamics**

Interpretation and applications of Newton's laws of motion, projectile motion, idea of range, time of flight, and maximum height of a projectile, Pseudo forces, Coriolis force and its effect on earth surface, elastic properties of matter, elastic constants and their inter relations.

Fluid dynamics, equation of continuity, Bernoulli's equation and explanation of some phenomena, stream line and turbulent flow, lines of flow in air foil, Poiseuille's equation.

**MODULE-II****Study of Sound and Light**

Velocity of sound, noise and sound intensity measurement, echo, reverberation, Sabine's formula, absorption effect of different materials, acoustics of buildings and factors affecting acoustics of buildings.

Sound distribution in an auditorium, introduction to ultrasonic, production of ultrasonic waves, applications of ultrasonics.

Refraction through thin layers, lens combinations, aberrations, interference in thin films, fringes of equal thickness, Newton's rings, and simple table spectrophotometer.

**MODULE-III****Laser and Fibre Optics**

Concept of Induced absorption, Spontaneous and Stimulated emission, Population inversion, Pumping Process, Condition for lasing action, Active medium, Production of LASER source mainly Ruby LASER and He-Ne LASER, Properties of Laser light, applications of LASER: Holography and its applications.

Total internal reflection &amp; Optical fibres, Propagation of light through optical fibre, Angle of acceptance and numerical aperture, losses.



## MODULE-IV

### Radio Activity

Review of nuclear composition, nuclear properties and half-life, Radioactive decay schemes, Nuclear reactions, Conservation laws in nuclear reactions, Q- value of Nuclear reaction. Applications of Radio Isotopes, Radiometric dating, Radiation hazards, Radiation levels of safety, Biological effects of nuclear radiation, Radiation protection methods, Nuclear disasters, Nuclear waste disposal, Radiation damage, Roentgen and Roentgen equivalent physical (rep) and man (rem), Radiation dose.

## MODULE-V

### Electronics Circuits & Digital Electronics

Basics of LR, CR, LCR circuits, transducers (Electric and Photo sensors), Rectifier circuits, Transistor and its characteristics and applications, Introduction to OPAM, remote sensing and controlling, Logic gates and their applications, Flip-flops and counters.

#### Text Books:

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

#### Books Suggested:

- 1) Lasers :Theory and Application- Thyagrajan.
- 2) Lasers and Non- Linear Optics: B. B. Laud, Wiley Easter Ltd.
- 3) Optoelectronics Devices and Circuits- Amar K. Ganguly, Narosa Publication.
- 4) Atomic and Nuclear Physics :N. Subrahmanyam et.al. , S- chand company Ltd.
- 5) Nuclear Physics: S. B. Patel, John Wiley & Sons.
- 6) Digital Computer Electronics: Malvino, Brown, Tata McGraw hills.
- 7) Principle of Electronics: V. K. Mehta, S Chand.

#### Digital References:

- 1.<https://opentextbc.ca/openstaxcollegephysics/chapter/further-applications-of-newtons-laws-of-motion/>
- 2.<https://ocw.mit.edu/courses/physics/8-03sc-physics-iii-vibrations-and-waves-fall-2016/part-i-mechanical-vibrations-and-waves/lecture-11/>
- 3.<https://nptel.ac.in/courses/117/101/117101002/>
- 4.<https://www.docsity.com/en/vibrations-and-sound-general-physics-lecture-notes/256666/>
- 5.<https://circuitdigest.com/tutorial/rc-rl-and-rlc-circuits>

**ZOO 153  
ZOOLOGY LAB****L-T-P-C Structure 0-0-2-1****Course Type: GE****Practical****COURSE OBJECTIVE:** Upon successful completion, student will be able

CO1: Understand the role, structure and importance of the bio molecules associated with plant life.

CO2: Learn Ultra structure and functioning of cell in the sub-microscopic and molecular level.

CO3: Understand applications of basic techniques in Mendelism.

CO4: To explain general characters of insects.

CO5: Understand the wildlife conservation.

1. Introduction to microscopy-simple and compound microscope.
2. Preparation and use of fixatives and stains.
3. Study of different stages of Mitosis and Meiosis through permanent slide.
4. Study of cell and its organelles with the help of electron micrographs
5. Study of life cycle of insect.
6. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics

**Text Books:**

1. Gupta P.K. 2004. Cytology, Genetics and evolution. Rastogi Publications, Meerut. (Hindi Edition)
2. Campbell, MK (2012) Biochemistry, 7<sup>th</sup> ed., Published by Cengage Learning.
3. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2<sup>nd</sup> ed., W.H. Freeman

**Reference Books:**

1. Kaushik, M.P. 2003. A text Book of Modern Botany. Prakash publications, Muzaffarnagar (UP)
2. Klug, W.W. and Cummings, M.R. 2005. Concepts of genetics Pearson Education (Singapore) pvt. Ltd., Indian Branch, PratapGanj, New Delhi.
3. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company
4. Nelson DL and Cox MM (2008) Lehninger Principles of Biochemistry, 5<sup>th</sup> Edition., W.H. Freeman and Company.

**PHY 281**  
**PHYSICS LAB**

**L-T-P-C Structure 0-0-2-1**

**Course Type: GE Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Study Refractive index of liquid by interference method.

CO2: To Study Frequency of AC mains, LDR, LCR etc.

CO3: To study Bridge rectifier ( to study load regulation),

CO4: Transistor(CE) characteristics,

CO5: D-Morgan's Theorems Ex-or gate, aNAND and NOR as universal building block.

- 1) Refractive index of a liquid by interference method
- 2) Frequency of AC mains
- 3) LDR characteristics
- 4) LCR series resonance
- 5) Study of Bridge rectifier with different loads.
- 6) Transistor (CE) characteristics
- 7) D-Morgan's Theorems
- 8) Ex-OR gate, NAND and NOR as universal building block.
- 9) Use of CRO
- 10) Determination of wavelength of light using Newton's rings method.
- 11) Meldes experiment

**Text Books:**

- 1) Engineering Physics: R. K. Gaur & S. L. Gupta, Dhanpat Rai Publications
- 2) Engineering Physics: A. S. Vasudeva, S- Chand
- 3) University Physics: J. C. Upadhyaya, Himalaya Publications
- 4) Modern Physics: R. Murugesan et. al. , S Chand Co Ltd.
- 5) Mechanics and Properties of Matter: J. C. Upadhyaya
- 6) Optoelectronics Devices and Circuits- Amar K. Ganguly, Narosa Publication.

**Books Suggested:**

- 1) Atomic and Nuclear Physics :N. Subrahmanyam et.al. , S- chand company Ltd.
- 2) Nuclear Physics: S. B. Patel, John Wiley & Sons.
- 3) Digital Computer Electronics: Malvino, Brown, Tata McGrawhills.
- 4) Principle of Electronics: V. K. Mehta, S Chand

## **CHY103 ENVIRONMENTAL SCIENCE**

**L-T-P-C Structure 2-0-0-2**

**Course Type: CAE**

**COURSE OBJECTIVE:** Students will gain an understanding of:

CO1:Core concepts and methods from ecological and physical sciences and their application in environment.

CO2:To make everyone aware of environmental issues like pollution, loss of forest, solid waste disposal, and degradation of environment.

CO3:The ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

CO4:Identify pollution and explain threats to the environment.

CO5:Discuss how political involvement can increase one's awareness of the topic of environmental protection

### **MODULE-I**

**Introduction and natural resources:** Multidisciplinary nature and public awareness, renewable and non-renewable resources and associated problems, forest, water , mineral, food , energy and land resources. Introduction to natural resources, conservation of natural resources and human role.

### **MODULE-II**

**Ecosystem:** Ecological concepts, concept of ecosystems, types of ecosystems, ecosystem structure and functioning, energy flow, food chains and food webs, ecological pyramids

### **MODULE-III**

**Biodiversity and Conservation:** Definition, genetic species and ecosystem diversity biogeographically , classification of Indian value of biodiversity at national and local levels, India as a mega-diversity nation , treats to biodiversity and endangered and endemic species of India, need for conservation of biodiversity.

### **MODULE-IV**

**Environmental pollution:** Definition , causes, effect and control of air pollution , water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, electromagnetic pollution, nuclear hazards , human role in prevention of pollution, solid waste management, disaster management, floods , earthquake, cyclone, and landslide **Firework Safety:** Combustion of firework and pollution (noise, smoke, fireworks fallout and residue pollution), heavy metal toxicity due to fireworks and associated health effects.

### **MODULE-V**

**Social Issue and Environment:** Unsuitable to suitable development , urban problem related to energy and water conservation, environment protection act, wild life protection act, forest conservation act, environmental issues, population explosion, and family welfare programme. Environmental and human health HIV, women and child welfare, role of information technology on environment and human health.

**Corruption:** definition and reasons, details of organizations/agencies working against corruption, role of individual against corruption and mode of action.

**Ethics :** Meaning , nature, determinants and objectives of ethics, ethics and its relation to values norms and morals, Indian ethos, Swami Vivekananda and ethics.

**Text Books:**

- 1) Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA
- 2) Odum E.P.: Fundamentals of Ecology, 1996, Dehradun: Natraj Publisher

**Books Suggested:**

- 1) Agrawal, K.C.: Fundamentals of Environmental Biology, 2001, Bikaner (India): Nidhi Publishers
- 2) Chapman, J.L. & Reiss, M.J.: Ecology: Principles and Applications, 1995, Cambridge University Press
- 3) Atmospheric pollution, by W Buch, Tata McGraw Hill (TMH)

**Digital Reference:**

1. <https://byjus.com/chemistry/types-natural-resources/>
2. <https://www.khanacademy.org/science/biology/biodiversity-and-conservation>
3. <https://www.civilserviceindia.com/subject/General-Studies/notes/environmental-pollution-and-degradation.html>
4. <https://www.ugc.ac.in/oldpdf/modelcurriculum/Chapter6.pdf>
5. <https://www.britannica.com/topic/ethics-philosophy>

# Semester II

B.Sc. (HONS.) FORENSIC SCIENCE SCHEME WEF 2021-22						
SEMESTER II						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 105	Core Theory	Criminal Law	4	0	0	4
FSH 107	Core Theory	Forensic Psychology	4	0	0	4
FSH 106	Core Practical	Criminal Law Lab	0	0	4	2
FSH 108	Core Practical	Forensic Psychology Lab	0	0	4	2
BOT 170	Generic Elective Course-2 (SEC)	Botany	3	0	0	3
BOT 171		Botany Lab	0	0	2	1
CHY 252		Chemistry	3	0	0	3
CHY 253		Chemistry Lab	0	0	2	1
ENG 106	Core Ability Enhancement	Professional Communication	2	0	0	2
ENG 107		Communication Tech Lab	0	0	2	1
SEP 200	Skill Enhancement Practical	Extra-Curricular Activity (NSS/NCC/Scouting/ club activity)	0	0	2	1
<b>Total</b>			<b>16</b>	<b>0</b>	<b>16</b>	<b>24</b>

## **FSH 105 CRIMINAL LAW**

**L-T-P-C Structure 4-0-0-4****Course Type: Core Theory****COURSE OBJECTIVES:** The objective of this course is to

CO1: Introduce the concept and scope of crime. It will familiarize students with types of crime and its effects as well its prevention.

CO2: The course would highlight about criminal behaviour and related theories. The course aims to discuss the concept of Juvenile delinquency and Victimology.

CO3: It will disseminate information to students with specific criminal Law, Indian Penal Code: sections, Criminal Procedure Code and police Administration.

CO4: Understanding of fundamental rights

CO5: Understanding of acts Pertaining to Socio-economic and Environmental Crimes

### **MODULE-I**

**Basic of Crime**

Definition of Crime, Nature of Crime, Essentials of Crime, Criminals and society Classification of crime, cognizable and non-cognizable offence, bailable and non-bailable offence, compoundable, non-compoundable offences and punishments.

### **MODULE-II**

**Various types of Crime**

Various types of crime under IPC, Crime against State, Crime against Army, Navy, and Air Force, Crime against public Tranquillity, Crime relating to public servant, Offences relating to election, False evidence and offence against public justice, Offence relating to Coin and Government stamps, Offence relating to weight and measures, Offence relating to Religion.

### **MODULE-III**

**Law to Combat Crime**

Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts, Criminal Procedure Code.

Sentences which the court of Chief Judicial Magistrate may pass, Summary trials – Section 260(2).

Judgements in abridged forms – Section 355.

Indian Penal Code pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362, Sections 375 & 377 and their amendments.

Indian Penal Code pertaining to offences against property Sections – 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497, 499, 503, 511.

Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141, Section 293 in the code of criminal procedure.

**MODULE-IV****Constitution of India**

Preamble, Fundamental Rights, Directive Principles of State Policy. – Articles 14, 15, 20, 21, 22, 51A.

**MODULE-V****Acts Pertaining to Socio-economic and Environmental Crimes**

Narcotic, Drugs and Psychotropic Substances Act. Essential Commodity Act, Drugs and Cosmetics Act. Explosive Substances Act. Arms Act, Dowry Prohibition Act. Prevention of Food Adulteration Act. Prevention of Corruption Act, Wildlife Protection Act. I.T. Act. Environment Protection Act. Untouchability Offences Act

**Text Books :**

- 1) D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton (1999).
- 2) Vipa P. Sarthi, *Law of Evidence*, 6th Edition, Eastern Book Co., Lucknow (2006).
- 3) A.S. Pillia, *Criminal Law*, 6th Edition, N.M. TripathiPvt Ltd., Mumbai (1983).

**Books Suggested :**

- 1) R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi (1965).
- 2) (Chief Justice) M. Monir, *Law of Evidence*, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).

**Digital References:**

1. <https://www.cliffsnotes.com/study-guides/criminal-justice/crime/types-of-crime>
2. <https://iuristebi.files.wordpress.com/2011/07/introduction-to-criminal-law.pdf>
3. <https://lecturenotes.in/notes/22519-note-for-constitution-of-india-ci-by-dr-janmejaysenapati>
4. <https://www.youtube.com/watch?v=eS03-itWEPs>
5. [https://swayam.gov.in/nd2\\_cec20\\_hs19/preview](https://swayam.gov.in/nd2_cec20_hs19/preview)



## FSH 107 FORENSIC PSYCHOLOGY

**L-T-P-C Structure 4-0-0-4**

**Course Type: Core Theory**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Introduce the Concepts of psychology - Definition, goals, History and Development of psychology.

CO2: It aims at explaining the concept of forensic entomology and forensic psychology with details involved and their application in forensic investigations.

CO3: To study a case wherein the untouchability Offences Act was invoked on the basis of Article

CO4: Understanding of learning, memory and associated laws

CO5: Understanding of assessment of personality

### MODULE I

#### **The Science of Psychology**

Concepts of psychology - Definition of psychology, goals of psychology, History of psychology - Development of psychology, role of psychologist, Different perspectives in Psychology - Modern perspectives, Humanistic, behaviouristic, cognitive, psychodynamic, Types of psychology professions - Psychiatrist, Psychologist, Counsellor, The science and research methods - Interview, observation, case study method,

### MODULE II

#### **Biological Perspective**

Nerve and neuron - Building the network, structure of neuron, neural impulses, neurotransmitters, Nervous System - Central nervous system, structure and function of CNS, types of amnesia, Peripheral nervous system, Human brain - structure and function, significance of left and right brain, types of Amnesia, Endocrine system- Pituitary gland, Thyroid gland, Neurotransmitters.

#### **Consciousness & Perception**

Consciousness - Definition of consciousness, states of consciousness, Altered state of consciousness - Dreams, awake states including day dreaming, Rhythms of consciousness (Circadian rhythms) Sleep - stages of sleep, Dreams - Content, REM sleep and non-REM sleep, Altered states - Hypnosis, Meaning, Hypnotic stages, Attention and awareness definition, Sensation and perception- Basic concepts in perception, problems in attention and perception, assessment attention and perception.

### MODULE III

#### **Learning and Memory**

Learning: Definition, and types of learning, Classical conditioning - Conditioned stimulus, unconditioned stimulus, Operant Conditioning - Thorndike's law of effect | basics of operant conditioning, generalization, discrimination.

Reinforcement - Primary And Secondary, Positive Reinforces, Punishment, Cognitive Learning - latent learning; observational learning, Basic Processes of Memory - Encoding, Storage, Retrieval. Sensory - Iconic, Memory and Echoic, Memory; STM - Working Memory, LTM, Episodic Memory. Explicit memory And Implicit memory, Techniques to improve memory: Rehearsal, Chunking, Mnemonics, Forgetting.

## MODULE IV

### Cognition, Motivation And Emotion

Thinking-Theories and models of thinking, types of Thinking, Decision making and problem solving: Stages of problem solving, methods of problem of problem solving, theories of decision making. Concept formation: Types of concepts. Intelligence: Definition, Tests of intelligence, concepts of. IQ Motivation: types and approaches of motivation and emotion. Stress and coping endocrine system : Types of stresses, relaxation techniques.

## MODULE V

### Theories of Personality

Understanding personality: Definition, stressing uniqueness, enduring characteristics, temperament, Approaches – Psychodynamic (Freud, Jung & Adler), Humanistic (Rogers & Maslow) .Assessment of personality – Questionnaires, Rating Scales and Projective tests, biological model assessment of personality.

#### Text Books:

1) B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).

#### Books Suggested :

- 1) M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).
- 2) S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005)

#### Digital Reference:

1. <https://psych.wisc.edu/braun/281/Outlines.html>
2. <http://cstlcla.semo.edu/wesnell/py101/class/notes/consciousness.htm#:~:text=Class%20Notes%20%2D,Emergent%2DInteraction%20Theory.>
3. <https://www.illumine.co.uk/2011/06/theories-and-models-of-thinking/>
4. <https://courses.lumenlearning.com/educationalpsychology/chapter/major-theories-and-models-of-learning/>
5. <https://psychologywis.weebly.com/thinking--decision-making.html>

## FSH 106 CRIMINAL LAW LAB

**L-T-P-C Structure 0-0-4-2**

**Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: To understand cognizable and five non-cognizable offences.

CO2: To study a crime case in which an accused was punished on charge of murder under Section 302.

CO3: To study a case wherein the Untouchability Offences Act was invoked on the basis of Article

CO4: Study of crime case in which an accused was punished on charge of murder under Section 302.

CO5: Study a case in which Drugs and Cosmetic Act was invoked.

1. To prepare a schedule of five cognizable and five non-cognizable offences.
2. To study the powers and limitations of the Court of Judicial Magistrate of First Class.
3. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal Procedure Code.
4. To study a crime case in which an accused was punished on charge of murder under Section 302.
5. To study a crime case in which an accused was punished on charge of rape under Section 375.
6. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.
7. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in this Article were taken care of.
8. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.
9. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
10. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyse the age group to which they belonged.
11. To study a case in which Drugs and Cosmetic Act was invoked.
12. To study a case in which Explosive Substances Act was invoked.
13. To study a case in which Arms Act was invoked.
14. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
15. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article

**Text Books :**

- 1) D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton (1999).
- 2) Vipa P. Sarthi, *Law of Evidence*, 6th Edition, Eastern Book Co., Lucknow (2006).
- 3) A.S. Pillia, *Criminal Law*, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).

**Books Suggested:**

- 4) R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi (1965).
- 5) (Chief Justice) M. Monir, *Law of Evidence*, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002)

## FSH 108 FORENSIC PSYCHOLOGY LAB

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical****COURSE OBJECTIVES:** The objective of this course is to

CO1: To learn different types of injuries and their forensic investigations.

CO2: To understand the concept of Forensic Entomology their history and significance.

CO3: To analyse different methods used in forensic psychology like Lie detection, brain fingerprinting, narco-analysis, hypnosis, neuro-anthropological and psychological testing.

CO4: Study of crime case involving serial murders

CO5: Study of criminal case in which narco analysis was used as a means to detect deception

1. To cite a crime case where legal procedures pertaining to psychic behaviour had to be invoked.
2. To prepare a report on relationship between mental disorders and forensic psychology.
3. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
4. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.
5. To study a criminal case in which hypnosis was used as a means to detect deception.
6. To prepare a case report on thematic appreciation test.
7. To prepare a case report on Minnesota multiphasic personality inventory test.
8. To prepare a case report on thematic appreciation test.
9. To prepare a case report on word association test.
10. To prepare a case report on Bhatia's battery of performance test of intelligence.
11. To cite a criminal case in which narco analysis was used as a means to detect deception.

**Text Books:**

- 1) A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York (1995).
- 2) R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
- 3) J.C. DeLadurantey and D.R. Sullivan, *Criminal Investigation Standards*, Harper & Row, New York (1980).

**Books Suggested:**

- 1) J. Niehaus, *Investigative Forensic Hypnosis*, CRC Press, Boca Raton (1999).
- 2) E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

**BOT 170**  
**BOTANY****L-T-P-C Structure 3-0-0-3****Course Type: GE Theory****COURSE OBJECTIVE:** Upon successful completion, students are able to

CO1: Understand the diversity among Viruses, Bacteria.

CO2: Understand the diversity among Algae.

CO3: Understand the structure and life cycle patterns of Viruses, Bacteria, Algae.

CO4: Know the Economic Importance of Viruses, Bacteria, Algae.

CO5: Clear &amp; sound background knowledge in respect to morphology and classification.

**MODULE I**

Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

**MODULE II**

Forensic significance of soil, Introduction of soil, formation of soil, Soil horizons, layers of soils, organic deposit and mineral matters of soil. Soil's evidence, impression of soil, pH of soil. Composition of soil, Size, distribution of soil, collection preservation and handling of soil. Examination of soil, physical properties, texture, soil density, methods of soil analysis, microscopic analysis density gradient method.

**MODULE III**

General Characteristics, classification and economic importance of Algae, Fungi, Lichens, Bryophytes, Pteridophytes & Gymnosperms Angiosperms: Principle of classification and nomenclature of angiosperms, Anatomy of angiosperms, Structure and development of anthers and ovules, fertilization, seed development, seed dormancy and germination

**MODULE IV**

Identification of Plant specimen. Analysis of pollen & aquatic microorganisms, Techniques for dating specimens using plant material. Dendrochronology. Application of plant ecology.

**MODULE V**

Palaeobotany: types of fossils, geological timescale. Brief account of *Rhynia* and *Psilophytes*. *Pteridospermales* (*Glossopteridaceae*), *Cycadeoidales*, *cordaitales* and *pentoxylales*. Contribution of birbalsahani in Palaeobotany.

**Text Books:**

1) Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.

2)Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S. Chand. Delhi, India.

### Reference Books

- 1) Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2<sup>nd</sup> edition.
- 2) Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10<sup>th</sup> edition.
- 3) Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4<sup>th</sup> edition.
- 4) Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
- 5) Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
- 6) Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

### Digital Reference:

1. <https://www.youtube.com/watch?v=54iNAYIWF80>
2. <https://www.biologydiscussion.com/articles/pteridophytes-features-economic-importance-and-classification/5698>
3. <https://www.easybiologyclass.com/general-characters-of-gymnosperms-lecture-notes-with-ppt/>
4. <https://www.youtube.com/watch?v=SzfMUoUcoHM>
5. <https://www.youtube.com/watch?v=dFCIZP3sufI>

## **BOT 171 BOTANY LAB**

**L-T-P-C Structure 0-0-2-1****Course Type: GE Practical****COURSE OBJECTIVE:** Upon successful completion, students are able to

CO1: Know Preparation of temporary and permanent algal slides.

CO2: Understand Preparation of cotton blue, Lactophenol and culture medium – PDA.

CO3: Study fungi with respect to vegetative, reproductive structures and classification with reasons.

CO4: Study of bacteriophage through chart/model preparation

CO5: Study of types of wood.

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3. Gram staining of bacteria
4. Study of vegetative and reproductive structures of *Nostoc*, *Chlamydomonas* (electron micrographs), *Oedogonium*, *Vaucheria*, and *Polysiphonia* through temporary preparations and permanent slides.
5. *Rhizopus*, *Penicillium*, *Alternaria*: Asexual stage from temporary mounts and sexual structures through permanent slides.
6. Determination of soil pH and comparative study
7. Types of wood and wood examination

**Text Books:**

- 1) Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.

**Reference Books:**

- 1) Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2<sup>nd</sup> edition.
- 2) Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10<sup>th</sup> edition.
- 3) Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley and Sons (Asia), Singapore. 4<sup>th</sup> edition.

## **CHY 252 CHEMISTRY**

**L-T-P-C Structure 3-0-0-3****Course Type: GE Theory****COURSE OBJECTIVES:** The objective of this course is to

CO1: Introduce the forensic chemistry basics with focus on Liquid state and solutions, Chemical thermodynamics and chemical kinetics, Introduction of Periodic Table & Physical Instruments, Introduction of Inorganic and Organic Chemistry and Analytical Techniques.

CO2: Study of Inorganic and Organic Chemistry and Analytical Techniques.

CO3: Know about forensic significance of cement as an evidence

CO4: Know about physical and chemical examination of cement sample

CO5: Understanding of IUPAC nomenclature of alkanes, alkenes, haloalkanes, alcohol, ether, aldehydes, ketones, carboxylic acids, nitro compounds, nitrites including cyclic analogues and also aromatic compounds

### **MODULE I**

#### **Liquid State and Solutions**

Liquid state: Free volume of liquid and density measurement, physical properties of liquid, vapor pressure, surface tension, surfactants, viscosity, molar refraction, optical activity, structure of liquid. Solutions: Method of exploring concentration of solutions, binary liquids, vapor pressure, composite diagram of binary liquids and solutions, distillation, fractional distillation, vacuum distillation.

### **MODULE II**

#### **Chemical Thermodynamics and Chemical Kinetics**

Chemical thermodynamics and kinetics, first law of thermodynamics, internal energy, enthalpy, second law of thermodynamics, entropy and its significance, free energy and work function. Rate of reaction, order of molecularity of reaction, slow reaction and fast reaction, first order reaction, half-life period of first order reaction, activation energy, temperature dependence of activation energy, explosive reactions, oscillatory reactions.

### **MODULE III**

#### **Introduction of Periodic Table & Physical Instruments**

Study of Modern Periodic Table, Long form of Periodic Table, periodic properties, atomic radiation, ionization potential, electron affinity, electronegativity, metallic characters, Non-metallic characters and magnetic properties, Comparative study of S and P block elements, Conductance, Conductometry, Electro Motive Force, Potentiometry.

### **MODULE IV**

#### **Introduction of Inorganic and Organic Chemistry**



Empirical and molecular formulae, hybridization, nature of chemical bonding, polarization, hydrogen bonding, Van der Waals forces, IUPAC nomenclature of alkanes, alkenes, haloalkanes, alcohol, ether, aldehydes, ketones, carboxylic acids, nitro compounds, nitrites including cyclic analogues and also aromatic compounds, naphthalene, anthrones and phenanthrones, reactive intermediates and related reactions.

## MODULE V

### Introduction of Cement

What is cement, composition, types, forensic significance of cement samples, Instrument used for cement sample, Chemical examination of cement sample, Physical examination of cement sample, Collection, preservation and packaging of cement sample.

### Text Books:

- 1) Thermodynamics for Chemists by S. Glasstone.
- 2) Principles of Physical Chemistry and Puri, Sharma and Pathania.
- 3) Advanced Inorganic Chemistry Vol II by Madan, Malik and Tuli.
- 4) Concise Inorganic Chemistry Fifth Edition by J. D. Lee.
- 5) Organic Chemistry by Morris and Boyed.
- 6) Heterocyclic Chemistry by Gupta and Kumar Vol I and Vol II
- 7) Chemistry of Natural Products by S.V. Bhat, B. A. Nagaswampagi, M. Shivshankar.
- 8) Instrumental Analysis by Skoog, Holler and Crouch.

### Books Suggested:

- 1) Essential of Physical Chemistry by Bahl, Bahl and Tuli.
- 2) Text book of organic chemistry by Arun Bahl and B. S. Bahl.
- 3) Basic Concept of Analytical Chemistry by S. M. Khopkar, Third Edition, New Age International Publication.
- 4) Analytical Chemistry by G. R. Chatwal, Himalaya Publication.
- 5) Instrumental Methods of Analysis, Seventh Edition by Willard, Merritt, Dean and Settle.
- 6) Analytical Chemistry by Dr. Alka Gupta.
- 7) Instrumental Method of Analysis by G. R. Chatwal and S. K. Anand, Himalaya Publication

### Digital Reference:

1. <https://www.saddleback.edu/faculty/jzoval/a.Version2.0/chapter-5-v2.0/chapter%205%20lecture%20notes/ch5-gases-liquids-solids-lecture-notes.pdf>
2. <https://ocw.mit.edu/courses/chemistry/5-60-thermodynamics-kinetics-spring-2008/lecture-notes/>
3. <https://ocw.mit.edu/courses/chemistry/5-111sc-principles-of-chemical-science-fall-2014/unit-v-chemical-kinetics/lecture-30/>
4. [http://milne.ruc.dk/kemikurser/InorgChem/Lecture\\_notes10.htm](http://milne.ruc.dk/kemikurser/InorgChem/Lecture_notes10.htm)
5. <https://www.kullabs.com/classes/subjects/units/lessons/notes/note-detail/8913>

**CHY 253**  
**CHEMISTRY LAB**

**L-T-P-C Structure 0-0-2-1**

**Course Type: GE Practical**

**COURSE OBJECTIVES:** The objective of this course is to

- CO1: Determination of density of given liquid
- CO2: Determination of viscosity of given liquid
- CO3: Determination of surface tension of given liquid
- CO4: Collection, preservation and packaging of cement sample.
- CO5: Determination of strength given acid.

1. To determine the density of given liquid
2. To determine the viscosity of given liquid
3. To determine the surface tension of given liquid .
4. Standardization of given liquid by primary standard
5. To determine strength given acid.
6. Inorganic micro/ semi micro qualitative analysis .
7. Collection, preservation and packaging of cement sample.

**Text Books:**

- 1) Parikh, C.K; Text Book of Medical Jurisprudence, Forensic Medicine & Toxicology, CBS Pub. New Delhi,1999
- 2) Morrison R.T and Boyd R. N;Organic Chemistry 6th Ed Prentice Hall, 2003.
- 3) Laboratory Procedure Manual : Petroleum Products ,Directorate of Forensic Science, MHA, Govt. of India, 2005.
- 4) Working Procedure Manual on Chemistry ; Directorate of Forensic Science MHA Govt. of India.
- 5) Bureau of Indian Standard Specifications related to Alcohols and Petroleum Products.

**Books Suggested:**

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

## **ENG 106**

### **PROFESSIONAL COMMUNICATION**

**L-T-P-C Structure 2-0-0-2****Course Type: AEC****COURSE OBJECTIVE:** Upon successful completion, students are able to

CO1: Understand importance and barriers of communication

CO2: Understand Group Discussion.

CO3: Understand Effective Presentation Skills

CO4: Understand professional and technical writing skills.

CO5: Students will be able to understand and evaluate key theoretical approaches used in the interdisciplinary field of communication.

#### **MODULE-I**

**Fundamentals of Communication:** Introduction, Definition, Process, Importance, Different Forms and Purpose of Communication, Barriers to Communication, Organization and Interpersonal Communication

#### **MODULE-II**

**Group Discussion:** Introduction to Group Discussion, Types, Roles and Functions in Group Discussion, Difference between GD and Debate, Preparation Strategy, Tips for a good GD.

#### **MODULE-III**

**Presentation:** Fundamentals of Presentation, Audience Analysis, Organizing Material Effective Presentation, Question – Answer Session.

#### **MODULE-IV**

**Professional Writing:** Official Correspondence- Drafting E-mails, Memorandum, Notice, agenda, Minutes, Circulars, Business Correspondence- Business letter writing, sales letters, Enquiry letters and replies to enquiry (enquiry about a product, service or information, asking for a quotation, placing an order and replies to the same) letters of Claim and Adjustment.

#### **MODULE-V**

**Technical Writing** Report Writing- General and Technical report, Definition, Types, structure, Technical proposals- Definitions, Types and Format.**Books Suggested:**

1) Communication Skills, Pushp Lata, Sanjay Kumar, Oxford Higher Education/Oxford University Press, 2011.

- 2) Technical Communication, Principles and Practice, Meenakshi Raman & Sangita Sharma, Oxford University Press.
- 3) Effective Technical Communication, M Ashraf Rizvi, Tata McGraw –Hill Education.
- 4) Basic Communication Skills for Technology, Andre J Rutherford , Person Education Asia.

**Digital Reference:**

1. [https://www.university.youth4work.com/iipm\\_indian-institute-of-planning-and-management/study/72-barriers-to-communication-notes-for-indian-institute-of-planning-and-management-delhi#:~:text=Channel%20Barrier%3A%20%2D%20If%20the%20length,problems%20which%20can%20hamper%20the](https://www.university.youth4work.com/iipm_indian-institute-of-planning-and-management/study/72-barriers-to-communication-notes-for-indian-institute-of-planning-and-management-delhi#:~:text=Channel%20Barrier%3A%20%2D%20If%20the%20length,problems%20which%20can%20hamper%20the)
2. <https://nptel.ac.in/content/storage2/courses/109104030/Module2/Lecture3.pdf>
3. [https://courses.lumenlearning.com/technicalwriting/chapter/unt-3\\_letters\\_readings-2/](https://courses.lumenlearning.com/technicalwriting/chapter/unt-3_letters_readings-2/)
4. <http://vits.vivekanand.ac.in/Downloads/2016/Notes/PROFESSIONAL%20COMMUNICATION%20Unit-4.pdf>
5. <https://www.comm.pitt.edu/oral-comm-lab/audience-analysis>

## ENG 107 COMMUNICATION TECHNIQUE LAB

**L-T-P-C Structure 0-0-2-1**

**Course Type: AEC**

**COURSE OBJECTIVE:** Upon successful completion, students are able to

CO1: Understand methods of word formation.

CO2: Understand Group Discussion

CO3: Learn Presentation Skills

CO4: Students will be able to communicate effectively orally and in writing.

CO5: Students will be able to understand and apply knowledge of human communication and language processes.

1. Phonetics Symbols and Transcriptions
2. Methods of word formation
3. Reading, Listening and speaking Skills
4. Seminar Presentation
5. Group Discussion
6. Job Interview

### **Books Suggested:**

- 1) Advanced Manual for Communication Laboratories and Technical report Writing, D.Sindha Rani, Pearson (New Delhi)
- 2) A Course in Phonetics and Spoken English , J. Sethi&P.V.Dhamija, PHI Learning Pvt. Ltd
- 3) English Language Laboratories: A Comprehensive manual, NiraKonar , PHI Learning Pvt
- 4) Oxford English Learning Package (with CDs: Headway Series
- 5) Tata McGraw hills English Learning package (with CDs)
- 6) Oxford advanced Learners Dictionary by Oxford University Press (New Delhi).

# Semester III

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME EFF 2021-22						
SEMESTER III						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 109	Core Theory	Forensic Dermatoglyphics	4	0	0	4
FSH 111	Core Theory	Technological Methods in Forensic Science	4	0	0	4
FSH 113	Core Theory	Criminalistics	4	0	0	4
FSH 110	Core Practical	Forensic Dermatoglyphics Lab	0	0	4	2
FSH 112	Core Practical	Technological Methods in Forensic Science Lab	0	0	4	2
FSH 114	Core Practical	Criminalistics Lab	0	0	4	2
MGT109*	Core Ability Enhancement	Business Ethics & Corporate Social Responsibility	2	0	0	2
FSH137	Generic Elective Course	Digital Forensics	4	0	0	4
FSH 141	Core Ability Enhancement	Introduction to Biometry	2	0	0	2
<b>Total</b>			<b>20</b>	<b>0</b>	<b>12</b>	<b>26</b>

## FORENSIC DERMATOGLYPHICS

**L-T-P-C Structure 4-0-0-4**

**Course Type: Core Theory**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The fundamental principles on which the science of fingerprinting is based.

CO2: Fingerprints are the most infallible means of identification.

CO3: The world's first fingerprint bureau was established in India.

CO4: The method of classifying criminal record by fingerprints was worked out in India, and by Indians.

CO5: The physical and chemical techniques of fingerprints was worked out in India, and evidence.

### MODULE I

#### INTRODUCTION AND HISTORY

Introduction and history with special reference to India. Biological basis of fingerprints. formation of ridges. Fundamentals of fingerprinting. Types of fingerprints.

### MODULE II

#### BASICS OF FINGERPRINTING

Fingerprint patterns. Fingerprint characters/ minutiae. Plain and rolled fingerprints. Classification and cataloguing of fingerprint record. Automated fingerprint Identification system. Significance of poroscopy and edgeoscopy.

### MODULE III

#### DEVELOPMENT OF FINGERPRINT

Latent prints. Constituents of sweat residue. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement.

### MODULE IV

#### PHYSICAL AND CHEMICAL METHOD

Latent fingerprints detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents. Application of light sources in fingerprint detection. Fingerprint the deceased. Developing fingerprints on gloves.

### MODULE V

#### OTHER IMPRESSIONS

Importance of footprints. Casting of footprints. Electro static lifting of latent foot prints. Lip prints – Nature, location, collection and examination of lip prints. Ear prints and their significance. Palm prints and their historical importance.

**Text Books:**

1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh. Quantitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).

**Books Suggested:**

1. C. Champod, C. Lennard, P. Margot and M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
2. Lee and Gaensleen's, Advances in Fingerprint Technology, 3<sup>rd</sup> Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton(2013)

**Digital Reference:**

- 1.[http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp\\_content/S000001AN/P001120/M013356/ET/145804073315ET.pdf](http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000001AN/P001120/M013356/ET/145804073315ET.pdf)
- 2.<https://www.ncjrs.gov/pdffiles1/nij/225320.pdf>
- 3.<https://www.chem.fsu.edu/chemlab/chm1020c/Lecture%2011/01.php>
- 4.<https://study.com/academy/lesson/latent-fingerprint-analysis-development-techniques.html>
- 5.<https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/biometrics/afis-history>



**L-T-P-C Structure 4-0-0-4****Course Type: Core Theory**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.

CO2: The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.

CO3: The significance of microscopy in visualizing trace evidence and comparing it with control samples.

CO4: The usefulness of photography and videography for recording the crime scene.

CO5: The significance of simple separation techniques.

**MODULE I**

**CHEMICAL INSTRUMENTATION** :Sample preparation for chromatographic and spectroscopic evidence. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography. Gas chromatography and liquid chromatography.

**MODULE II****PHYSICAL INSTRUMENTATION**

Spectroscopic methods. Fundamental principle and applications of ultraviolet visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X- ray spectrometry. Calorimetric analysis and Lambert – Beer law. Electrophoresis – fundamental principles and forensic applications. Neutron activation analysis - fundamental principles and forensic applications.

**MODULE III****MICROSCOPY**

Fundamental principles, Different types of microscopes. Electron microscope. Comparison microscope. Forensic application of microscopy.

**MODULE IV****FORENSIC PHOTOGRAPHY**

Basic principles and applications of photography in forensic science. 3 D photography. Photographic evidence. Infrared and ultraviolet photography. Videography. Crime scene and laboratory photography. Importance of photography. Point and shoot camera. Polaroid camera. Role of movie camera, Dancing riots.

**MODULE V**

**SIMPLE SEPARATION TECHNIQUES**

General Idea and Basic Principle of Distillation and Various Types of Distillation Techniques. Centrifugation; Centrifuge and its Types. Filtration, Evaporation and Crystallization. Solvent Extraction Technique Like LLE, SPE, Micro SPE and Distribution Law.

**Text Books:**

1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry, 6<sup>th</sup> Edition, Saunders Collage Publishing, Fort worth (1992)
2. W. Kemp, Organic Spectroscopy, 3<sup>rd</sup> Edition, Macmillan, Hampshire (1991)

**Books Suggested:**

1. J.W. Robinson, Undergraduate Instrumental Analysis, 5<sup>th</sup> Edition, Marcel Dekker, Inc., New York (1995)
2. D.R. Redsicker. The Practical Methodology of Forensic Photography, 2<sup>nd</sup> Edition, CRC Press, Boca Raton (2000)

**Digital Reference:**

1. <https://www.cliffsnotes.com/study-guides/biology/microbiology/microscopy/types-of-microscopes>
2. <https://www.biologydiscussion.com/cell/cell-fractionation-extraction-homogenization-and-centrifugation/5848>
3. <https://nptel.ac.in/content/storage2/courses/102103044/pdf/mod5.pdf>
4. <https://nptel.ac.in/content/storage2/courses/102103013/pdf/mod3.pdf>
5. [https://www.youtube.com/watch?v=9KuDkJOR31U&list=PL89QP7ZwONKkVC8MIh4d\\_Xzag36UVh7XJ&index=35](https://www.youtube.com/watch?v=9KuDkJOR31U&list=PL89QP7ZwONKkVC8MIh4d_Xzag36UVh7XJ&index=35)

**L-T-P-C Structure 4-0-0-4****Course Type: Core Theory****COURSE OBJECTIVES:** The objective of this course is to

CO1: The methods of securing, searching and documenting crime scene.

CO2: The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.

CO3: The legal importance of chain of custody.

CO4: The tools and techniques for analysis of different types of crime scene evidence.

CO5: Learn The techniques of documentation and reconstruction of crime scene.

**MODULE I****INVESTIGATION**

Introduction and definition of investigation. Quality of investigation officer. Role of investigation officer. Methods of investigation. Guideline of investigator- Police, CBI, CID, Other agencies, FIR. The recognition, Transportation of physical evidence, preservation of viscera.

**MODULE II****CRIME SCENE MANAGEMENT**

Types of crime scene- indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scene. Legal considerations at crime scenes.

**MODULE III****DOCUMENTATION AND RECONSTRUCTION OF CRIME SCENE**

Procedure and requirement for crime scene reconstruction, Documentation of crime scene- sketching and recording notes. Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at the crime scenes. The evaluation of 5Ws ( who? what? when? where? why? ) and 1H (how?). Crime scene modus operandi.

**MODULE IV****CRIME SCENE EVIDENCE**

Classification of crime scene evidence – physical and trace evidence. Lockard principle. Collection, labelling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Reconstruction of crime scene.

**MODULE V****EVIDENCES**

Paint evidences – Collecting, packaging, and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases. Toolmark evidence. Classification of toolmarks. Forensic importance of toolmarks. Collection. Preservation and matching of tool marks.

**Text Books:**

1. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence. CRC Press, Boca Raton (2001)
2. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4<sup>th</sup> ED., Wadsworth, Belmont (2001)

**Books Suggested:**

1. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence. CRC Press, Boca Raton (2001)
2. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4<sup>th</sup> ED., Wadsworth, Belmont (2001)

**Digital References:**

1. [https://swayam.gov.in/nd2\\_cec19\\_cs03/preview](https://swayam.gov.in/nd2_cec19_cs03/preview)
2. <https://pressbooks.bccampus.ca/criminalinvestigation/chapter/chapter-8-crime-scene-management/>
3. <https://www.casdschools.org/site/handlers/filedownload.ashx?moduleinstanceid=7201&dataid=6177&FileName=02-TypesOfEvidence.pdf>
4. <https://pressbooks.bccampus.ca/criminalinvestigation/chapter/chapter-10-forensic-sciences/>
5. <https://study.com/academy/lesson/paint-as-forensic-evidence-purpose-collection-preservation.html>

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The fundamental principles on which the science of fingerprinting is based.

CO2: Fingerprints are the most infallible means of identification.

CO3: The world's first fingerprint bureau was established in India.

CO4: The method of classifying criminal record by fingerprints was worked out in India, and by Indians.

CO5: The physical and chemical techniques of fingerprints was worked out in India, and evidence.

1. To detect fingerprints by powder method and iodine method.
2. To carry out ten Digit classification of plain and rolled fingerprints.
3. To identify different fingerprint patterns.
4. To carry out ridge tracing and ridge counting
5. To cast fingerprints using Plaster of Paris.
6. To detect fingerprinting by silver nitrate method.
7. To investigate physical and chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of footprints.

**Text Books:**

1.J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).

2.D.A. Ashbaugh. Quantitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).

**Books Suggested:**

1.C. Champod, C. Lennard, P. Margot and M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).

2.Lee and Gaensleen's, Advances in Fingerprint Technology, 3<sup>rd</sup> Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton

**FSH 112**  
**TECHNOLOGICAL METHODS IN FORENSIC SCIENCE LAB**

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.

CO2: The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.

CO3: The significance of microscopy in visualizing trace evidence and comparing it with control samples.

CO4: The usefulness of photography and videography for recording the crime scene.

CO5: The significance of simple separation techniques.

1. To determine the concentration of a coloured compound by colorimetry analysis.
2. To carry out thin layer chromatography of ink samples.
3. To carry out separation of organic compounds by paper chromatography.
4. To identify drug samples using UV-Visible spectroscopy.
5. To take photographs using different filters.
6. To take photographs of crime scene exhibits at different angles.
7. To record videography of a crime scene.
8. Extraction of Ethanol by Simple Distillation.

**Text Books:**

1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry, 6<sup>th</sup> Edition, Saunders Collage Publishing, Fort worth (1992)
2. W. Kemp, Organic Spectroscopy, 3<sup>rd</sup> Edition, Macmillan, Hampshire (1991)

**Books Suggested:**

1. J.W. Robinson, Undergraduate Instrumental Analysis, 5<sup>th</sup> Edition, Marcel Dekker, Inc., New York (1995)
2. D.R. Redsicker. The Practical Methodology of Forensic Photography, 2<sup>nd</sup> Edition, CRC Press, Boca Raton (2000)

**CRIMINALISTICS LAB****L-T-P-C Structure 0-0-4-2****Course Type: Core Practical****COURSE OBJECTIVES:** The objective of this course is to

CO1: The methods of securing, searching and documenting crime scene.

CO2: The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.

CO3: The legal importance of chain of custody.

CO4: The tools and techniques for analysis of different types of crime scene evidence.

CO5: Learn The techniques of documentation and reconstruction of crime scene

1. To prepare a report on evaluation of crime scene.
2. To reconstruct a crime scene (outdoor and indoor).
3. To identify and compare tool marks.
4. To identify cloth sample and fibre sample by physical matching.
5. Reconstruction of different crime scene.
6. Preservation and collection, labelling and handling and physical evidences.
7. Collection and Preservation of viscera.
8. Reconstruction of different crime scene.

**Text Books:**

1. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence. CRC Press, Boca Raton (2001)
2. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4<sup>th</sup> ED., Wadsworth, Belmont (2001)

**Books Suggested:**

1. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence. CRC Press, Boca Raton (2001)
2. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4<sup>th</sup> ED., Wadsworth, Belmont (2001)

## **BUSINESS ETHICS& CORPORATE SOCIAL RESPONSIBILITY**

**L-T-P-C Structure 2-0-0-2**

**Course Type: CAE**

This would be sessional course with no end term examination

Objective: The objective of this paper is to make the students more clear about the importance of ethics in business and practices of good corporate governance. It also talks about the corporate social responsibility.

### **MODULE-I**

Business ethics: Meaning of ethics, why ethical problems occur in business. Ethical principles in business: Utilitarianism: weighing social cost and benefits, Rights and duties, Justice and fairness, ethics of care, Integrating utility, rights, justice and Carin.

### **MODULE-II**

Moral principles: virtue ethics, Moral issues in business: Worker's and employee's rights and responsibilities, Profit maximization vs. social responsibility.

### **MODULE-III**

Corporate governance: concept, Need to improve corporate governance standards, Features of good governance, Role played by regulators to improve corporate governance, accounting standards and corporate governance, corporate disclosure, inside trading. The Board –Quality, Composition and role of Board, Outside Directors on the board (independent, nominee), Executive and Non-Executive directors, SEBI clause 49 directors and financial institutions in enhancing corporate governance, critical issues in governance of board directors, CEO Duality.

### **MODULE-IV**

Role of auditors in enhancing corporate governance, duties and responsibilities of auditors, corporate governance and internal auditors, Whistle blowing: Kinds of whistleblowing, precluding the need for whistle blowing. Discrimination, affirmative action, and reverse discrimination: Equal employment opportunity Moduley, Affirmative action, Preferential hiring.

### **MODULE-V**

Corporate social responsibility: Meaning, Evolution of corporate social responsibility, common indicators for measuring business social performance, reporting social responsibility measures in annual report.

Suggested Books:

1. Manuel G Velasquez: Business ethics- concepts and cases Pearson.



2. Luthans Hodgetts and Thompson: Social issues in business, Macmillan USA
3. A.C. Fernando: Business Ethics Pearson Education.
4. A.C. Fernando: Corporate Governance Pearson Education.
5. Adrian Davies: Strategic approach to corporate governance Gower Pub Co.
6. N. Gopalswamy: Corporate governance a new paradigm A H Wheeler Publishing Co Ltd.
7. Marianne M Jennings: Cases in Business Ethics Indian South-Western College Publishing
8. Kevin Gibson: Ethics and Business, An Introduction, Cambridge Applied Ethics  
Cambridge  
University Press

**L-T-P-C Structure 4-0-0-4  
Course****Course Type: Generic Elective****COURSE OBJECTIVES:** The objective of this course is to

CO1: The basics of digital forensics and cyber security.

CO2: The cases which fall under the purview of digital crimes.

CO3: The types of digital crimes.

CO4: The elements involved in investigation of digital crimes.

CO5: Learn about various investigation tools

**MODULE I****INTRODUCTION TO CYBER FORENSICS**

Cyber forensic basics- Introduction to cyber forensics, Storage Fundamentals, File system Concepts, Data Recovery, Operating system Software, Cell Phone/Mobile Forensics, Computer Ethics and Application programs.

**MODULE II****FUNDAMENTALS AND CONCEPTS, NETWORKING**

Fundamentals of computer Hardware and accessories- development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats. Memory and processor, Methods of storing data, Operating system, Software, Introduction to Network, Concept of Network security and investigation, Basics of security planning, Multi layered security, Intrusion Triangle, Removing Intrusion opportunities, Importance of physical security, Protecting server, Work station and Network devices, Protection of removable Storage Disks.

**MODULE III****COMPUTER CRIME/CYBER CRIME**

Definition and types of computer crimes, Distinction between computer crimes and conventional crimes, Reason for commission of computer crimes, Breaching security and operation of digital systems. Computer Virus, cookies, obscenity and Computer worm- Trojan house, trap door, super zapping, logic bombs. Types of computer crimes- computer stalking, pornography, hacking, manipulation, crimes related to intellectual property rights, computer terrorism, Hate speech, private and national security in cyber space. An overview of hacking, spamming, phishing and stalking, Software piracy.

Relevant sections of Information Technology Act 2000

**MODULE IV****CRYPTOGRAPHY**

Encryption And Decryption Methods, Cryptography and Steganography.

## **MODULE V**

### **COMPUTER FORENSIC INVESTIGATION**

Introduction to cyber forensic investigation, Investigation tools, e-Discovery, Digital Evidence collection, Seizure of suspected computer, preparation required prior to seizure, , protocol to be taken at the scene, Extraction of information from the hard disk, Treatment of exhibits, Creating bitstream of the original media, Collection and seizure of magnetic media, Legal and privacy issues, Examining forensically sterile media, restoration of deleted files, Password cracking and E-mail tracking and IP Tracking , encryption and decryption methods, Tracking users.

#### **Text Books:**

1. R.K. Tiwari , P.K. Sastry and K.V. Ravikumar, computer crimes and computer forensics, Select publishers, New Delhi (2003).
2. C.B. Leshin, Internet investigations in criminal justice, Prentice hall, New Jersey(1997)

#### **Books Suggested:**

1. R. Saferstein, Criminalistics, 8<sup>th</sup> edition Prentice hall, New Jersey(2004)
2. E. Casey, Digital Evidence and Computer Crime, Academic press, London (2000)

#### **Digital Reference:**

1. <https://lecturenotes.in/m/23480-lecture-note-for-cyber-forensics->
2. <https://lecturenotes.in/m/14323-computer-fundamentals>
3. [http://vssut.ac.in/lecture\\_notes/lecture1428550736.pdf](http://vssut.ac.in/lecture_notes/lecture1428550736.pdf)
4. [http://www.fim.unilinz.ac.at/lva/IT\\_Recht\\_Computerforensik/Introduction\\_to\\_Computer\\_Forensics.pdf](http://www.fim.unilinz.ac.at/lva/IT_Recht_Computerforensik/Introduction_to_Computer_Forensics.pdf)
5. <http://www.tgpcet.com/CSE-NOTES/8/DF.pdf>

**L-T-P-C Structure 4-0-0-4****Course Type: Core Ability Enhancement Course**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The basics of biometry.

CO2: The classification of biometry processes.

CO3: The importance of behavioural biometry.

CO4: Learn about physiological biometrics

CO5: Learn shoe impression examination

**MODULE I****FUNDAMENTAL ASPECTS**

Definition, characteristics and operation of biometric system, Classification of biometric systems- physiological and behavioural, Strength and weakness of physiological and behavioural biometrics.

**MODULE II****TYPES OF BIOMETRICS**

Multimodal biometrics, Key biometric processes- enrolment, identification and verification, Positive and negative identification, Performances measures used in biometric system- FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

**MODULE III****PHYSIOLOGICAL BIOMETRICS**

Fingerprints, palm prints, iris, retina, geometry of hand and face

**MODULE IV****BEHAVIOURAL BIOMETRICS**

Handwriting, Signatures, Keystrokes, Gait and voice photosensors, Logic gates and their applications, Flip- flops and counters.

**MODULE V****SHOE IMPRESSION EXAMINATION**

Introduction to Shoe impression, locating impressions at the scene of crime, Evidence collection: Collection, importance of Gait pattern, Forensic Identification and Methods of comparison, Case Studies

**Text Books:**

1. Bridges, B.C; Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting expert Testimony, Opinion Evidence., Univ. Book Agency, Allhabad, 2000
2. Mehta, M.K; Identification of Thumb impression & cross examination of Fingerprints, N.M. Tripathi Pub. Bombay, 1980.
3. Chatterjee, S.K; Speculation in Fingerprint Identification, Jantralekha printing Works, Kolkata, 1981.
4. Cowger James F; Friction Ridge Skin- Comparison & Identification of Fingerprints, CRC

Press, NY, 1993

**Books Suggested:**

1. Cossidy, M.J; Footwear Identification, Royal Canadian, Mounted Police, 1980.
2. Iannavelli, A.V; Ear Identification, Forensic Identification Series, Paramount, 1989.
3. Henry, C.L. & Ganesslen, R.E; Advances in Fingerprint Technology, CRC Press, London, 1991.
4. Jain, A.K., Flynn, P. & Ross A.A., Handbook of Biometrics, Springer, New York 2008

**Digital Reference:**

1. <https://www.studocu.com/en-ca/document/the-university-of-british-columbia/introduction-to-biometrics/lecture-notes/introduction-to-biometrics-lecture-notes-231-notes/296276/view>
2. [https://www.tutorialspoint.com/biometrics/biometrics\\_quick\\_guide.htm](https://www.tutorialspoint.com/biometrics/biometrics_quick_guide.htm)
3. <https://www.nap.edu/read/12720/chapter/3>
4. <http://www.forensicsciencesimplified.org/fwt/FootwearTireTracks.pdf>
5. <https://www.crime-scene-investigator.net/guide-for-the-examination-of-footwear-and-tire-impression-evidence.html>

# Semester IV

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME EFF 2021-22						
SEMESTER IV						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 115	Core Theory	Introduction to Forensic Chemistry	4	0	0	4
FSH 117	Core Theory	Questioned Documents	4	0	0	4
FSH 119	Core Theory	Forensic Biology	4	0	0	4
FSH 116	Core Practical	Forensic Chemistry Lab	0	0	4	2
FSH 118	Core Practical	Questioned Documents Lab	0	0	4	2
FSH 120	Core Practical	Forensic Biology Lab	0	0	4	2
FSH142	Generic Elective Course	Economics	4	0	0	4
FSH 146	Core Ability Enhancement	Handwriting Identification and Recognition	2	0	0	2
<b>Total</b>			<b>18</b>	<b>0</b>	<b>12</b>	<b>24</b>

## FSH 115 INTRODUCTION TO FORENSIC CHEMISTRY

**L-T-P-C Structure 4-0-0-4**

**Course Type: Core Theory**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Theoretical understanding of major concepts in Forensic Chemistry

CO2: Range of practical skills in Forensic Chemistry, and

CO3: Knowledge and skills applicable to academia, industry, and government

CO4: The methods of analysing trace amounts of petroleum products in crime scene evidence.

CO5: The techniques of locating hidden explosives.

## **MODULE I**

### **FORENSIC CHEMISTRY**

Forensic Chemistry: Introduction, Nature & Scope Distillation and Fractionation of Petroleum Products. Commercial Uses of Different Petroleum Product and their Analysis. Trace Analysis of Petroleum Products in Forensic Exhibits. Analysis of Alcohol and Non-alcoholic Beverages. Adulteration in Food Products, Use of Pesticides and Insecticides.

## **MODULE II**

### **ABUSE AND MISUSE OF DRUGS**

Introduction, Classification, Route of Administration of Different type of Narcotic Drugs & Psychotropic Substances, Analysis of ND& P Substances. Drug Abuse in Sports.

## **MODULE III**

### **IMPORTANCE OF GLASS AS EVIDENCE**

Glass evidence – connection, packaging, analysis. Matching of glass samples by mechanical fit and refractive index measurements. Analysis by spectroscopic methods. Fracture analysis and direction of impacts.

## **MODULE IV**

### **FIRES AND EXPLOSIVES**

Nature and Chemistry of fire, Classification, Igniters of fires, Phases of fires, Main types of fires, Examination of scene of fires Arson: Relevant IPC sections, Motives, Analysis of Accelerants. Classification, Comparison & characterization of explosives, Military & Commercial explosives, Detection of Explosophores (anions), Detection of Black powder, Nitrocellulose and Dynamite, Quantitative determination

## **MODULE V**

### **INTRODUCTION TO TOXICOLOGY AND FORENSIC PHARMACOLOGY**

Definition, Law relating to poison, Classification of poisons. Action of poisons & factors modifying its action, routes of administration of poisons.

Pharmacology and toxicology of Psychotropic Drugs: Sedatives, Stimulants, Opiates and drugs of abuse. Extraction, Isolation of drugs from viscera, tissues and body fluids.

#### **Text Books:**

1. Maudham Bassett et al; Vogel's Textbook of Quantitative Chemical Analysis, 6<sup>th</sup> Ed., Longman Essex (2004)

2. I. L. Finar; Organic Chemistry Vol. II Pearson Education (Singapore)
3. R.T. Morrison, R.N. Boyd; Organic Chemistry, 6th Ed., Prentice Hall, new Delhi (2003)
4. Brean S. Furnisetal; A.I Vogel Textbook of Practical Organic Chemistry, Addison Wesley Longman, Edinburg (1998)

**Books Suggested:**

1. A. Burger; Medicinal Chemistry, Vol. II, Wiley Interscience, NY (1970)
2. D A Skoog, D.M. West, F.J. Holler; Analytical Chemistry – An Introduction, 7<sup>th</sup> Ed., Saunders College Pub. Philadelphia, USA (2000)
3. Boudreau JE, etal; Arson & Arson Investigation, Survey & Assessment National Institute of Law Enforcement, U.S. Deptt of Justice, US Govt Printing Press (1977)
4. Dettean J D; Kirk's Fire Investigation, 5th Ed., Prentice Hall, Eaglewood Cliffs, N.J. (2002) w.e.f. 2005-2006
5. YinonJitrin; Modern Methods & Application in Analysis of Explosives, John Wiley & Sons, England (1993)
6. Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, 1986.
7. Cravey, R.H., Baselt, R.C., Introduction to Forensic Toxicology, Biochemical publications, Davis C A, 1981. Gleason, M.N. et.al, Clinical Toxicology of Commercial products, Williams and Williams, Baltimore.

**Digital Reference:**

1. <https://www.studocu.com/en-au/document/western-sydney-university/forensic-science/lecture-notes/forensic-chemistry-lecture-notes-1-8/2687530/view>
2. <https://oneclass.com/class-notes/ca/sfu/crim/crim-355/2218694-crim-355-lecture-2.en.html>
3. <https://migreenchemistry.org/wp-content/uploads/2013/05/Intrduction-to-Toxicology-Lecture-Slides.pdf>
4. [https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture\\_notes/med\\_lab\\_tech\\_students/LN\\_Toxicology\\_final.pdf](https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/med_lab_tech_students/LN_Toxicology_final.pdf)
5. <https://study.com/academy/lesson/glass-as-forensic-evidence-purpose-collection-preservation.html>

**FSH 117**  
**QUESTIONED DOCUMENTS**

**L-T-P-C Structure 4-0-0-4****Course Type: Core Theory**



**COURSE OBJECTIVES:** The objective of this course is to

CO1: Developing an understanding and appreciation for the scope of Questioned Documents.

CO2: Develop an understanding on different types of questioned documents, the types of forgeries and disguise generally encountered.

CO3: Brief description on general report writing, used in examination of Questioned Documents.

CO4: The significance of comparing hand writing samples.

CO5: The importance of detecting frauds and forgeries by analysing questioned documents.

## **MODULE I**

### **NATURE AND SCOPE OF QUESTIONED DOCUMENTS**

Definition of Questioned Document, Types of Questioned Document, Preliminary Examination of Questioned Document. Basic Tools Needed for Forensic Document Examination- Ultraviolet, Visible, Infrared, and Fluorescence Spectroscopy, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus. Determining the Age and Relative Age of Documents.

## **MODULE II**

### **COMPARISON OF QUESTIONED DOCUMENTS**

Comparison of Handwriting, Development of Individuality in Handwriting, Natural Variations and Fundamental Divergences in Handwriting, Class & Individual Characteristics. Merits and Demerits of Exemplar and Non-Exemplar Samples During Comparison of Handwriting. Standards for Comparison of Handwriting. Comparison of Paper, Ink, Printed Documents, Typed Documents, Xeroxed Documents.

## **MODULE III**

### **FORGERIES**

Alterations in Documents, Including Erasures, Additions, Over-Writing, and Obliterations. Indented and Invisible Writings. Charred Documents. Examination of Counterfeit Indian Currency Notes, Passports, Visas and Stamp Pads.

## **MODULE IV**

### **DISPUTED DOCUMENTS**

Disputed documents – wills, deeds, cheques, suicidal letter, threatening letters, anonymous letters, Tampered documents (alteration, additions, erasures, obliterations etc.), Examination of disputed documents, age of the document and ink analysis.

## **MODULE V**

### **REPORT WRITING AND CASE PRESENTATION**

Comparison with standards: admitted and specimen samples, report writing, Moot court - case presentation, Expert's testimony, Expert as witness, Cross examination, re-examination and direct examination in Court of Law.

**Text Books:**

1. Ashbaugh D. R. (1999). Quantitative and Qualitative Friction ridge analysis. India, CRS Press.
2. Hardless H.R. (1988). Disputed Documents, Handwriting and Thumbs –Print Identification, Profusely Illustrated. India: Low Book Co.
3. Lee H. C. & Ganesslen R. E. (1991). Advances in Finger Print Technology. London: RC Press, Boca Raton.

**Books Suggested :**

1. Osborn A. S. (1998). The Problem of Proof. India, Universal Law Publishing.
2. Pierce D. S. (2011). Mechanics of Impression Evidence. India, CRC Press.
3. Stiefel C. (2011). Fingerprints: Dead People Do Tell Tales. USA, Enslow Publishers.

**Digital Reference:**

1. <https://www.slideshare.net/tomwinfrey/questioned-documents-slide-show>
2. <http://www.forensicsciencesimplified.org/docs/QuestionedDocuments.pdf>
3. <https://www.slideshare.net/advocatekgupta/moot-court-46670823>
4. <https://www.studocu.com/gt/document/the-university-of-winchester/fakes-and-forgeries/apuntes/fakes-and-forgeries-lecture-notes-1/6818058/view>
5. <https://eprint.iacr.org/2018/793.pdf>

**L-T-P-C Structure 4-0-0-4****Course Type: Generic Elective Course**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The significance of biological and serological evidence.

CO2: The forensic importance of hair evidence.

CO3: The importance of biological fluids – blood, urine, semen, saliva, sweat and –  
in crime investigations.

CO4: The forensic importance of fibre evidence

CO5: How forensic entomology assists in death investigations.

**MODULE I****IDENTIFICATION AND EXAMINATION OF BIOLOGICAL FLUIDS AND BODY REMAINS**

Blood, Semen, Saliva, Urine, Faeces etc., Bone: Estimation of Height, Age and Sex, Facial Reconstruction. Hair: Hair Anatomy and Examination of Hairs from Animal and Human Origin.

**MODULE II****INTRODUCTION TO FIBER**

What is fibre, Classification of fibre, Class and individual characteristics of fibre, Collection, Handling and preservation of fibre, fibre as Evidence, Types of fibres, Natural-Plants, Vegetables, Animal, Inorganic and Manmade, Methods of collecting fibres, Chemical composition, Manufacturing process of fibres, Comparison of shape and structure of various fibres, Comparison of physical properties of fibre, Examination of fibre.

**MODULE III****DNA PROFILING**

Structure of DNA, Damage to DNA, Variation in DNA, DNA as Excellent Polymorphic Marker, Basis of DNA Typing and Techniques.

**MODULE IV****FORENSIC BOTANY**

Forensic Botany: Introduction, Nature & Scope, Woods & their Identification and Matching, Diatoms and their Forensic Significance in Drowning Cases, Study and Identification of Pollen Grains.

**MODULE V****FORENSIC ENTOMOLOGY**

General Entomology, Significance of terrestrial and aquatic insects in forensic investigations and their role in crime detection, insect's succession and its relationship to determine time since death. Impact of ecological factors on insect's developments.

**Text Books:**

1. E.J. Gardner, M. 1. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York; (1991)
2. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London; (1904)
3. Richard Saferstein; Forensic Science Hand Book; Ed.; Prentice Hall, Englewood Cliff, New Jersey;(1982)
4. P. L. Williams and R. Warwick; Gray's anatomy; Churchill Livingston, London;(1980)
5. Biology Methods manual; Metropolitan Police Forensic Science Laboratory, London; (1978)

**Books Suggested :**

1. Herbert R. Mauersberger; Mathews Textile Fibres – their physical, Microscopic and chemical properties; John Wiley, New York; (1954)
2. R.P. Pandey, Plant Anatomy; S. Chand, new Delhi; (1998)
3. Kimball, John W; Biology; Arvind Publishing Co. New Delhi (1974)
4. Edwin, H. Mc Caney – Human Genetics, The Molecular Revolution, Jones & Bartlett Pub. London, (1993)
5. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of Cell,2nd ed. Garland Pub. New York (1989)

**Digital Reference:**

1. <https://www.dovepress.com/forensic-body-fluid-identification-state-of-the-art-peer-reviewed-fulltext-article-RRFMS>
2. <https://lecturenotes.in/notes/13602-note-for-optical-fibre-communication-ofc-by-sunil-s-harakannanavar>
3. [https://mrcet.com/downloads/digital\\_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf](https://mrcet.com/downloads/digital_notes/ECE/III%20Year/FIBER%20OPTICAL%20COMMUNICATIONS.pdf)
4. <https://www.docsity.com/en/forensic-entomology-forensic-science-lecture-slides/248546/>
5. <https://www.studocu.com/en-gb/document/university-of-derby/introduction-to-forensic-science/lecture-notes/introduction-to-forensic-entomology/1177855/view>

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Learn separation and identification of volatile liquid by simple distillation.

CO2: Learn identification of salts and metals by simple colour test and group analysis

CO3: Learn identification of different vegetable poison by colour test, chromatography

CO4: Learn identification of insecticides and pesticides by TLC/ colour test.

CO5: Extraction and identification of drugs/ toxicants from biological matrix and their detection.

1. Separation and identification of volatile liquid by simple distillation.
2. Identification of salts and metals by simple colour test and group analysis.
3. Identification of different vegetable poison by colour test, chromatography etc.
4. Identification of insecticides and pesticides by TLC/ colour test.
5. Extraction and identification of drugs/ toxicants from biological matrix and their detection.
6. To compare glass samples by refractive index method.
7. Microcrystalline tests for drugs
8. Analysis of fire residues by GC
9. Separation of lipids by TLC
10. Analysis of high explosives by colour test and TLC.

**Text Books :**

1. Maudham Bassett et al; Vogel's Textbook of Quantitative Chemical Analysis, 6<sup>th</sup> Ed., Longman Essex (2004)
2. I. L. Finar; Organic Chemistry Vol. II Pearson Education (Singapore)
3. R.T. Morrison, R.N. Boyd; Organic Chemistry, 6<sup>th</sup> Ed., Prentice Hall, New Delhi (2003)
4. Brean S. Furniss et al; A.I Vogel Textbook of Practical Organic Chemistry, Addison Wesley Longman, Edinburgh (1998)

**Books Suggested :**

1. A. Burger; Medicinal Chemistry, Vol. II, Wiley Interscience, NY (1970)
2. D A Skoog, D.M. West, F.J. Holler; Analytical Chemistry – An Introduction, 7<sup>th</sup> Ed., Saunders College Pub. Philadelphia, USA (2000)
3. Boudreau JE, et al; Arson & Arson Investigation, Survey & Assessment National Institute of Law Enforcement, U.S. Deptt of Justice, US Govt Printing Press (1977)
4. Dettean J D; Kirk's Fire Investigation, 5<sup>th</sup> Ed., Prentice Hall, Eaglewood Cliffs, N.J. (2002) w.e.f. 2005-2006
5. Yinon Jitrin; Modern Methods & Application in Analysis of Explosives, John Wiley & Sons, England (1993)

6. Clark, E.G.C., Isolation and identification of Drugs, Vol. I and Vol. II, Academic Press, 1986.
7. Cravey, R.H., Baselt, R.C., Introduction to Forensic Toxicology, Biochemical publications, Davis C A, 1981. Gleason, M.N. et.al, Clinical Toxicology of Commercial products, Williams and Williams, Baltimore.

**FSH 118**  
**QUESTIONED DOCUMENTS LAB**

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Developing an understanding and appreciation for the scope of Questioned Documents.

CO2: Develop an understanding on different types of questioned documents, the types of forgeries and disguise generally encountered.

CO3: Brief description on general report writing, used in examination of Questioned Documents.

CO4: The significance of comparing hand writing samples.

CO5: The importance of detecting frauds and forgeries by analysing questioned documents.

1. Examination of various ink samples using planer chromatographic techniques.
2. Decipherment of secret, erased, obliterated, indented hand writing using physical/chemical technique.
3. Matching of hand writing and signatures (genuine/forged)
4. Examination of type written and printer generated prints.
5. Print your own 10-digit finger print card using black ink.
6. Primary and secondary classification of given finger print chart.
7. Location, development and lifting of latent finger print.
8. Casting and matching of foot/footwear print on soft surface.
9. Comparison of finger prints.

**Text Books:**

1. Ashbaugh D. R. (1999). Quantitative and Qualitative Friction ridge analysis. India, CRS Press.
2. Hardless H.R. (1988). Disputed Documents, Handwriting and Thumbs –Print Identification, Profusely Illustrated. India: Low Book Co.
3. Lee H. C. & Ganesslen R. E. (1991). Advances in Finger Print Technology. London: RC Press, Boca Raton.

**Books Suggested :**

1. Osborn A. S. (1998). The Problem of Proof. India, Universal Law Publishing.
2. Pierce D. S. (2011). Mechanics of Impression Evidence. India, CRC Press.
3. Stiefel C. (2011). Fingerprints: Dead People Do Tell Tales. USA, Enslow Publishers.

**L-T-P-C Structure 0-0-4-2****Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: The significance of biological and serological evidence.

CO2: The forensic importance of hair evidence.

CO3: The importance of biological fluids – blood, urine, semen, saliva, sweat and – in crime investigations.

CO4: The forensic importance of fibre evidence

CO5: How forensic entomology assists in death investigations.

1. Primary and secondary identification of blood/ semen sample.
2. Identification of species from the given hair sample.
3. Examination of given fibre by physical and chemical method.
4. Identification of microscopic fibre.
5. Identification of fibre by Burn Test
6. Difference between animal and Human Hair fibre.
7. Determine ABO and Rh factor of human blood.
8. Detection of salivary stains.
9. Draw and label bones of human body. Determine age and sex from long bones and skull.

**Text Books:**

1. E.J. Gardner, M. 1. Simmons and D.P. Snustad; Principles of Genetics; John Wiley, New York; (1991)
2. H.G. Greenish & E. Collin; An anatomical Atlas of vegetable Powders; J&A Churchill, London; (1904)
3. Richard Saferstein; Forensic Science Hand Book; Ed.; Prentice Hall, Englewood Cliff, New Jersey;(1982)
4. P. L. Williams and R. Warwick; Gray's anatomy; Churchill Livingstone, London;(1980)
5. Biology Methods manual; Metropolitan Police Forensic Science Laboratory, London; (1978)

**Books Suggested :**

1. Herbert R. Mauersberger; Mathews Textile Fibres – their physical, Microscopic and chemical properties; John Wiley, New York; (1954)
2. R.P. Pandey, Plant Anatomy; S. Chand, new Delhi; (1998)
3. Kimball, John W; Biology; Arvind Publishing Co. New Delhi (1974)
4. Edwin, H. Mc Caney – Human Genetics, The Molecular Revolution, Jones & Bartlett Pub. London, (1993)
5. Albert's, B, Bray, D, Lewis, J, Roberts K & Watson, J.D; Molecular Biology of Cell,2nd ed. Garland Pub. New Yark (1989)

**FSH 142**  
**ECONOMICS**



**L-T-P-C Structure 4-0-0-4****Course Type: Generic Elective Course**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Demonstrate the concept and types of economics and its application in managerial environment.

CO2: Understand the basic theories behind consumer behaviour (demand) and producer behaviour (supply) and identify the determinants of the demand and supply of goods.

CO3: Analyse the different costs in the product and study the long run and short run relationship of costs.

CO4: Understand the major characteristics of different market structures and the implications of the degrees of competition in a market on firms pricing and output decision.

CO5: Apply special pricing strategies for multi-product and transfer price.

**MODULE I****INTRODUCTION TO MANAGERIAL ECONOMICS**

Definition of Economics - Important concept of Economics – Basic Economic problem – Relationship between Micro and Macroeconomics – Managerial Economics – meaning, concept, significance and scope.

**MODULE II****BASIC OF DEMAND AND SUPPLY**

Demand Function, Supply function- Market Equilibrium Changes in market Equilibrium – Demand elasticity & Supply Elasticity – Effects of taxes, subsidies, price control, price support, Tariff and Quota Theory of consumer behaviour, cardinal utility theory, ordinal utility theory (indifference curves, budget line, consumer choice, price effect, substitution effect, income effect for normal, inferior and giffen goods), revealed preference theory.

**MODULE III****THEORY OF PRODUCTION AND COST ANALYSIS**

Factors of Production, Production function -total product, average product and marginal product, Law of variable proportion, Returns to scale, Optimum factor combination. Different concepts of Cost & Revenue: short-run and long-run costs and revenues–economics, and diseconomies of scale.

**MODULE IV****MARKET STRUCTURE AND PRICING DECISIONS**

Market Structure, degree of competition, pricing decisions, Features of perfect competition, monopoly, monopolistic competition and oligopoly. Perfect competition: Price and output decisions in the short run and the long run. Monopoly and Monopolistic Competition: Price and output decisions short run and long run equilibrium under monopoly and monopolistic competition- price discrimination by degree. Oligopoly: kinked demand curve- price leadership models –Collusion model: The Cartel.

## MODULE V

### SPECIAL PRICING STRATEGIES

Cost-plus pricing, the multi-product pricing, Transfer Pricing, Peak-Load pricing, Product bundling.

#### Text Books:

1. Lipsey and Chrystal. Economics. 11th edition- Oxford University Press - New Delhi- (2008).
2. Dominick Salvatore. Principles of Microeconomics -5th Edition. Oxford University Press- New Delhi- (2009).

#### Books Suggested:

1. Vanita Agarwal- Managerial Economics- Pearson Education- New Delhi. (2013).
2. Koutosyannis- Modern Micro Economics- Palgrave Macmillan- (1979).
3. Pindyck, Rubinfeld and Mehta. Micro Economics.
4. State Crime Branch, Haryana, *Investigation of Economic Offences*

#### Digital Reference:

1. <https://www.docsity.com/en/introduction-managerial-economics-lecture-notes/167816/>
2. <https://nptel.ac.in/courses/110/101/110101005/>
3. <https://www.economicscafe.com.sg/economics-lecture-notes-chapter-2/#:~:text=The%20demand%20for%20a%20good,willing%20and%20able%20to%20buy.&text=The%20demand%20curve%20is%20downward%20sloping%20due%20to%20the%20law%20of%20demand.>
4. <https://www.slideshare.net/dvy92010/pricing-decisions-under-different-market-structures>
5. <https://www.slideshare.net/IndraPrasadPyakurel/cost-plus-and-incremental-pricing-method>

## FSH 146

### HANDWRITING IDENTIFICATION AND RECOGNITION

**L-T-P-C Structure 4-0-0-4  
Course****Course Type: Core Ability Enhancement**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Developing an understanding and appreciation for the scope of Handwriting Identification and Examination.

CO2: Develop an understanding on handwriting and their characteristics, principles of identification.

CO3: Give brief description on various methods of their detection and examination.

CO4: Develop comprehensive knowledge on type written documents, common styles and their examination.

CO5: Learn about identification of typescripts

**MODULE I****HANDWRITING**

Handwriting, Class and Individual characteristics, Natural variations, Principles of handwriting identification, External and internal factors which influence handwriting, ethnic and gender variability of handwriting, various types of forgeries and their detection.

**MODULE II****SIGNATURE EXAMINATION**

examination of signatures – characteristics of genuine and forged signatures, identification of forger, identification of writer of anonymous letters and application of Forensic Stylistics/Linguistics in the identification of writer, examination of built-up documents and determination of sequence of strokes.

**MODULE III****FORGED AND DISGUISE HANDWRITING**

Forged documents, disguised documents, characteristics features and variations found in handwriting characteristics due to forgery/ disguise, types of forgeries and their identification.

**MODULE IV****TYPEWRITTEN AND PRINTED DOCUMENTS**

Identification of typescripts-identification of typist, various types of printing processes, identification of printed matter including printing of security documents and currency notes, identification of electronic typewriters, dot matrix, inkjet and laser jet printers, examination of black and white and colour photocopies, fax messages and carbon copies.

**MODULE V****TYPEWRITING IDENTIFICATION**

Type written documents/ scripts, Comparison of type written documents, common types of styles and examination of typewritten documents.

**Text Books:**

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*, 2<sup>nd</sup> edition, CRC Press, Taylor & Francis group.

**Books Suggested:**

1. Huber, A. R. Headrick, A. M. (1999). *The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals*, CRC Press, Boca Raton London.
2. James, S. H. And Nordby, J. J. (Eds), Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.

**Digital Reference**

1. <https://www.slideshare.net/prashantmehta371/handwriting-and-document-examination>
2. <http://eknygos.lsmuni.lt/springer/658/223-248.pdf>
3. <https://www.etownschools.org/site/handlers/filedownload.ashx?moduleinstanceid=6829&dataid=13569&FileName=Handwriting%20Analysis.pdf>
4. <https://docs.kde.org/trunk5/en/kdeedu/ktouch/ktouch.pdf>
5. <https://www.questioneddocuments.com/questioned-document-overviews/signatures-forgery/>

# Semester V

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME WEF 2021-22						
SEMESTER V						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 121	Core Theory	Forensic Ballistics	4	0	0	4
FSH 123	Core Theory	Forensic Toxicology	4	0	0	4
FSH 122	Core Practical	Forensic Ballistics Lab	0	0	4	2
FSH 124	Core Practical	Forensic Toxicology Lab	0	0	4	2
FSH 147	Discipline Specific Course-1	Forensic Physics				
FSH 149	Discipline Specific Course-2	Economic Offences	4	0	0	4
FSH 151	Discipline Specific Course- 3	Forensic Serology				
FSH 148	Discipline Specific Course Lab-1	Forensic Physics Lab				
FSH 150	Discipline Specific Course Lab-2	Economic Offences Lab	0	0	4	2
FSH 152	Discipline Specific Course Lab - 3	Forensic Serology Lab				
FSH 153	Skill Enhancement Course	Research Methodology	2	0	0	2
FSH 154	Core Course	Seminar	2	0	0	2
<b>Total</b>			<b>16</b>	<b>0</b>	<b>12</b>	<b>22</b>

**FSH 121**  
**FORENSIC BALLISTICS**

**L-T-P-C Structure- 4-0-0-4**

**Course Type -Core Theory**

**COURSE OBJECTIVE**

CO1: The classification of firearms and their firing mechanisms and the methods of identifying firearms.

CO2: The characteristics of ammunition.

CO3: The importance of firearm evidence.

CO4: The nature of firearm injuries.

CO5: The methods for characterization of gunshot residue.

### **MODULE I**

History of Firearms and Ammunitions, their classification, details of various small arms used in crime – shotguns, rifles, revolvers, pistols, carbines, improvised firearms. Bore and calibre, choke, automatic mechanisms employed in small arms, rifling – class characteristics of rifled bore, purpose of rifling, types of rifling, methods to produce rifling, various locks used in small arms. Head-space.

### **MODULE II**

Various types of primers/ priming mixtures, propellants, shotgun ball ammunition, various kinds of bullets, head-stamp markings. Manufacture of small arms and their ammunition. Proof firing, various physical, ballistic & functional tests of ammunitions.

### **MODULE III**

Internal and External Ballistics Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting. Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity.

### **MODULE IV**

Firearm Evidence, Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire. Mechanisms of formation of gunshot residues. Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self defence

### **MODULE V**

Reconstruction of sequence of events in crimes involving firearms, high velocity impact splatter blood. Firing through glass, determination of direction of firing & sequence of shots. All considerations during direct investigation of shooting incidents without the benefit of original crime scene investigation – the scene of occurrence, medico-legal report, basic ballistic facts, laboratory examination report, firearm and ammunition, clothes of victims, etc. Documentation and evaluation of bullet holes, ricochet marks, pellet pattern in various targets, etc. Bullet holes in tyres.

### **Text Books**

1. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).

### **Books Suggested**

3. A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
4. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

## **FSH 123 FORENSIC TOXICOLOGY**

**L-T-P-C Structure 4-0-0-4**

**Course Type: Core Theory**

### **COURSE OBJECTIVE**

The student will be able to explain:

CO1: the significance of toxicological studies in forensic science,



CO2: the classification of poisons and their modes of actions

CO3: the absorption of poisons in body fluids.

CO4: The student will attain skills in the forensic identification of illicit liquors,

CO5: the classification and characteristics of the narcotics, drugs and psychotropic substances, analyse the menace of designer drugs and demonstrate the methods of identifying and purifying narcotics, drugs and psychotropic substances.

### **MODULE I**

#### **Forensic Toxicology:**

Introduction, History and Pioneers (Paracelsus, Mary Blandy James Marsh and M. J. B. Orfila), International organization related to Forensic Toxicology, Areas of Forensic Toxicology, Elements of Forensic Toxicology, Applications, Scientific Principles, Instrumentation and equipments, Nature of cases, Role of the Forensic Toxicologist, Laws related to Forensic Toxicology.

### **MODULE II**

Definition of Poison, Classification of Poison, Types of Poisoning, Sign and Symptoms of Poisoning, Mode of Action, Factors Modifying the Action of Poisons. Toxicological Exhibits in Fatal and Survival Cases and their Preservation, Treatment in Cases of Poisoning, Analysis Report.

### **MODULE III**

#### **Extraction, Isolation and Clean-Up Procedures for:**

Non-Volatile Organic Poison: Stas-Otto, Dovbriey Nickolls (Ammonium Sulphate) Method, Acid Digest and Valov (Tungstate) Methods, Solid Phase Micro Extraction Techniques, Solvent Extraction Methods.

Volatile Poisons: Industrial Solvent Acid and Basic Distillation

Toxic Cations: Dry Ashing and Wet Digestion Process

Toxic Anions: Dialysis Method Total Alcoholic Extract

### **MODULE IV**

#### **General Study and Analysis of:**

Barbiturates, Methaqualone, Hydromorphone, Methadone, Meprobamate, Mescaline, Amphetamines, LDS, Heroin, Cannabinoids, Phinothiazines. Insecticides: Types, General Methods for their Analysis. Alkaloids: Definition, Classification, Isolation and General Characterization. Vegetable Poison: General Studies and Analysis of Some Vegetable Poisons, Opium, Abrus, Cyanogenetic Glycosides, Dhatura, Marking Nuts, Nux-Vomica, Oleander Aconite etc.

### **MODULE V**

#### **Examination and Analysis of Poisons**

Metallic Poisons: Arsenic, Mercury, Lead, Bismuth, Copper, Aluminium, Iron, Barium, Zinc etc. Analysis of Ethyl Alcohol in Blood and Urine, Illicit Liquor, Methanol, Acetone, Chloroform, Phenol Snake Venoms and other Animal Poisons, Irrespirable Gases etc.

**Text Books:**

1. Parikh C.K. (1972).Forensic Medicine and Toxicology. India,Medical Publications.
2. Rao N.G.(2010). Textbook of Forensic Medicine &Toxicology. India, Jaypee Brother Medical Publishers (P) Ltd.
3. Reddy K.S.N. (2014). Forensic Medicine. India, Jaypee Brothers.

**Books Suggested :**

1. Aggrawal A. (2016). Textbook of Forensic Medicine and Toxicology. India,Avichal Publishing Company.
2. Bardale R. (2011). Principles of Forensic Medicine & toxicology. India, Jaypee Brothers Medical Publishers (P) Ltd.

**FSH 122**  
**FORENSIC BALLISTICS LAB**

**L-T-P-C Structure- 0-0-4-2**  
**Practical**

**Course Type- Core**

**COURSE OBJECTIVE**

CO1: The classification of firearms and their firing mechanisms and the methods of identifying firearms.

CO2: The characteristics of ammunition.

CO3: The importance of firearm evidence.

CO4: The nature of firearm injuries.

CO5: The methods for characterization of gunshot residue.

To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.

2. To correlate the velocity of bullet with the impact it produces on the target.
3. To correlate the striking angle of the bullet with the impact on the target.
4. To estimate the range of fired bullets.
5. To carry out the comparison of fired bullets.
6. To carry out the comparison of fired cartridge cases.
7. To identify gunshot residue.
8. To correlate the nature of injuries with distance from which the bullet was fired.
9. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

### **Text Books**

1. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).

### **Books Suggested**

1. A.J. Schwobbe and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
2. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

## **FSH 124 FORENSIC TOXICOLOGY LAB**

**L-T-P-C Structure 0-0-4-2**

**Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to know:

CO1: Anatomical Study of Poisonous Plants i.e. Calotropis, Cannabis, Dhatura, Nux-Vomica, Marking Nut, Abrus Precatorius, Opium Poppy etc.

CO2: Identification of Different Vegetable Poison by Color Test, Chromatographic Methods.

CO3: Identification of Insecticides and Pesticides by TLC/ Color Test.

CO4: Identification of Salts and Metals by Simple Color Test in Case of Metallic Poisoning.

CO5: Extraction and Identification of Metallic Poisons from Viscera Using Dry Ashing Method.

**Text Books:**

1. Parikh C.K. (1972). Forensic Medicine and Toxicology. India, Medical Publications.
2. Reddy K.S.N. (2014). Forensic Medicine. India, Jaypee Brothers.

**Books Suggested :**

1. Aggrawal A. (2016). Textbook of Forensic Medicine and Toxicology. India, Avichal Publishing Company.
2. Bardale R. (2011). Principles of Forensic Medicine & toxicology. India, Jaypee Brothers Medical Publishers (P) Ltd.

**FSH 147**  
**FORENSIC PHYSICS**

**L-T-P-C Structure 4-0-0-4**

**Course Type: Discipline Specific Course- 1**

**Course Objective:**

On completion of this course, the students would be able to understand

- CO1: the physics of speech which is important in speaker identification,  
CO2: Causes and investigation of vehicular accidents, and its legal implications.  
CO3: Photography is another aspect that will be covered in this paper  
CO4: parts of a camera, forensic importance of Forensic photography and different types of photography used in the investigation of crime will be covered in this course.  
CO5: methods of photographing a crime scene etc.

### **MODULE I**

**SPEAKER IDENTIFICATION** Human Vocal cord anatomy, Production of voice, Speaker identification and authentication, Voice analysis, Forensic Significance

### **MODULE II**

**Causes and Investigation of Vehicular Accidents-an overview** :Automobile accidents- Introduction, sources of information: eye witnesses, Tire and other mark, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, curved cuff-marks, Time and distance, reaction time, Vehicular Accident Photography.

**Legal Aspects of Vehicular accidents:** Relevant Provisions of Motor Vehicle Act, 1988 (Offenses and Penalties); Relevant Provisions of Indian Penal Code, 1860, (Sections 337 (causing hurt), 304 A (causing death due to negligence) and 279 (rash and negligent driving)

### **MODULE III**

**Tool Marks:** Types of tool marks: compression marks, striated marks, combination of compression and striated marks, repeated marks: class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks. Restoration of Erased / Obliterated Marks: Methods of making-cast, punch, engrave; methods of obliteration, methods of restoration- etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks.

### **MODULE IV**

**Forensic Examination of Soil and Paint** Classification and composition of soil, Variations in soil, Collection and preservation of soil evidence. Forensic analysis and examination of soil – Colour, density, size distribution of soil particles, mineral analysis and chemical analysis of soil, the significance of soil evidence. Types of paint and their composition, macroscopic and microscopic studies, pigment distribution, micro-chemical analysis- solubility test, pyrolysis chromatographic techniques, TLC, colorimetry, IR spectroscopy and X-ray diffraction, elemental analysis, interpretation of paint evidence.

### **MODULE V**

**Forensic Examination of Glass** Classification and Composition of glass, Glass fractures, Collection and preservation of glass evidence, Comparison of glass fragments, Measuring and comparing density and refractive index of glass.

### **Text Books**

1. Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Presss, London, 1994.
2. Encyclopedia of Forensic Science, Volume 1-3: Jay A Siegel, Pekka J Saukko, GeofferyKnupfer. Academic Press.

### **Books Suggested**

1. Criminalistics, An Introduction to Forensic Science: Richard Saferstein, 10th Edition, Pearson Education International.
2. Forensic Science An Introduction to Scientific and Investigative Techniques: Stuart H. James and Jon J. Nordby., 3rd Edition CRC Press, Taylor & Francis Group.
3. Edward M Robinson, Crime Scene Photography
4. Herbert L Blitzer, Forensic Digital Imaging and Photography
5. Tom Ang, Digital Photography, 1999

## **FSH 149 ECONOMIC OFFENCES**

**L-T-P-C Structure 4-0-0-4  
Course- 2**

**Course Type: Discipline Specific**

### **Course Objectives**

- CO1: Basic economic and financial terminology.  
CO2: Economic crimes in India are linked to several other crimes.

- CO3: Economic crimes often have a bearing on national security.  
CO4: Types of common economic offences and their consequences.  
CO5: Steps involved in mitigating economic crimes.

## **MODULE I**

### **Taxonomy of Economic Offences/Criminogenic Factors**

Fundamentals of economics in economic offences. Tax evasion. Excise duty evasion. Fraudulent bankruptcy. White collar crime. Economic exclusion. Black money. Corruption and bribery of public servants. Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme.

## **MODULE II**

### **Trafficking**

Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in human organs. Cultural objects trafficking. Racketeering in employment. Racketeering in false travel documents.

## **MODULE III**

### **Applied Economics in Processing Evidence**

Forensic accountancy and forensic auditing. Valuation of economic losses. Violation of Intellectual Property Rights.

## **MODULE IV**

### **Prevention of Economic Offences**

Legislations to deal with different forms of economic offences. RBI Act. SEBI Act. Competition Commission of India Act. Credit card frauds.

## **MODULE V**

### **Enforcement**

Enforcement agencies to deal with different forms of economic offences. International perspectives – measures adopted by FBI and INTERPOL. Case histories of economic offences.

### **Text Books:**

1. R.V. Clarke, Situational Crime Prevention: Successful Case Studies, 2nd Edition, Criminal Justice Press, New York (1997).
2. S.P. Green, Lying, Cheating and Stealing: A Moral Theory of White-Collar Crime, Oxford University Press, Oxford (2006).

**Books Suggested:**

1. G. Geis, R. Meier, L. Salinger (Eds.), White-Collar Crime: Classic & Contemporary Views, Free Press, New York (1995).
2. J. Reiman, The Rich get Richer and the Poor get Prison, Allyn & Bacon, Boston (1998).
3. Indian Audit and Accounts department, Audit of Fraud, Fraud Detection and Forensic Audit, 2007.
4. State Crime Branch, Haryana, Investigation of Economic Offences.

**FSH 151**  
**FORENSIC SEROLOGY**

**L-T-P-C Structure 4-0-0-4**

**Course Type: Discipline Specific Course- 3**

**Course Objective:** The objective of this course is to

CO1: impart complete and thorough knowledge to the students regarding the various aspects of forensic biology,

CO2: impart complete and thorough knowledge to the students regarding the various aspects of especially blood, its properties, its various methods of analysis and laboratory examination



CO3: Understand the importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.

CO4: demonstrate the usefulness of genetic markers in forensic investigations and the forensic importance of bloodstain patterns

CO5: The student will be able to explain the significance of serological evidence.

## **MODULE I**

### **Blood and its Properties**

The nature of blood, Components of blood- Cellular part & plasma part, study of blood composition and its functions, identification of blood cells by microscopic methods.

## **MODULE II**

### **Analysis of blood**

Collection, preservation & packing of blood evidence. Presumptive examination- Catalytic test (Phenolphthalein, Benzidine tests), Confirmatory test- crystal tests (Teichmann test, Takayama test and Wagenaar test). ABO system, Rh system and MN system; Techniques for the determination of blood groups from bloodstains: Absorption –inhibition, mixed-agglutination, Absorption-elution method

## **MODULE III**

### **Analysis of blood: Instrumental technique**

Spectrophotometric method, Electrophoresis methods: Cellulose Acetate Electrophoresis, Immuno-electrophoresis; chromatographic methods and immunological methods, Determination of species of blood: precipitin test (Ring test, immune-diffusion, Crossed-Over electrophoresis and others methods.

## **MODULE IV**

### **Analysis of Biological Fluids**

Composition and examination of Biological Fluids such as Saliva, semen, Vaginal Fluid, Urine and sweat, Protection of Biological Evidences, collection, Packaging, preservation & transportation of Biological Evidences

## **MODULE V**

### **Blood Pattern Analysis**

History of Bloodstain Pattern interpretation, target surface considerations, Size, Shape and Directionality of bloodstains, interpretation of Bloodstain on clothing and footwear, Documentation and Photography for Bloodstain Pattern Analysis. Preservation of blood evidence; procedures and precautions thereof.

### **Text & References:**

- Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
- James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
- Kirk, P.L., Introduction in crime investigation (2<sup>nd</sup>), John Willey and, New York, 1974.
- Saferstein, R. (1998).Criminalistics, An Introduction to Forensic Science, 6<sup>th</sup> Ed. 6<sup>th</sup> Ed. Prentice –Hall. New Jersey.
- M K Bhasin, A Laboratory Manual for Human Blood Analysis
- Richard Li, Forensic Biology: Identification and DNA Analysis
- Tom Bevel, Bloodstain Pattern Analysis with and Introduction to Crime Scene Reconstruction

## **FSH 148 FORENSIC PHYSICS LAB**

**L-T-P-C Structure 0-0-4-2**

**Course Type: Discipline Specific Course-Lab 1**

### **Course Objective:**

On completion of this course, the students would be able to understand

CO1: the physics of speech which is important in speaker identification,

CO2: Causes and investigation of vehicular accidents, and its legal implications.

CO3: Photography is another aspect that will be covered in this paper

CO4: parts of a camera, forensic importance of Forensic photography and different types of photography used in the investigation of crime will be covered in this course.

CO5: methods of photographing a crime scene etc.

### **Practical Credits: 2**

1. To prepare a report on evaluation of crime scene.
2. To reconstruct a crime scene (outdoor and indoor).
3. To compare soil samples by density gradient method.
4. To compare paint samples by physical matching method.
5. To compare paint samples by thin layer chromatography method.
6. To compare glass samples by refractive index method.
7. To identify and compare tool marks.
8. To compare cloth samples by physical matching.

### **Suggested Readings**

1. M. Byrd, *Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence*, CRC Press, Boca Raton (2001).
2. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).
3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013)

## **FSH 150**

### **ECONOMIC OFFENCES LAB**

**L-T-P-C Structure 0-0-4-2**

**Course Type: Discipline Specific Course Lab- 2**

### **Course Objectives**

- CO1: Basic economic and financial terminology.
- CO2: Economic crimes in India are linked to several other crimes.
- CO3: Economic crimes often have a bearing on national security.
- CO4: Types of common economic offences and their consequences.

CO5: Steps involved in mitigating economic crimes.

1. To prepare a draft on fraudulent bankruptcy.
2. To cite a case of money laundering and hawala transactions in India and prepare a note on it.
3. To cite a case involving bank fraud and suggest measures to prevent such crimes.
4. To study a case involving illicit drug trafficking and trace the route by which the item was being smuggled.
5. To prepare a report on trafficking of heritage artefacts, including religious deities in India.
6. To study the applications of accounting software.
7. To study the applications of TALLY software.
8. To review the legislative measures to deal with a particular economic offence, identifying the loopholes and suggesting ways to plug the loopholes.
9. To prepare a schedule of national agencies involved in curbing economic offences. Outline their specific duties.

### **Suggested Readings**

1. R.V. Clarke, Situational Crime Prevention: Successful Case Studies, 2nd Edition, Criminal Justice Press, New York (1997).
2. S.P. Green, Lying, Cheating and Stealing: A Moral Theory of White-Collar Crime, Oxford University Press, Oxford (2006).
3. G. Geis, R. Meier, L. Salinger (Eds.), White-Collar Crime: Classic & Contemporary Views, Free Press, New York (1995).
4. J. Reiman, The Rich get Richer and the Poor get Prison, Allyn & Bacon, Boston (1998).
5. Indian Audit and Accounts department, Audit of Fraud, Fraud Detection and Forensic Audit, 2007.
1. State Crime Branch, Haryana, Investigation of Economic Offences

## **FSH 152 FORENSIC SEROLOGY LAB**

**L-T-P-C Structure 0-0-4-2**

**Course Type: Discipline Specific Course Lab- 3**

**Course Objective:** The objective of this course is to

CO1: impart complete and thorough knowledge to the students regarding the various aspects of forensic biology,

CO2: impart complete and thorough knowledge to the students regarding the various aspects of especially blood, its properties, its various methods of analysis and laboratory examination

CO3: Understand the importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.

CO4: demonstrate the usefulness of genetic markers in forensic investigations and the forensic importance of bloodstain patterns

CO5: The student will be able to explain the significance of serological evidence.

### **Practical**

1. To determine blood group from fresh blood samples.
2. To determine blood group from dried blood sample.
3. To carry out the crystal test on a blood sample.
4. To identify blood samples by chemical tests.
5. To identify the given stain as saliva.
6. To identify the given stain as urine.
7. To carry out cross-over electrophoresis.
8. To study the correlation between impact angle and shape of bloodstain.
9. To identify the point of convergence from the bloodstain patterns.

### **Suggested Readings**

1. W.G. Eckert and S.H. James, *Interpretation of Bloodstain Evidence at Crime Scenes*, CRC Press, Boca Raton (1989).
2. G.T. Duncan and M.I. Tracey in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008)

## **FSH 153**

### **RESEARCH METHODOLOGY**

**L-T-P-C Structure 2-0-0-2**

**Course Type: SEC**

**COURSE OBJECTIVES:** The objective of this course is to

CO1: Understand some basic concepts of research and its methodologies

CO2: Identify appropriate research topics • select and define appropriate research problem and parameters

CO3: Prepare a project proposal (to undertake a project)

CO4: Organize and conduct research (advanced project) in a more appropriate manner

CO5: Write a research report and thesis • write a research proposal (grants)

## **MODULE I**

### **Introduction to Research Methodology**

Definition, concept and research in science and forensic science; Introduction to Research Methodology, research methodology in science, social science and behavioural science.

## **MODULE II**

### **Research in Scientific and Social Settings**

Experimental research and non – experimental research design.

## **MODULE III**

### **Tools of Data Collection**

Observation, questionnaires, interview schedules, case study methods

## **MODULE IV**

### **Introduction to Statics.**

Introduction to statistics; parametric and non-parametric statistics.

## **MODULE V**

### **Descriptive Statistics**

Measures of central tendency; Measures of dispersion; graphical representation of the data; simple correlation methods.

### **Text Books**

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. J T Walker, Statistics in Criminology and Criminal Justice analysis and Interpretation

# Semester VI

B.Sc.(HONS.) FORENSIC SCIENCES SCHEME WEF 2021-22						
SEMESTER VI						
Course Code	University Course Type	Course Name	Teaching Scheme			
			L	T	P	C
FSH 127	Core Theory	Forensic Anthropology	4	0	0	4
FSH 129	Core Theory	Forensic Medicine	4	0	0	4
FSH 128	Core Practical	Forensic Anthropology Lab	0	0	4	2
FSH 130	Core Practical	Forensic Medicine Lab	0	0	4	2
FSH 155	Discipline Specific Course-4	DNA Profiling	4	0	0	4
FSH 157	Discipline Specific Course-5	Accident Investigation				
FSH 156	Discipline Specific Course Lab-4	DNA Profiling Lab	0	0	4	2
FSH 158	Discipline Specific Course Lab-5	Accident Investigation Lab				
FSH 159	Core Course	Dissertation/ Internship	6	0	0	6
FSH 160	Skill Enhancement Course	Universal Human Values And Ethics	2	0	0	2
<b>Total</b>			<b>2</b>	<b>0</b>	<b>12</b>	<b>26</b>

**FSH 127**  
**FORENSIC ANTHROPOLOGY**

**L-T-P-C Structure 4-0-0-4**

**Course Type: Core Theory**

**COURSE OBJECTIVES:** The objective of this course is to

- CO1: Learn about the importance of forensic anthropology in identification of persons.
- CO2: Learn about different techniques of facial reconstruction and their forensic importance.
- CO3: Know about the significance of Somatoscopy and Somatometry
- CO4: Know about human skeleton examination.
- CO5: Age and Sex determination from bones.



## **MODULE I**

### **GENESIS AND DEVELOPMENTS IN ANTHROPOLOGY**

Human Physique: Somatotypes – Ectomorphy, Mesomorphy and Endomorphy. Methods of somatotyping: Sheldon's and Heath-Carter's Methods. Principles and methods of anthropometry. Measurements on the living and skeletal parts. Land marks on human body and measurement techniques. Somatological characteristics of various parts of the human body. Genetic traits of forensic importance. Dermatoglyphics- Development of dermal ridges in intra-uterine life. Finger, palm and sole prints, palmer lines and creases, plantar creases, human foot morphological variations. Role of anthropology in identification of person

## **MODULE II**

### **METHODS OF STUDYING HUMAN GROWTH**

Longitudinal cross sectional and mixed longitudinal methods. Distance and velocity curves of body height and weight. Pre-natal and post-natal stages of growth and development. Factors affecting growth and development.

Age assessment -Decimal age calculation, age grouping. Chronological and developmental age-Methods of assessing developmental age, dental age, skeletal age, morphological age and secondary sex character age. Significance of growth studies in forensics.

## **MODULE III**

### **OSTEOLOGY OF THE HUMAN SKELETON**

Distinguishing human from non-human bones. Terminology associated with gross morphology of bone, skeletal direction and human dentition. Skeletal trauma and pathology. Human dentition. Dental numbering system. Dental anomalies. Racial differences in skull, mandible, pelvis, long bones and scapula. Studies on stature reconstruction in various population groups. Exhumation- Purpose and Procedure. Maceration- Purpose and Procedure. Recovery and packaging of skeletonized and burnt remains.

## **MODULE IV**

### **SKELETAL AGE**

Skeletal age (Earlier years): Criteria of age in human skeleton – Post natal appearance and union of centres of ossification, Pre-natal ossification, differences due to race. Skeletal age (Later years): Suture closure, pelvis, long bones. Osteon counting. Sexing skeletal remains: Sex differences in skull, pelvis and long bone. Accuracy of sexing and ageing of adult skeleton remains.

## **MODULE V**

### **CALCULATION OF STATURE FROM LONG BONES.**

Calculation of stature from long bones. Use of immature and fragmentary long bones in stature calculation. Restoration of physiognomic details from skull- relation of the skull to photographs.

Restoration of the head from the skull. Use of radiography of skull and other bones in skeletal identification.

### **Text Books:**

1. Maria Teresa, Tersigni-Tarrant, Natalie R. Shirley; "Forensic Anthropology: An Introduction", CRC Press, Taylor & Francis Group, 2012.
2. Angi Christensen, N. Passalacqua, & E. Bartelink; "Forensic Anthropology: Current Methods and Practices", Academic Press, Elsevier, 2014.
3. Anil Mahajan & Surinder Nath; "Application areas of Anthropology", Reliance Publishing House, 1992.

### **Books Suggested**

1. Goutam Shubra; "Introduction to Forensic Examination", Selective Scientific Books, 2008.
2. Megan Brickley & Roxanna Ferllini; "Forensic Anthropology: Case Studies from Europe", Charles C. Thomas Publisher, Springfield, Illinois, USA, 2007.  
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3. Indra P. Singh & M.K. Bhasin; "A Manual of Biological Anthropology", Kamla Raj Enterprises, 2004.
4. Fred Plog, Clifford J. Jolly & Danial Bates; "Anthropology", Alfred A. KNOPF, New York, 1976.
5. Kroeber; "Anthropology", Oxford & IBH Publishing Co., 1972.
6. Robert Pickering & David Bachman; "The use of Forensic Anthropology", CRC Press, 2009.
7. Nirmal Kumar Bose; "Anthropology", Narayan Press, 1972.
8. B.R.K Shukla & Sudha Rastogi; "Physical Anthropology", Palaka Prakashan, 2005.
9. James Robertson; "Forensic Examination of Hair", Taylor and Francis, 1999.
10. Inderbir Singh; "Human Osteology", Jaypee Brothers, 2004.
11. Michael W. Warren, Heather A. Haney & Laurel E. Freas; "The Forensic Anthropology Laboratory", CRC Press, 2008.
12. Fazekas, I Gy; "Forensic in Foetal Osteology", Akademiai Kiado, 1978.
13. "Forensic Recovery of Human Remains", Dupras, T.L. CRC Press.

## **FSH 129**

### **FORENSIC MEDICINE**

**L-T-P-C Structure 4-0-0-4**

**Course Type: Core Theory**

**COURSE OBJECTIVES:** The objective of this course is to

- CO1: The duties of the first responding officer who receives a call on homicide or suicide case.
- CO2: The steps involved in processing the death scene
- CO3: The importance of ascertaining whether the crime was staged to appear as suicide or accident.
- CO4: The importance of bloodstain patterns in reconstructing the crime scene.

CO5: Identification of Wounds, fractures and have knowledge about autopsy.

## **MODULE I**

### **DEATH INVESTIGATIONS**

Fundamental aspects and scope of forensic medicine. Approaching the crime scene of death. Obtaining first-hand information from the caller. Rendering medical assistance to the victim, if alive. Protecting life. Recording dying declaration. Identifying witnesses and, if possible, suspect. Interviewing onlookers and segregating possible witnesses. Suspect in custody – initial interrogation and searching for evidence. Assessing the crime scene. Request for forensic team. Importance of command post and log book. Evaluation of injuries. Importance of canvass form. Indexing the death investigation. Handling buried body cases – search for buried bodies, methods of exhumation. Suicide cases – evaluating the type of injuries, gauging the psychological state of victim, suicide notes.

## **MODULE II**

### **AUTOPSY**

Forensic pathology. Medico-legal aspects of death. Causes of death. Determination of time since death. Investigation of sexual offences. Death by drowning. Injuries. Types and classification of injuries. Antemortem and post mortem injuries. Aging of injuries. Artificial injuries.

## **MODULE III**

### **MECHANICAL INJURIES**

Cases of Hanging and its types. Ligature marks. Abrasions, Bruises, Lacerations, Incised wounds, Stab wounds, Firearm injuries, Defence injuries, fabricated injuries. Traffic accident injuries: vehicular injuries, railway injuries and aircraft injuries.

### **THERMAL/ CHEMICAL INJURIES**

Thermal injuries: Burn and scalds, Lightning, Electricity, Explosions. Chemical trauma. Injuries- Accidental, self-inflicted, or inflicted by others. Ante-mortem and post-mortem, artificial injuries and aging of injuries.

## **MODULE IV**

### **FRACTURES**

Skeletal age (Earlier years): Criteria of age in human skeleton – Post natal appearance and union of centres of ossification, Pre-natal ossification, differences due to race. Skeletal age (Later years): Suture closure, pelvis, long bones. Osteon counting. Sexing skeletal remains: Sex differences in skull, pelvis and long bone. Accuracy of sexing and ageing of adult skeleton remains.

**MODULE V****SKIN AND ITS GLANDS**

Skin and its appendages- structure and functions, pigmentation, blood and nerve supply.  
Structure of hair and hair follicle, sebaceous glands, nails, sweat gland.

**Text Books:**

- 1- Houck, M.M. & Siegel, JA; "Fundamentals of Forensic Science", Academic Press, London, 2006.
2. Sharma, B.R.; "Forensic Science in Criminal Investigation & Trials", Universal Publishing Co., New Delhi, 2003.
3. Barry, A.J. Fisher; "Techniques of Crime Scene Investigation", 7th Ed, CRC Press, NY, 2003.

**Books Suggested:**

1. Eckett, WG & James, SH; "Interpretation of Blood Stains Evidence of Crime Scene", Elsevier Pub. NY, 1989.
2. Chadha, PV; "Handbook of Forensic Medicine & Toxicology", Jaypee Brothers, New Delhi, 2004.
3. O'Hara CE and Osterburg, JW; "An Introduction to Criminalistics", Indiana Univ. Press, London, 1972.
4. James SH; "Scientific and Legal Applications of Blood Stain Pattern Identification", CRC Press, 1998.
5. Smith, BC, Holland MM, Sweel, DL & Dizzino, A; "DNA & Forensic Odontology- Manual of Forensic Odontology", Colorado Springs, USA, 1995.

**FSH 128****FORENSIC ANTHROPOLOGY LAB****L-T-P-C Structure 0-0-4-2****Practical****Course Type: Core****COURSE OBJECTIVES:** The objective of this course is to

- CO1: Learn about the importance of forensic anthropology in identification of persons.
- CO2: Learn about different techniques of facial reconstruction and their forensic importance.
- CO3: Know about the significance of Somatoscopy and Somatometry
- CO4: Know about human skeleton examination.
- CO5: Age and Sex determination from bones.

- To determine of age from skull and teeth.
2. To determine of sex from skull.
  3. To determine sex from pelvis.
  4. To study identification and description of bones and their measurements.
  5. To investigate the differences between animal and human bones.
  6. To perform somatometric measurements on living subjects.
  7. To carry out craniometric measurements of human skull.
  8. To estimate stature from long bone length.
  9. To conduct portrait parley using photofit identification kit.

### **Text Books**

1. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
3. S.Rhine, Bone Voyage: A Journey in Forensic Anthropology, University of Mexico Press, Mexico (1998)

## **FSH 130 FORENSIC MEDICINE LAB**

**L-T-P-C Structure 0-0-4-2**

**Course Type: Core Practical**

**COURSE OBJECTIVES:** The objective of this course is to

- CO1: The duties of the first responding officer who receives a call on homicide or suicide case.
- CO2: The steps involved in processing the death scene
- CO3: The importance of ascertaining whether the crime was staged to appear as suicide or accident.
- CO4: The importance of bloodstain patterns in reconstructing the crime scene.
- CO5: Identification of Wounds, fractures and have knowledge about autopsy.

1. To design a questionnaire for the first responder to the death scene.
2. To design a protocol to deal with the media at the crime scene.
3. To design a checklist for the forensic scientists at the death scene.
4. To design a canvass form giving description of an unidentified victim.
5. To analyse and preserve bite marks.
6. Viscera Report writing
7. Medicolegal officer report writing

### **Text Books**

1. K. Smyth, The Cause of Death, Van Nostrand and Company, New York (1982).
2. M. Bernstein, Forensic odontology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

### **Books Suggested**

1. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton (1999).
2. H.B. Baldwin and C.P. May in, Encyclopedia in Forensic Science, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
3. V.J. Geberth, Practical Homicide Investigation, CRC Press, Boca Raton (2006).
4. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).
5. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

## **FSH 155 DNA PROFILING**

**L-T-P-C Structure 4-0-0-4**

**Course Type: Discipline Specific Course-4**

### **COURSE OBJECTIVES:**

The objective of this course is to

CO1: To study basics of DNA, RNA,

CO2: To obtain knowledge about different instruments used in DNA typing

CO3: To study DNA typing, profiling etc

CO4: Concept of Gene, Conventional and modern views. Concept of sequence variation

CO5: Use the science to identify missing persons and paternity cases.

## **MODULE I**

### **Introduction to DNA**

Structure of DNA, Damage to DNA, Variation in DNA, DNA as Excellent Polymorphic Marker, Double helical structure of DNA, alternate forms of DNA double helix, Structure and function of DNA, RNA and genome organization. Denaturation and Renaturation of DNA, Milestones in development of DNA technology. History of Forensic DNA Testing. Enzymes used in manipulation of nucleic acids. Probes. Genetic basis of Forensic DNA typing, Technological basis of Forensic DNA typing.

## **MODULE II**

### **DNA Profiling**

Basis of DNA Typing and Techniques, denaturation and renaturation of DNA, DNA binding proteins, factors affecting DNA stability, types and structure of RNA. Chemical nature of DNA and RNA. Nature and structure of human genome and its diversity. mt-DNA, Y-Chromosomes and the peopling, migration, of modern humans.

## **MODULE III**

### **DNA Polymorphism**

Concept of gene – Conventional and modern views. Concept of sequence variation - VNTRs, STRs, Mini STRs , SNPs. Detection techniques - RFLP, PCR amplifications, Amp-FLP, sequence polymorphism, Y-STR, Mitochondrial DNA. Disputed paternity cases. Missing person identity, population genetics and legal admissibility of DNA evidence.

## **MODULE IV**

### **Identification**

Sample collection and preservation. DNA Extraction Methods. Quantification and Quality assessment methods. PCR amplification – PCR process, components, controls, advantages and disadvantages, types of PCR, PCR inhibitors,

## **MODULE V**

### **Investigation-:**

Disputed paternity cases. Missing person identity. Rape, Murder. Report Writing on DNA profiling

**Text Books.**

1. Brown, T; Gene cloning and DNA analysis: An Introduction , 5th ed. Blackwell publishing, London, 2006 .

**Books Suggested**

2. Butler, J; Advanced Topics in Forensic DNA Typing: Methodology, 1st Ed., Academic Press, London, 2009.

3. Easteal, S. McLeod, N. & Reed, K; DNA Profiling: Principles, Pitfalls and Potential, Harwood Academic Publishers, New Jersey, 1991.

4. Primorac, D.& Schanfield, M; Forensic DNA Applications: An Interdisciplinary Perspective, CRC Press, New York, 2014.

5. Rudin, N. & Inman, K; An Introduction to Forensic DNA Analysis, Second Ed.,CRC press, New York, 2001.

6. Spencer, C; Genetic testimony: a guide to forensic DNA profiling, Pearson, New Delhi, 2004.

**FSH 156**  
**DNA Profiling LAB**

**L-T-P-C Structure 0-0-4--2**

**Course Type: Discipline Specific Course Lab- 4**

**COURSE OBJECTIVES:**

The objective of this course is to

CO1: To learn extraction of DNA from various biological samples.

CO2: To study PCR and its amplifications.

CO3: Have an idea about Report Writing in cases of DNA profiling according to FSL

CO4: Use of New Technologies.

CO5: Know Concept of Gene, Conventional and modern views. Concept of sequence variation



1. DNA Extraction from biological samples ( Blood and other body fluids and tissues) using Organic (Phenol-Chloroform) Method
2. DNA Extraction from biological samples using Chelax Method.
3. DNA Extraction from biological samples using Salting out Method.
4. DNA Extraction from biological samples using FTA Cards.
5. DNA Extraction from biological samples using commercially available kits
6. Qualitative and Quantitative Analysis using Agarose, UV Spectrophotometer and Real time PCR.
7. To study PCR and its amplifications.
8. Report Writing on DNA profile of different cases
9. Washing of FTA cards

**Text Books.**

1. Brown, T; Gene cloning and DNA analysis: An Introduction , 5th ed. Blackwell publishing, London, 2006 .

**Books Suggested**

1. Butler, J; Advanced Topics in Forensic DNA Typing: Methodology, 1st Ed., Academic Press, London, 2009.
2. Easteal, S. McLeod, N. & Reed, K; DNA Profiling: Principles, Pitfalls and Potential, Harwood Academic Publishers, New Jersey, 1991.
3. Primorac, D.& Schanfield, M; Forensic DNA Applications: An Interdisciplinary Perspective, CRC Press, New York, 2014.
4. Rudin, N. & Inman, K; An Introduction to Forensic DNA Analysis, Second Ed., CRC press, New York, 2001.
6. Spencer, C; Genetic testimony: a guide to forensic DNA profiling, Pearson, New Delhi, 2004.

**FSH 157****ACCIDENT INVESTIGATIONS****L-T-P-C Structure- 4-0-0-4****Course Type- Discipline Specific Course-5****COURSE OBJECTIVE**

- CO1: Photograph Hit and Run Cases  
CO2: Know the importance of tire marks  
CO3: Reconstruct Pre-Crash and Post-Crash movement.

CO4: Vehicle and road kinematics, coefficient of friction and drag factor, methods of determining drag factor

CO5: Computer aided design techniques, vehicle specification databases

### **MODULE I**

Accident scene. Sources of forensic information. Eyewitness accounts. Extent of vehicle damage. Visibility conditions. Photographs of accident site. Tire marks skid marks, scuff marks. Maintenance of vehicles. Abandoned vehicles. Importance of air bags. Railway accidents.

### **MODULE II**

Pre-crash movement. Post-crash movement. Collision model. Gauging driver's reaction. Occupants's kinematics. Types of injuries resulting from accident. Biomechanics of injuries. Hit and run investigations. Trace evidence at accident sites.

### **MODULE III**

Forensic significance of tachograph data. Tachograph charts. Principles of chart analysis. Accuracy of speed record. Tire slip effects. Falsification and diagnostic signals. Route tracing

### **MODULE IV**

Speed analysis: vehicle and road kinematics, coefficient of friction and drag factor, methods of determining drag factor, influence on braking distance Speed determination: skid marks measurement, speed from vehicle yaw, speed calculation on different road surfaces, falls, flips and vault speeds, special speed problem

### **MODULE V**

Reconstruction of accident: overview of reconstruction software and techniques, computer aided design techniques, vehicle specification databases, momentum and energy analysis program, collision simulators, photogrammetry software.

#### **Text Books**

1. T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York (1988).

#### **Books Suggested**

1. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
2. T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
3. S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

**FSH 158**  
**ACCIDENT INVESTIGATION LAB**

**L-T-P-C Structure- 4-0-0-4**

**Course Type- Discipline Specific Course-5 Lab**

**COURSE OBJECTIVE**

CO1: Photograph Hit and Run Cases

CO2: Know the importance of tire marks

CO3: Reconstruct Pre-Crash and Post-Crash movement.

CO4: Vehicle and road kinematics, coefficient of friction and drag factor, methods of determining drag factor

CO5: Computer aided design techniques, vehicle specification databases

1. To lift tire marks.
2. To study the pattern of skid marks.
3. To study the pattern of scuff marks.
4. To estimate the speed of the vehicle from skid marks.
5. To prepare a report on a major road accident.
6. To prepare a report on a major train accident.

### **Text Books**

1. T.S. Ferry,  
Modern Accident Investigation and Analysis, Wiley, New York (1988).

### **Books Suggested**

1. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
2. T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
3. S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000)

## **FSH 160**

### **UNIVERSAL HUMAN VALUES AND ETHICS**

**L-T-P-C Structure 2-0-0-2**

**Course Type: Skill Enhancement Course**

**COURSE OBJECTIVES:** The objective of this course is to

- CO1: To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
- CO2: To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
- CO3: To help students understand the meaning of happiness and prosperity for a human being.
- CO4: To facilitate the students to understand harmony at all the levels of human living, and

live accordingly.

CO5: To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

## MODULE I

### **INTRODUCTION - NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION**

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration—what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

## MODULE II

### **UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF**

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - *Sukh* and *Suvidha*, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure *Sanyam* and *Swasthya*.

## MODULE III

### **UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN-HUMAN RELATIONSHIP**

Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfilment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Universal Order (*SarvabhaumVyawastha* )- from family to world family.

## MODULE IV

### **UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO-EXISTENCE**

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

## MODULE V

**IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS**

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems.

**Text Books:**

1 R Gaur, R Sangal, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, 2009. ISBN: 978-9-350-62091-5

**Books Suggested:**

- 1 . Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blonde & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, JeevanVidyaEkParichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.