File Ref.No.86241/GA - IV - J1/2016/Admn

UNIVERSITY OF CALICUT

Abstract

BSc Forensic Science Programme under CUCBCSS UG 2014 Regulations-Corrected syllabus -w.e.f 2018 admission-approved-Implemented-Orders issued.

G & A - IV - J

U.O.No. 8112/2018/Admn Dated, Calicut University.P.O, 05.07.2018

Read:-1. U.O.No. 641/2018/Admn Dated 15.01.2018.
2.. U.O Note No. 2904/EX-I-ASST-2/2018/PB dtd.22.02.2018
3. Corrected Syllabus forwarded by Chairman of Board of Studies in Forensic Science dtd.19.04.2018
4. Remarks of the Dean, Faculty of Science dtd.
5. Orders of the Vice Chancellor in the file of even No.dated 04.06.2018

ORDER

Vide paper read first above, the Scheme and Syllabus of BSc Forensic Science Programme has been implemented under the University of Calicut from 2018 admission onwards.

Vide paper read second above, Examination Branch has informed some anomalies in the syllabus of B.Sc Forensic Science Programme.

Vide paper read third above the Chairman Board of Studies in Forensic Science has forwarded the corrected Syllabus of Forensic Science programme after rectifying the anomalies as follows:

1. Abbreviation of the subject 'FSC' shall be used in the alpha-numeric code for the courses, if 'FSC' is already allotted; the course code can be centrally generated by the University.
2. Existing syllabus and pattern of the complementary courses provided in the B.Sc Chemistry & B.Sc Zoology syllabi of University of Calicut shall be followed for the B.Sc Forensic Science programme with the evaluation scheme of internal marks - 16 and external marks- 64.

The above recommendation approved by Dean, Faculty of Science vide paper read fourth above.

Vide paper read fifth above, the Vice Chancellor approved the above modifications, subject to ratification of Academic Council.

Sanction has therefore been accorded to include the above modifications in the Syllabus of BSc Forensic Science Programme Under University of Calicut w.e.f 2018 admissions.

Orders are issued accordingly.

Ajitha P.P

Joint Registrar

To

The Controller of Examinations/ EX Branch/ B. Sc Branch/ Digital wing.

Forwarded / By Order

Section Officer

UNIVERSITY OF CALICUT

B.Sc. FORENSIC SCIENCE PROGRAMME

SYLLABUS

CORE COURSES, ELECTIVE COURSES,
OPEN &
COMPLEMENTARY COURSES

(CUCBCSS- UG)

With effect from 2018-19 admission onwards

Details of the members of Board of Studies in Forensic Science (Single Board), University of Calicut

U.O.No.1507/2016/Admn dated, Calicut University P.O, 11.02.2016

Sl. No.	Name & Designation	Contact details
1.	Dr. K Prasannan Professor & Head, Department of Forensic Medicine, Government Medical College, Calicut. **(Chairman)**	Prasadam, Chevayur P.O, Kozhikode-673017. Mob.:- 9961988889 E-mail:- ranjiprasannan@gmail.com
2.	Smt. Annamma John Former Assistant Director, Forensic Biology Division, Regional Forensic Science Laboratory, Thrissur	Alummootil House, Nellikkadu, Ramavarmapuram P.O, Thrissur- 680631. Mob.:- 9446092318 E-mail:- annammajohnfs@gmail.com
3.	Dr. James Vadackumchery Former Criminologist, Kerala Police	VRA III, Ashramam Road, Mannamoola, Perurkada, Thiruvananthapuram- 5. Mob.:- 9447724369 E-mail:- jvadackumchery@yahoo.com
4.	Prof. (Dr.) G. B Aravind Head of the Department of Criminology & Forensic Science, S.B.R.R Mahajan First Grade College, Mysore- 570012.	Head of the Department of Criminology & Forensic Science, S.B.R.R Mahajan First Grade College, Mysore- 570012. Mob.:- 9886089317 E- mail:-criminology-hod@mahajanafgc.com
5.	Dr. Shirley Vasu Principal, Government Medical College, Thrissur.	Principal, Government Medical College, Thrissur. Mob.:- 9349112937 E-mail:- drshirleyvasu@gmail.com
6.	Dr. P.B Gujaral District Police Surgeon, District Hospital, Palakkad- 678001.	District Police Surgeon, District Hospital, Palakkad- 678001. Mob.:- 8089552728 E-mail:- drpbgujaral@gmail.com
7.	Shri. K Mohanan Former Joint Director, Forensic Physics Division, Forensic Science Laboaratory, Thiruvananthapuram.	TC 14/560, G 8, Silent Nagar, Pothujanam Road, Kumarapuram, Medical College P.O, Thiruvananthapuram-11. Mob.:- 9446102295 E-mail:- liaisonbookhouse@gmail.com
8.	Dr. S. P Shaji Prabha Junior Scientific Officer, Chemical Examiner's Laboratory, Department of Home, Thiruvananthapuram- 695035.	Junior Scientific Officer, Chemical Examiner's Laboratory, Department of Home, Thiruvananthapuram- 695035. Mob.:- 9496252162 E-mail:- shajiprabhaa@yahoo.com
9.	Dr. Jayesh K Joseph Criminologist, Kerala Police Academy.	Criminologist, Kerala Police Academy, Ramavarmapuram- 680631. Thrissur. Mob.:- 9493352042 E-mail:- criminologistkepa@gmail.com
10.	Shri. Ranjith N.K Junior Scientific Officer, Regional Chemical Examiner's Laboratory, Department of Home, Calicut Medical College, Calicut- 673008.	Junior Scientific Officer, Regional Chemical Examiner's Laboratory, Department of Home, Calicut Medical College, Calicut- 673008. Mob.:- 9447300506 E-mail:- nkrjith@gmail.com

COURSE STRUCTURE

Credit Distribution

Semester	*Common course*		*Core course*	*Complementary course*		*Open course*	*Total*
	English	*Additional Language*		*Zoology*	*Chemistry*		
I	4+3	4	2	2	2	-	17
II	4+3	4	2	2	2	-	17
III	4	4	3	2	2	-	15
IV	4	4	3+4*	2+4*	2+4*	-	27
V	-	-	3+3+3+3	-	-	2	14
VI	-	-	2+3+3+3+3+3 +4*+4*+3** + 2***	-	-	-	30
Total	**22**	**16**	**56**	**12**	**12**	**2**	**120**

Practical** ****Project** ** Viva- voce**

Mark Distribution and Indirect Grading System

Mark system is followed instead of direct grading for each question. After external and internal evaluations marks are entered in the answer scripts. All other calculations, including grading, will be done by the university using the software. Indirect Grading System in 7 point scale is followed. Each course is evaluated by assigning marks with a letter grade (A^+, A, B, C, D, E or F) to that course by the method of indirect grading.

Mark Distribution

Sl. No.	***Course***	***Marks***
1	English	600
2	Additional Language	400
3	Core course: Forensic Science	1750
4	Complementary course: Zoology	400
5	Complementary course: Chemistry	400
6	Open Course	50
	Total Marks	**3600**

Seven point Indirect Grading System

% of Marks	***Grade***	***Interpretation***	***Grade Point Average***	***Range of Grade points***	***Class***
90 and above	A^+	Outstanding	6	5.5 - 6	First Class with distinction
80 to below 90	A	Excellent	5	4.5 – 5.49	
70 to below 80	B	Very good	4	3.5 – 4.49	First Class
60 to below 70	C	Good	3	2.5 – 3.49	
50 to below 60	D	Satisfactory	2	1.5 – 2.49	Second Class
40 to below 50	E	Pass/Adequate	1	0.5 – 1.49	Pass
Below 40	F	Failure	0	0 – 0.49	Fail

CREDIT AND MARK DISTRIBUTION IN EACH SEMESTERS Total

Credits: 120; Total Marks: 3600

Semester	*Course*	*Credit*	*Marks*
I	Common course: English	4	100
	Common course: English	3	100
	Common course: Additional Language	4	100
	Core Course I: Fundamentals of Forensic Science	2	100
	Complementary course: Zoology I	2	80[x]
	Complementary course: Chemistry I	2	80[x]
	Total	**17**	**560**
II	Common course: English	4	100
	Common course: English	3	100
	Common course: Additional Language	4	100
	Core Course II: Criminal Major Acts (IPC, Cr.PC, IEA)	2	100
	Complementary course: Zoology II	2	80[x]
	Complementary course: Chemistry II	2	80[x]
	Total	**17**	**560**
III	Common course: English	4	100
	Common course: Additional Language	4	100
	Core Course III: Criminology, Penology, Victimology and Forensic Psychology	3	100
	Complementary course: Zoology III	2	80[x]
	Complementary course: Chemistry III	2	80[x]
	Total	**15**	**460**
IV	Common course: English	4	100
	Common course: Additional Language	4	100
	Core Course IV: Instrumentation Techniques	3	100

	Core Course V: Practical- I*A, I*B, I*C & I*D	4	100
	Complementary course: Zoology IV	2	80[x]
	Complementary course: Chemistry IV	2	80[x]
	Complementary course: Zoology practical	4	80[x]
	Complementary course: Chemistry practical	4	80[x]
	Total	**27**	**720**
V	Core Course VI: Forensic Physics	3	100
	Core Course VII: Forensic Ballistics	3	100
	Core Course VIII: Forensic Dermatoglyphics and Questioned Documents	3	100
	Core Course IX: Forensic Chemistry and Toxicology	3	100
	Open course	2	50
	Total	**14**	**450**
VI	Core Course X: Forensic Medicine	2	100
	Core Course XI: Forensic Biology and Serology	3	100
	Core Course XII: Advanced techniques in personal identification	3	100
	Core Course XIII: Crime investigation techniques	3	100
	Core Course XIV: Cyber crime and cyber forensics	3	100
	Core Course XV: Elective Course: 01 Arson & Explosives/ 02- Forensic Botany & Wildlife forensic/ 03- Forensic Audio Video analysis (Anyone)	3	100
	Core Course XVI: Practical II- II*A, II*B & II*C	4	100
	Core Course XVII: Practical III-III*A, III*B, III*C & III*D	4	100
	Core Course- XVIII: Project Work	3	50
	Field Study/ Study tour		
	Viva- voce	2	
	Total	**30**	**850**

[x] The evaluation scheme for each complementary course contains two parts viz. internal evaluation (16 marks) and external evaluation (64 marks). This shall abide by the existing syllabus of the corresponding complementary courses offered by Zoology and Chemistry UG programmes.

Core Course Structure

Total Credits: 56 (Internal: 20%; External: 80%)

Semester	*Code No*	*Course Title*	*Hrs/ Week*	*Total Hrs/ Sem*	*Credits*	*Marks*
I	FSC1B01T	Core Course I: Fundamentals of Forensic Science	2	36	2	100
	-	Core Course V : Practical related to FSC1B01T- Practical-I*A	2	36	*	-
II	FSC2B02T	Core Course II: Criminal Major Acts (IPC, Cr.PC, IEA)	2	36	2	100
	-	Core Course V : Practical related to FSC2B02T- Practical-I*B	2	36	*	-
III	FSC3B03T	Core Course III – Criminology, Penology, Victimology & Forensic Psychology	3	54	3	100
	-	Core Course V : Practical related to FSC3B03T -Practical-I*C	2	36	*	-
IV	FSC4B04T	Core Course IV: Instrumentation Techniques	3	54	3	100
	-	Core Course V: Practical related to FSC4B04T - Practical-I*D	2	36	*	-
	FSC4B05P	Practical-I*A, I*B, I*C & I*D	8	144	4*	100
V	FSC5B06T	Core Course VI: Forensic Physics	3	54	3	100
	FSC5B07T	Core Course VII: Forensic Ballistics	3	54	3	100
	-	Practical related to Theory core Course: FSC5B06T & FSC5B07T - Practical II*A	3	54	**	-
	FSC5B08T	Core Course VIII: Forensic Dermatoglyphics and Questioned Documents	3	54	3	100
	-	Practical related to Theory Core Course : FSC5B08T -Practical II*B	3	54	**	-
	FSC5B09T	Core Course IX: Forensic Chemistry & Toxicology	3	54	3	100
	-	Practical Related to Theory Core Course FSC5B09T -Practical II*C	2	36	**	-

	-	Project Work	2	36	**	-
	-	Field Study	1	18	**	-
VI	FSC6B10T	Core Course X: Forensic Medicine	2	36	2	100
	FSC6B11T	Core Course XI: Forensic Biology & Serology	3	54	3	100
	-	Practical related to Core Course FSC6B10T & FSC6B11T-III*A	2	36	**	-
	FSC6B12T	Core Course XII: Advanced techniques in personal identification	3	54	3	100
	FSC6B13T	Core Course XIII: Crime investigation techniques	3	54	3	100
	-	Practical related to Theory Core Course FSC6B12T & FSC6B13T-Practical-III*B	2	36	**	-
	FSC6B14T	Core Course XIV: Cyber Crime & Cyber forensics	3	54	3	100
	-	Practical Related to theory Core Course FSC6B14T-Practical III*C	2	36	**	-
	FSC6B1T[#] (E1) (E2) (E3)	Core Course XV: Elective — 1. Arson and Explosives; 2. Forensic Botany & Wild life forensics; 3. Forensic audio video analysis	3	54	3	100
	-	Practical Related to Theory Elective Course FSC0615T(E)-Practical III*D	2	36	**	-
	FSC6B16P[•$]	Core Course XVI: Practical II-II*A, II*B & II*C	8	144	4**	100
	FSC6B17P[•@]	Core Course XVII: Practical III-III*A, III*B, III*C & III*D	8	144	4**	100

	FSC0618(Pr)	Core Course XVIII: Project Work	-	-	3**	50
	FSC0619F	Field Study		18	**	-
	FSC0620V	Viva voce	-	-	2**	-
				Total	**56**	**1750**

[*] Exam will be held at the end of 4th semester .

[**] Exam will be held at the end of 6th semester.

[#] FSC0615T- An institution can choose any one Elective course among the three courses.

[$] Includes Field Study also- Marks: 90 (FSC6B16P) + 10 (Hand written report).

[@] Includes Viva Voce also- Marks: 85(FSC6B17P) + 15(General Viva Voce).

[•] Practical Examinations are of 4 hrs Duration.

CORE COURSE THEORY: EVALUATION SCHEME

The evaluation scheme for each course contains two parts: *viz.*, internal evaluation and external evaluation.

1. INTERNAL EVALUATION

20% of the total marks in each course are for internal evaluation. The colleges shall send only the marks obtained for internal examination to the university. Assignments/ seminars are compulsory for all theory papers. Topics allotted for assignments/ seminars shall be considered for internal assessments only and can be subdivided among students.

Table 1: Components of Evaluation

Sl. No.	***Components***	***Marks***
1	Attendance	5
2	Test papers: I & II	5 + 5
3	Assignment	2
4	Seminar	3
	Total Marks	**20**

Table 2: Percentage of Attendance and Eligible Marks

% of attendance	***Marks***
Above 90%	5
85-89%	4
80-84%	3
76-79%	2
75%	1

Table 3: Pattern of Test Papers

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
1.5 Hours	One word	4	4	1	4
	Short answer	5	4	2	8
	Paragraph	5	3	6	18
	Essay	2	1	10	10
				*Total Marks**	40

*90% and above = 5, 80 to below 90% = 4.5, 70 to below 80% = 4, 60 to below 70% = 3.5, 50 to below 60% = 3, 40 to below 50% = 2, 35 to below 40% = 1, below 35% = 0.

Table: 4 Scheme for Internal Evaluation of Core Course Practical: 1 (FSC4B 05P)

Attendance	Performance & punctuality	Test paper	Record	Total
5 marks	4 marks	6 marks	5 marks	20 marks

Record: 25 marks (20 marks external+5marks internal)

Attendance :

90% and above	5 marks
85-89%	4 marks
80-84%	3 marks
76-79%	2 marks
75%	1 marks
Below 75%	Not eligible to attend practical Examination

Performance & Punctuality

Excellent	4 marks
Very good	3 marks
Good	2 marks
Average	1 marks

Test Paper

90% & Above	6 marks
80-89%	5 marks
70-79%	4 marks
60-69%	3 marks
50-59%	2 marks
40-49%	1 marks
Below 40%	failure

Record Evaluation:

Excellent	5 marks
Very good	4 marks
Good	3 marks
Average	2 marks

Table: 5 Scheme for the Internal Evaluation of Practical: II (FSC0616P)

Attendance	Performance & Punctuality	Test paper	Field Report	Record
5 marks	2 marks	6 marks	2 marks	5 marks

(5+2+6+2+5=20marks)

Table: 6 Scheme for the Internal Evaluation of Practical: III (FSC0617P)

Attendance	Performance & Punctuality	Test paper	Viva-Voce	Record	Total
5 marks	1 marks	6 marks	3 marks	5 marks	**20marks**

2. EXTERNAL EVALUATION

External evaluation carries 80% marks. University examinations will be conducted at the end of each semester.

Table 1: Pattern of Question Papers:

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
3 Hours	One word	10	10	1	10
	Short answer	12	10	2	20
	Paragraph	8	5	6	30
	Essay	4	2	10	20
				Total Marks	80

CORE COURSE PROJECT: EVALUATION SCHEME

Project evaluation will be conducted at the end of sixth semester.

Table 1: Internal Evaluation

Sl. No	***Criteria***	***Marks***
1	Punctuality	2
2	Skill in doing project work	3
3	Project presentation	2
4	Viva-Voce	3
	Total Marks	**10**

Table 2: External Evaluation

Sl. No	***Criteria***	***Marks***
1	Content and relevance of the project	10
2	Project report	10
3	Project presentation	10
4	Viva-voce	10
	Total Marks	**40**

FORENSIC SCIENCE COMPLEMENTARY COURSE STRUCTURE

Total Credits: 12 (Internal: 20%; External: 80%)

Semester	*Code No*	*Course Title*	*Hrs/ Week*	*Total Hrs*	*Credit*	*Marks*
I	FSC1CO1	Complementary Course I: Forensic Science-I	2	36	2	80
	-	Complementary Course V: Forensic Science Practical-I	2	36	*	-
II	FSC2CO2	Complementary Course II: Forensic Science -II	2	36	2	80
	-	Complementary Course V: Forensic Science Practical-II	2	36	*	-
III	FSC3CO3	Complementary Course III: Forensic Science -III	3	54	2	80
	-	Complementary Course V: Forensic Science Practical-III	2	36	*	-
IV	FSC4CO4	Complementary Course IV: Forensic Science -IV	3	54	2	80
	-	Complementary Course V: Forensic Science Practical-IV	2	36	*	-
	FSC4C05(P)	Complementary Course V: Forensic Science Practical-V	2	36	4*	80
				Total	**12**	**400**

* Examination will be held at the end of 4th semester.

COMPLEMENTARY COURSE THEORY: EVALUATION SCHEME

The evaluation scheme for each course contains two parts: *viz.*, internal evaluation and external evaluation.

1. INTERNAL EVALUATION

20% of the total marks in each course are for internal evaluation. The colleges shall send only the marks obtained for internal examination to the university.

Table 1: Components of Evaluation

Sl. No.	***Components***	***Marks***
1	Attendance	4
2	Test papers: I & II	4 + 4
3	Assignment	2
4	Viva-Voce	2
	Total Marks	**16**

Table 2: Percentage of Attendance and Eligible Marks

% of attendance	***Marks***
Above 90%	4
85-89%	3.2
80-84%	2.4
76-79%	1.6
75%	0.8

Table 3: Pattern of Test Papers

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
1.5 Hours	One word	4	4	1	4
	Short Answer	4	4	2	8
	Paragraph	3	2	5	10
	Essay	2	1	10	10
				Total Marks*	**32**

*Marks: 80% and above = 2 , 60 to below 80% = 1.5, 50 to below 60% = 1, 35 to below 50% = 0.5, below 35% = 0.

Table 4: Scheme for the evaluation of complementary internal practical

Attendance	Performance & Punctuality	Test Paper	Record	Total
5 marks	3 marks	4 marks	4 marks	16

Record: 20marks (16 external+ 4 internal)

Attendance:

90% & above	5 marks
85-89%	4 marks
80-84%	3 marks
76-79%	2 marks
75%	1marks
Below 75%	Not eligible to attend practical

Performance & punctuality:

Excellent	3 marks
Good	2 marks
Average	1 marks

Test Paper:

85% & Above	4 marks
70-84%	3 marks
55-69%	2 marks
40-54%	1 marks
Below 40%	Failure

Record:

Excellent	4 marks
Good	3marks
Average	2 marks

2. EXTERNAL EVALUATION

External evaluation carries 80% marks. University examinations will be conducted at the end of each semester.

Table 1: Pattern of Question Papers

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
3 Hours	One word	10	10	1	10
	Short answer	10	7	2	14
	Paragraph	6	4	5	20
	Essay	4	2	10	20
				Total Marks	**64**

OPEN COURSE STRUCTURE
(FOR STUDENTS OTHER THAN B.Sc. FORENSIC SCIENCE)
Total Credits: 2 (Internal 20%; External 80%)

Semester	***Code No.***	***Course Title (Any one)***	***Hrs/ Week***	***Total Hrs***	***Marks***
V	FSC5D01	Open Course 1: Basic concepts in Criminology & Forensic Science	2	36	50
	FSC5D02	Open Course 2: Laboratory quality management & safety			
	FSC5D03	Open Course 3: Economic Offences			

OPEN COURSE: EVALUATION SCHEME

The evaluation scheme contains two parts: *viz.,* internal evaluation and external evaluation.

1. INTERNAL EVALUATION

20% of the total marks are for internal evaluation. The colleges shall send only the marks obtained for internal examination to the university.

Table 1: Components of Evaluation

Sl. No.	***Components***	***Marks***
1	Attendance	2.5
2	Test papers: I & II	2.5 + 2.5
3	Assignment / Viva	2.5
	Total Marks	**10**

Table 2: Percentage of Attendance and Eligible Marks

% of attendance	***Marks***
Above 90%	2.5
85-89%	2
80-84%	1.5
76-79%	1
75%	0.5

Table 3: Pattern of Test Papers

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
1 Hour	One word	3	3	1	3
	Short answer	1	1	2	2
	Paragraph	2	1	5	5
	Essay	2	1	10	10
				Total Marks	**20**

*Marks: 80% and above = 2.5, 60 to below 80% = 2, 50 to below 60% = 1.5, 40 to below 50% = 1, 35 to below 40% = 0.5, below 35% = 0.

2. EXTERNAL EVALUATION

External evaluation carries 80% marks. University examination will be conducted at the end of 5th semester.

Table 1: Pattern of Question Paper

Duration	***Pattern***	***Total number of questions***	***Number of questions to be answered***	***Marks for each question***	***Marks***
2 Hours	One word	10	10	1	10
	Short Answer	7	5	2	10
	Paragraph	3	2	5	10
	Essay	2	1	10	10
				Total Marks	**40**

FIRST SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- I

FUNDAMENTALS OF FORENSIC SCIENCE
Code: FSC1B 01T
(36 hours) (2 hours per week) (2 Credits)

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

a. The significance of forensic science to human society.
b. The fundamental principles and functions of forensic science.
c. The divisions in a forensic science laboratory.
d. The working of the forensic establishments in India and abroad.

Module I: History and development of Forensic Science (12 hrs)

Historical aspects of forensic science, Definitions and concepts of forensic science, Need of Forensic Science, Basic principles of Forensic Science, Functions of Forensic Science, Different branches of Forensic Science. Frye case and Daubert standard.

Module II: Legal aspects of crime (12 hrs)

Crime – Introduction, Nature, causes and consequences of crime, Broad concepts of criminal Justice System, Procedures involved in the detection of crime, Filing of criminal charges, Indian police system – The police Act, Human rights and criminal justice system in India. Set up of INTERPOL.

Module III: Organizational set up of FSLs in India (12 hrs)

Hierarchical set up of central forensic science laboratory, Hierarchical set up of state forensic science laboratory, Government examiners of questioned documents, Chemical examiners laboratory, Finger print bureaus, National crime records bureau, Bureau of police research and development, Mobile crime laboratory, Duties of forensic scientist, code of conduct of forensic scientists.

Recommended Reading:

1. B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).
2. M.K. Bhasin and S. Nath, *Role of Forensic Science in the New Millennium*, University of Delhi, Delhi (2002).
3. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
4. W.G. Eckert and R.K. Wright in *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (ED.), CRC Press, Boca Raton (1997).
5. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, *Fisher's Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

CORE COURSE I: PRACTICAL- I* A

FUNDAMENTALS OF FORENSIC SCIENCE
(36 hours) (2 hrs per week)

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 College.
10. To compare the code of conduct prescribed by different establishments for forensic scientists.

SECOND SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- II

CRIMINAL MAJOR ACTS (IPC, Cr.PC, IEA)
Code: FSC2B 02T

(36 hours) (2 hours per week) (2 Credits)

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

a. Constitution of India.
b. Criminal Major & Minor Acts.
c. Acts governing to social legislations.

Module I: Indian Constitution **8 hrs**

Preamble, Fundamental rights, Directive principles of state policy, Fundamental Duties, The Union Judiciary, The State, The Union Territories, Relation between the Union & the State, Tribunals, Elections, Special Provision related certain classes, Emergency provisions and Schedules.

Module II: Criminal Major Acts (18 hrs)

Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts. Criminal Procedure Code. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass. 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 III: Criminal Minor Acts and Social Legislations (10 hrs)

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, J.J Act, POCSO Act, KAAPA, SC & ST (Prevention of Atrocities) Act.

Recommended Reading:

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).
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).

CORE COURSE II: PRACTICAL- I* B

CRIMINAL MAJOR ACTS (IPC, Cr.PC, IEA)
(36 hours) (2 hrs per week)

1. To study the powers and limitations of the Court of Judicial Magistrate of First Class.
2. To prepare a schedule of five cognizable and five non-cognizable offences.
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 analyze 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 15 of the Constitution of India.

THIRD SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE-III

CRIMINOLOGY, PENOLOGY, VICTIMOLOGY & FORENSIC PSYCHOLOGY
CODE: FSC3B 03T

(54 hours) (3 hours per week) (3 credits)

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

a. The importance of criminology, penology and victimology.
b. The causes of criminal behavior.
c. The significance of criminal profiling to mitigate crime.
d. The consequences of crime in society.
e. The critical assessment of advanced forensic techniques like polygraphy, narcoanalysis and brain electrical oscillation signatures.

Module I: Basics of Criminology, Penology, Victimology (18 hrs)

Definition, aims and scope. Theories of criminal behaviour – classical, positivist, sociological. Criminal anthropology. Understanding modus operandi. Investigative strategy. Role of media. 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. Penology- Meaning, Definition and Scope, Meaning and Importance of Punishment, Punishment in ancient and modern times, History of correctional administration, Different prisons, Prison Acts, Theories of punishment. Treatment- Institutional, Non-institutional.

Module II: Psychology and criminal behavior (18 hrs)

Crime-biological factors, Biological perspective – nervous system:- central nervous system, structure and functions of CNS, peripheral nervous system. Endocrine system:- pituitary

gland, thyroid gland, neurotransmitters. socio learning theories, psycho-social factors, Theories of offending- social cognition, moral reasoning, Psychopathology and personality disorders, Psychological assessment, Ethical issues of forensic psychology.

Module III: Basics of Forensic Psychology (18 hrs)

Definition and fundamental concepts of forensic psychology and forensic psychiatry, Psychological evidence, Eyewitness testimony, Confession evidence, Criminal profiling, Psychology in the courtroom with special reference to section 84IPC. Tools for detection of deception- interviews, nonverbal detection, statement analysis, voice. Stress analysis, hypnosis, case study methods. Polygraphy- operational and question formulation techniques, ethical and legal aspects**.** Narco analysis and brain mapping – principle and theory, ethical and legal issues.

Recommended Reading:

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

CORE COURSE III: PRACTICAL- I* C

CRIMINOLOGY, PENOLOGY, VICTIMOLOGY & FORENSIC PSYCHOLOGY (36 hours) (2 hours per week)

1. To review past criminal cases and elucidate which theory best explains the criminal behavior 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 behavior 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 suggests improvements.
12. To prepare a report on interrogation cells and suggest improvements.

FOURTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE-IV

INSTRUMENTATION TECHNIQUES
Code: FSC4B 04T
(54 hours) (3 hours per week) (3 credits)

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

a. The importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
b. The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials.
c. The significance of microscopy in visualizing trace evidence and comparing it with control samples.
d. The usefulness of photography and videography for recording the crime scenes.

Module I: Instrumentation (22 hrs)

Sample preparation for chromatographic and spectroscopic evidence. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography. Spectroscopic methods. Fundamental principles and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law. Electrophoresis – fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

Module II: Microscopy and Forensic photography (22 hrs)

Fundamental principles. Magnification, Resolution, Different types of microscopes- Compound microscope, Comparison microscope, Electron microscope. SEM, TEM, Stereomicroscope Polarization and application Forensic applications of microscopy. Basic principles and applications of photography in forensic science. 3D photography. Photographic evidence. Infrared and ultraviolet photography. Digital photography. Videography. Crime scene and laboratory photography.

Module III: Statistical methods (10 hrs)

Measures of central tendency:- Mean, Median and Mode Measures of dispersion:- Range, Mean Deviation, Variance, Standard Deviation, Coefficient of variation. Correlation and regression (brief account). Probability:-Laws of probability. Addition theorem and Multiplication theorem. Probability Distribution:- Binomial Distribution, Normal Distribution and Poisson distribution Test of hypothesis:- Null hypothesis, Alternate hypothesis Chi-square test and t-test.

Recommended Reading:

1. D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry*, 6th Edition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).
3. J.W. Robinson, *Undergraduate Instrumental Analysis*, 5th Edition, Marcel Dekker, Inc., New York (1995).
4. D.R. Redsicker, *The Practical Methodology of Forensic Photography*, 2nd Edition, CRC Press, Boca Raton (2000).
5. Jasra. P.K. and Raj Gurdeep 2000. Biostatistics.
6. Khan, I.A. and Khayum. Fundamentals of Biostatistics. Wraaz Publ. Hyderabad.
7. Norman, T.J. Bailey. Statistical methods in Biology Cambridge Univ. Press.
8. Prasad, S. 2003. Elements of Biostatistics. Rastogi Publ.
9. Ramakrishnan, P. Biostatistics, Saras Publishers.

CORE COURSE IV: PRACTICAL- I* D

INSTRUMENTATION TECHNIQUES
(36 ours) (2 hours per week)

1. To carry out thin layer chromatography of ink samples.
2. To determine the concentration of a colored compound by colorimetry analysis.
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. Work out the problems related to mean, median, mode, standard deviation, probability, Chi-square test, t-test and correlation.
9. Familiarise the technique of data representation (tables, bar-diagram, histogram, pie-diagram and frequency curve (manual and using computer).

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE –VI

FORENSIC PHYSICS
Code: FSC5B 06T

(54 hours) (3 hours per week) (3 credits)

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

a. The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
b. The tools and techniques for analysis of different types of crime scene evidence.

Module I: Glass, Paint & Fibre **(18 hrs)**

Collection, packaging, analysis of glass evidence. Matching of glass samples by mechanical fit and refractive index measurements. Analysis by spectroscopic methods. Fracture analysis and direction of impact. Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases. Fibre evidence – artificial and man-made fibres. Collection of fibre evidence. Identification and comparison of fibres.

Module II: Soil & Cloth evidence **(18 hrs)**

Importance, location, collection and comparison of soil samples. Cloth evidence – importance, collection, analysis of adhering material. Matching of pieces.

Module III: Tool marks **(18 hrs)**

Classification of tool marks. Forensic importance of tool marks. Collection, preservation and matching of tool marks. Restoration of erased serial numbers and engraved marks. Forensic gemmology. Accident Analysis- Extent of vehicle damage, Estimation of speed, Tyre tread marks and skid marks, Trace evidence at accident sites, Hit and run investigations.

Recommended Reading:

1. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
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).

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE –VII

FORENSIC BALLISTICS
Code: FSC5B 07T
(54 hours) (3 hours per week) (3 credits)

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

a. The classification of firearms and their firing mechanisms.
b. The methods of identifying firearms.

c. *The characteristics of ammunition.*
d. *The importance of firearm evidence.*
e. *The nature of firearm injuries.*
f. *The methods for characterization of gunshot residue.*

Module I: Firearms and ammunitions (18 hrs)

Types of firearms and ammunition, Primer and priming compounds, Head stamp markings, Ballistics – internal, external and terminal. Mechanism of gun. Various kinds of firing marks- rifling marks, base markings, chamber marking, extraction and Ejection markings. Comparison microscope-instrumentation.

Module II: Firearm evidence (18 hrs)

Collection and preservation of firearm evidence- firearm, ammunition, targets etc, Identification of bullets, wads collected from scene of crime. Matching of bullets and cartridge cases, Gunshot residues-mechanism of formation, sample collection, analysis and instrumentation, Identification of shooter, Detection of range of firing- contact range, near contact, point blank, powder range, chip, Range, distant range, Determination of angle of impact, Ricochet analysis.

Module III: Identification and nature of firearm injuries (18 hrs)

Identification and nature of firearm injuries, Shotgun, pistol, revolver, rifle, air guns. Bullet hole examinations-entry and exit hole determination, Estimation of calibre from bullet holes, Wave and cavitation effect, Bullet and trajectory through glass and other targets, Reconstruction with respect to accident, suicide and homicide.

Recommended Reading:

1. B.J. Heard, *Handbook of Firearms and Ballistics*, Wiley and Sons, Chichester (1997).
2. W.F. Rowe, Firearms identification, *Forensic Science Handbook*, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
3. A.J. Schwoeble and D.L. Exline, *Current Methods in Forensic Gunshot Residue Analysis*, CRC Press, Boca Raton (2000).
4. E. Elaad in *Encyclopedia of Forensic Science, Volume 2*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. T.J. Gardener and T.M. Anderson, *Criminal Evidence*, 4th Ed., Wadsworth, Belmont (2001).
6. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

CORE COURSE XVI: PRACTICAL II*-A

FORENSIC PHYSICS & BALLISTICS
(54 hours) (3hours per week)

1. To compare soil samples by density gradient method.
2. To compare paint samples by physical matching method.
3. To compare paint samples by thin layer chromatography method.
4. To compare glass samples by refractive index method.
5. To identify and compare tool marks.
6. To compare cloth samples by physical matching.
7. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
8. To correlate the velocity of bullet with the impact it produces on the target.
9. To correlate the striking angle of the bullet with the impact on the target.
10. To estimate the range of fired bullets.
11. To carry out the comparison of fired bullets.
12. To carry out the comparison of fired cartridge cases.
13. To identify gunshot residue.
14. To correlate the nature of injuries with distance from which the bullet was fired.
15. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- VIII

FORENSIC DERMATOGLYPHICS AND QUESTIONED DOCUMENTS
Code: FSC5B 08T
(54 hours) (3 hours per week) (3 credits)

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

a. The fundamental principles on which the science of fingerprinting is based.
b. Fingerprints are the most infallible means of identification.
c. The world's first fingerprint bureau was established in India.
d. The method of classifying criminal record by fingerprints was worked out in India, and by Indians.
e. The physical and chemical techniques of developing fingerprints on crime scene evidence.
f. The significance of foot, palm, ear and lip prints.
g. The importance of examining questioned documents in crime cases.
h. The tools required for examination of questioned documents.
i. The significance of comparing hand writing samples.
j. The importance of detecting frauds and forgeries by analyzing questioned documents.

Module I: Basics of Fingerprinting (20 hrs)

Introduction and history, with special reference to India. Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints. Classification and cataloguing of fingerprint record. Automated Fingerprint Identification System. Significance of poroscopy and edgeoscopy. Development of Fingerprints- Latent prints. Constituents of sweat residue. Latent fingerprints' detection by physical and chemical techniques. Mechanism of detection of fingerprints by different developing reagents. Application of light sources in fingerprint detection. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Fingerprinting the deceased. Developing fingerprints on gloves.

Module II: Other Impressions (12 hrs)

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

Module III: Nature and Scope of Questioned Documents (22 hrs)

Definition of questioned documents. Types of questioned documents. Preliminary examination of documents. Basic tools needed for forensic documents' examination – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, visible spectral comparator, electrostatic detection apparatus. Determining the age and relative age of documents. Comparison of Documents- Comparison of handwriting. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and 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. Forgeries- Alterations in documents, including erasures, additions, over-writings and obliterations. Indented and invisible writings. Charred documents. Examination of counterfeit Indian currency notes, passports, visas and stamp papers. Disguised writing and anonymous letters.

Recommended Reading:

1. J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton (2004).
4. Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).
5. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton (1982).
6. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, Foundation Press, New York (1995).
7. R.N. Morris, *Forensic Handwriting Identification: Fundamental Concepts and Principles*, Academic Press, London (2000).

8. E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants (1997).

CORE COURSE XVI: PRACTICAL- II*B

FORENSIC DERMATOGLYPHICS AND QUESTIONED DOCUMENTS
(54hours) (3 hours per week)

1. To record plain and rolled fingerprints.
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To use different light sources for enhancing developed fingerprints.
9. To prepare cast of foot prints.
10. To identify handwriting characters.
11. To study natural variations in handwriting.
12. To compare handwriting samples.
13. To detect simulated forgery.
14. To detect traced forgery.
15. To study the line quality defects in handwriting samples.
16. To examine the security features of currency notes, passports and plastic money.
17. To study alterations, obliterations and erasures in handwriting samples.

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- IX

FORENSIC CHEMISTRY & TOXICOLOGY
Code: FSC5B 09T

(54 hours) (3 hrs per week) (3 credits)

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

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.
b. The methods of analyzing contaminants in petroleum products.
c. The classification and characteristics of the narcotics, drugs and psychotropic substances.
d. The significance of toxicological studies in forensic science.
e. The classification of poisons and their modes of actions.
f. The absorption of poisons in body fluids.
g. The forensic identification of illicit liquors.
h. The classification and characteristics of the narcotics, drugs and psychotropic substances.
i. The menace of designer drugs.
j. The methods of identifying and purifying narcotics, drugs and psychotropic substances.

Module I: Petroleum and Petroleum Products (15 hrs)

Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.

Module II: Basics of Toxicology and Poisons (20 hrs)

Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests. Postmortem Toxicology. Human performance toxicology. Dose-response relationship. Lethal dose 50 and effective dose 50. Classification of poisons. Physico-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings. Signs and symptoms of common poisoning and their antidotes. Collection and preservation of viscera, blood and urine for various poison cases. Identification of biocides and metal salts in body fluids. Metabolism and excretion of poisons. Application of immunoassays in forensic work. Animal poisons. Snake venom. Mode of action. Carbon monoxide poisoning. Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms. Beverages. Alcoholic and non-alcoholic illicit liquors. Analysis and identification of ethyl alcohol. Estimation of ethyl alcohol in blood and urine. Proof spirit. Crime scene management in illicit liquor cases.

Module III: Narcotics, Drugs, Psychotropic Substances and Alcoholic Beverages (19 hrs)

Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances. Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substances**.** Crime scene search for narcotics, drugs and psychotropic substances – searching a suspect, searching a dwelling, searching a vehicle. Clandestine drug laboratories. Collection and preservation of drug evidence. Testing of narcotics, drugs and psychotropic substances. Isolation techniques for purifying narcotics, drugs and psychotropic substances – thin layer chromatography, gas-liquid chromatography and high performance liquid chromatography. Presumptive and screening tests for narcotics, drugs and psychotropic substances. Microcrystalline testing of drugs of abuse. Analysis of narcotics, drugs and psychotropic substances in breast milk, saliva, urine, hair and antemortem blood. Drugs and driving. Dope tests. Analysis of narcotics, drugs and psychotropic substances in postmortem blood. Postmortem changes affecting the analysis of narcotics, drugs and psychotropic substances.

Recommended Reading:

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. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
4. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition, Oxford University Press, New York (1983).
5. S.B. Karch, *The Pathology of Drug Abuse*, CRC Press, Boca Raton (1996).
6. A. Poklis, Forensic toxicology in, *Introduction to Forensic Sciences*, 2nd Edition,

W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
7. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, *Alcohol, Drug and Driving*, 4, 99 (1988).

CORE COURSE XVI: PRACTICAL- II* C

FORENSIC CHEMISTRY & TOXICOLOGY
(36 hours) (2 hours per week)

1. To carry out analysis of gasoline.
2. To carry out analysis of diesel.
3. To carry out analysis of kerosene oil.
4. To identify illicit drugs by spot tests.
5. To perform color tests for opiates.
6. To perform color tests for barbiturates.
7. To identify methyl alcohol.
8. To identify ethyl alcohol.
9. To identify biocides.
10. To identify metallic poisons.
11. To identify organic poisons.
12. To identify ethyl alcohol.
13. To identify methyl alcohol.
14. To carry out quantitative estimation of ethyl alcohol.
15. To prepare iodoform.
16. To identify drugs of abuse by spot tests.
17. To perform colour tests for barbiturates.
18. To separate drugs of abuse by thin layer chromatography.

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- X

FORENSIC MEDICINE
Code: FSC6B 10T
(36 hours) (2hours/ week) (2 credits)

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

a. The duties of the first responding officer who receives a call on homicide or suicide case.
b. The steps involved in processing the death scene.
c. The importance of ascertaining whether the crime was staged to appear as suicide or accident.
d. The importance of bloodstain patterns in reconstructing the crime scene.
e. The importance of autopsy.
f. The importance of forensic odontology.

Module I: Death Investigations **(12 hrs)**

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. Miranda warning card. Assessing the crime scene. Request for forensic team. Importance of command post and log book. Management of crowd and media. Importance of taking notes. Items to be a part of noting. Documenting the death scene. Processing evidence. Evaluation of injuries. 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 **(12 hrs)**

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.

Unit III: Forensic Odontology **(12 hrs)**

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

Recommended Reading:

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).
3. J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
4. 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).
5. V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton (2006).
6. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton (2008).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- XI

FORENSIC BIOLOGY AND SEROLOGY
Code: FSC6B 11T
(54 hours) (3hours/ week) (3 credits)

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

a. The significance of biological and serological evidence.
b. The forensic importance of hair evidence.
c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
d. How forensic entomology assists in death investigations.
e. The usefulness of genetic markers in forensic investigations.
f. The forensic importance of bloodstain patterns

Module I: Biological evidence (22 hrs)

Hair- Significance, transfer and recovery, Structure of human hair, Morphology and biochemistry of human hair, Comparison of hair samples, Comparison of human and animal hairs. Semen- Forensic significance of semen, Composition and morphology of spermatozoa, Collection, evaluation and tests for identification of semen. Types and identification of microbial organisms of forensic significance, Diatoms and their forensic significance, Structure and analysis of skull and bones.

Module II: Serological evidence (22 hrs)

Composition of blood, Collection and preservation of blood evidence, Importance of dried blood stains, Antigens and antibodies, ABO blood groups, Determination of blood group from dried blood stains, Extracellular proteins and intracellular enzymes, Blood spatter analysis –basics, Composition and analysis of common body fluids like saliva, milk, sweat, urine, etc.

Module III: Forensic entomology (10 hrs)

Insects of forensic importance, Collection of entomological evidence during death investigations. 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.

Recommended Reading:

1. L. Stryer, *Biochemistry*, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, *Harper's Biochemistry*, APPLETON & Lange, Norwalk (1993).
3. S. Chowdhuri, *Forensic Biology*, BPRD, New Delhi (1971).

4. R. Saferstein, *Forensic Science Handbook*, Vol. III, Prentice Hall, New Jersey (1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

CORE COURSE XVII: PRACTICAL III*-A

FORENSIC MEDICINE, FORENSIC BIOLOGY & SEROLOGY

(36 hours) (2 hours per week)

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 analyze and preserve bite marks.
5. To examine hair morphology and determine the species to which the hair belongs.
6. To prepare slides of scale pattern of human hair.
7. To examine human hair for cortex and medulla.
8. To carry out microscopic examination of pollen grains.
9. To carry out microscopic examination of diatoms.
10. To cite a crime case in which diatoms have served as forensic evidence.
11. To prepare a case report on forensic entomology.
12. To determine blood group from fresh blood samples.
13. To determine blood group from dried blood sample.
14. To carry out the crystal test on a blood sample.
15. To identify blood samples by chemical tests.
16. To identify the given stain as saliva.
17. To identify the given stain as urine.
18. To carry out cross-over electrophoresis.
19. To study the correlation between impact angle and shape of bloodstain.
20. To identify the point of convergence from the bloodstain patterns.

SIXTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE-XII

ADVANCED TECHNIQUES IN PERSONAL IDENTIFICATION
Code: FSC6B 12T
(54 hours) (3 hours per week) (3credits)

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

a. The basic principle of DNA analysis.
b. The forensic significance of DNA typing.
c. The importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.
d. Role of DNA typing in parentage testing.
e. Importance of forensic anthropology in identification of persons.
f. Different techniques of facial reconstruction and their forensic importance.
g. Significance of somatoscopy and somatometry.
h. The basis of biometry.
i. The classification of biometric processes.
j. The importance of behavioral biometry.

Module I: Forensic DNA analysis (24 hrs)

DNA – fundamentals, structure, composition, Mitochondrial DNA, Evidentiary clue materials- collection of specimens, Extraction of sample for analysis, Polymerase Chain Reaction (PCR), Short Tandem Repeats (STR)- Role of fluorescent dyes, Restriction Fragment Length Polymorphism(RFLP), Touch DNA. Individuality determination – maternity and paternity issues. Role of DNA typing in identifying unrecognizable bodies. Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

Module II: Forensic Anthropology (15 hrs)

Scope of forensic anthropology. Somatoscopy- observation of forehead, eye, nasal bridge, nasal tip, ear lobes, circumference of head, facial fractures etc. Somatometry- measurement of above features. Facial reconstruction- facial superimposition techniques and other techniques.

Module III: Biometrics (15 hrs)

Definition, characteristics and operation of biometric system. Classification of biometric systems – physiological and behavioral. Strength and weakness of physiological and behavioral biometrics. Multimodal biometrics. Key biometric processes – enrolment, identification and verification. Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies. Physiological Biometrics- Fingerprints, palm prints, iris, retina,

geometry of hand and face. Behavioral Biometrics- Handwriting, signatures, keystrokes, gait and voice.

Recommended Reading:

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). J.M. Butler, *Forensic DNA Typing*, Elsevier, Burlington (2005).
4. K. Inman and N. Rudin, *An Introduction to Forensic DNA Analysis*, CRC Press, Boca Raton (1997).
5. H. Coleman and E. Swenson, *DNA in the Courtroom: A Trial Watcher's Guide*, GeneLex Corporation, Washington (1994).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
7. S. Nanavati, M. Thieme and R. Nanavati, *Biometrics*, Wiley India Pvt. Ltd. (2002).
8. P. Reid, *Biometrics for Network Security*, New Delhi (2004).
9. J.R. Vacca, *Biometric Technologies and Verification Systems*, Butterworth-Heinemann, Oxford (2007).

SIXTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE- XIII

CRIME INVESTIGATION TECHNIQUES
Code: FSC6B 13 T

(54 Hours) (3 hours per week, 3 credits)

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

a. *The methods of securing, searching and documenting crime scenes.*
b. *The art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.*
c. *The legal importance of chain of custody.*
d. *The tools and techniques for analysis of different types of crime scene evidence.*
e. *To reconstruct crime scene.*

Module I: Crime Scene Management (18 hrs)

Types of crime scenes – indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods. Safety measures at crime scenes. Legal considerations at crime scenes. Documentation of crime scenes – photography, videography, sketching and recording notes. Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at crime scenes. The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how?). Crime scene logs.

Module II: Crime Scene Evidence and report writing (18 hrs)

Classification of crime scene evidence – physical and trace evidence. Locard principle. Collection, labelling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody. Report Writing and Evidence Evaluation- Components of reports and Report formants in respect of Crime Scene and Laboratory findings Court Testimony- admissibility of expert testimony, pre Court preparations & Court appearance, Examination in chief, cross examination and re-examination, Ethics in Forensic Science.

Module III: Crime Scene Reconstruction (18 hrs)

Introduction, Importance of crime scene reconstruction, nature of reconstruction. Basic principle of reconstruction (Recognition, Identification, Individualization, Reconstruction), Stages of reconstruction, Types of reconstruction- Classification, Pattern evidence reconstruction, Writing a reconstruction report, general recommendations. Final report for court presentation, case study.

Recommended Reading:

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).

CORE COURSE XVII: PRACTICAL III*B

ADVANCED TECHNIQUES IN PERSONAL IDENTIFICATION & CRIME INVESTIGATION TECHNIQUES

(36 hours) (2 hours per week)

1. To carry out extraction of DNA from body fluids.
2. To preparation of gel plates for electrophoresis.
3. To carry out electrophoresis for separation of enzymes.
4. To prepare a report on the role of DNA typing in solving paternity disputes.
5. To determine of age from skull and teeth.
6. To determine of sex from skull.
7. To determine sex from pelvis.
8. To study identification and description of bones and their measurements.
9. To investigate the differences between animal and human bones.
10. To perform somatometric measurements on living subjects.
11. To carry out craniometric measurements of human skull.
12. To estimate stature from long bone length.
13. To protect and record scene of crime by different methods of barricading (indoor and

outdoor).

14. To photograph scene of crime: Bird eye view, angular photography and close-up photography, evidential photography with and without light source.
15. To videograph scene of crime: Full scene videography, evidential videography.
16. Sketching of crime scene: Rough sketch of indoor/ outdoor crime scene, Final sketch of indoor/ outdoor crime scene.
17. Searching of evidence on scene of crime: Evidence search using traditional method of searching, evidence searching using light sources and modern technology, search of evidence in case of old crime scenes.
18. To prepare a report on evaluation of crime scene.
19. Collection of evidence at scene of crime (Physical, chemical, biological, document, fingerprint, ballistics, etc.,)
20. Preservation of evidences according to their nature, stability, reactivity.
21. Packing, sealing and forwarding of physical evidence to forensic science laboratory.
22. To reconstruct a crime scene (outdoor and indoor).

SIXTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE CORE COURSE XIV

CYBER CRIME & CYBER FORENSICS
Code: FSC6B 14T
(54 hours) (3 hours per week) (3 credits)

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

a. The basics of digital forensics.
b. The cases which fall under the purview of digital crimes.
c. The types of digital crimes.
d. The elements involved in investigation of digital crimes.

Module I: Computer fundamentals (20 hrs)

Fundamentals of computer hardware and accessories, development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats. Memory and processors – methods of storing data, Operating systems, Networks- LAN, WAN and MAN.

Module II: Cyber crimes (15 hrs)

Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems. Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, 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.

Module III: Computer Forensic Investigations (19 hrs)

Seizure of suspected computer. Preparation required prior to seizure. Collection and seizure of magnetic data, Treatment of exhibits, Extraction of information, Restoration of deleted files –familiarization of software, Encase, Cyber check suites, Encryption and decryption methods**.** 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. Encryption and decryption methods. Tracking users.

Recommended Reading:

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).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).

CORE COURSE XVII: PRACTICAL III*C

CYBER CRIME & CYBER FORENSICS

(36 hours) 2hours per week

1. To identify, seize and preserve digital evidence from crime scenes.
2. To detect deletions, obliterations and modifications of files using encase software.
3. To trace routes followed by e-mails and chats.
4. To identify the IP address of the sender of e-mails.
5. To demonstrate concealment techniques using cryptographic PGP.
6. To identify encrypted files.
7. To identify hidden files.
8. To use digital signatures for securing e-mail and online transactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digital record.
11. To carry out imaging of hard disks.

PROJECT WORK Code No: [FSC06 18(Pr)] – Vth SEMESTER

(36 hrs 2 hrs/ week, 3-credits)
Internal Mark-10
External Mark-40

Students are required to undertake project work on problems pertaining to Forensic Science of 36 hrs duration in Vth Semester. Project work should be done as an extension of topics in the syllabus. Scientific study on the topic selected is required to be carried out under the supervision and guidance of faculty members. Project work may be done individually or as group of maximum of six students. A part of the project may be done in collaboration (association) with any of the CFSL/FSL/RFSL/FPB/Chemical Examiner's Laboratory/

Kerala Police Academy/ Any other State or Central Institutions of Forensic importance. The hours spent for the project work in any of the above mentioned institutions shall be counted for the percentage of attendance, provided that the attendance certificate shall be produced from the institution. Each student has to actively participate in the project work. The problem/ topic chosen by an earlier batch of students for their project work shall not be repeated by a latter batch. A certificate to this effect has to be attached by the Head of the department. A well documented project report duly attested by the supervising teacher and the Head of the Department must be submitted by *each candidate* for evaluation separately on the day of practical examination during VIth semester. The project must contain the following sections.

1. Introduction and objectives of study (This part may contain citations of relevant literature in the field, if available).
2. Methodology.
3. Interpretation of results.
4. Reference

Field Study/ Study Tour (10 Marks)

A field study/study tour of five days is compulsory during the tenure of the programme. A total of at least three days should be kept apart for visiting CFSL/FSL/RFSL/FPB/Chemical Examiner's Laboratory/ Any other State or Central Institutions of Forensic importance. Two day trip should be associated with a visit to Police Station and Court. A detailed tour report certified by the teacher in charge of study tour and also by the Head of the Department regarding the field study/study tours specifying the places and institutions visited, date and time of visit, details of observations made etc. must be submitted by each student for evaluation during the day of practical examination of VIth semester. The study tour report is compulsory for each student appearing for practical examination.

Viva-Voce (Two credits, 15 Marks)

At the end of VIth semester each student shall appear for a viva-voce before a team of two external examiners. External evaluation for Project report and Field study report will be conducted at the end of Semester VI on the next day after Practical III along with a viva-voce. The questions will be based on basic forensic science concepts and field study. It shall not normally exceed 10.m per candidate. Marks shall be given according to their performance. There shall be an internal viva-voice for 3 Marks.

SYLLABUS

OPEN COURSES
FSC5D 01, 02 & 03

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE OPEN COURSE- I

BASIC CONCEPTS IN CRIMINOLOGY AND FORENSIC SCIENCE
Code: FSC5D 01
(36 hours) (2 hours per week) (2 credits)

Module I: Concept and definition of crime. Causes of crime. Social changes and crime. Aim and scope of criminology and criminal anthropology. Theory of criminal behavior. Organized crime and public disorder. Control and prevention of crime. Criminal profiling. Understanding modus operandi. Investigative strategy. Police's power of investigation. Filing of criminal charges. **(12 hrs)**

Module II: Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science. Tools and techniques in forensic science. Branches of forensic science. Forensic science in India: Organizational set up of forensic science laboratories. Narcotic Drugs and Psychotropic Substances Act. Drugs and Cosmetics Act. Explosive Substances Act. Dowry Prohibition Act. Prevention of Food Adulteration Act. Prevention of Corruption Act. Arms Act. Wildlife Protection Act. I.T.Act. Problem of proof, presentation of evidence and evidentiary clues. Police, Medico-legal expert, Judicial officers. **(12 hrs)**

Module III: Facilities provided in forensic Science laboratories for chemical, physical, biological, psychological, digital and cyber crime detection and analysis. Detection of crime scene, Crime scene management, Role of forensic scientists, investigative officers, forensic doctors, fire brigade, judiciary. Importance of physical evidence, collection of physical evidence in crimes like murder, rape, theft, extortion, explosion etc. **(12 hrs)**

Recommended Reading:

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

FIFTH SEMESTER B. Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE OPEN COURSE-II

LABORATORY QUALITY MANAGEMENT AND SAFTEY
Code: FSC5D 02
(36 hours) (2 hours per week) (2 credits)

Module I: Standards for analysis (6 hrs)
Basic standards – Need of standards is analytical sciences – Basic chemical standards – Analytical standards – Reference materials – high purity substances – Certified reference materials – working or secondary standards – matrix effect in standards – Biological standards – Biochemical standards – Microbial cell lines and standards.

Module II: Quality Management (6 hrs)
Introduction – Quality -Quality system – Quality plan – Inspection and testing – Test records – Control of inspection Handling, storage, packaging, preservation and delivery of the material – Control of quality records – Internal quality audits – Quality assurance – Training.

Module III: Laboratory Accreditation and Laboratory Management (12 hrs)
ISO 9000 and ISO 14000 and 17000 series of standards – Accreditation Boards – NABL guidelines for accreditation in India. ILAC, APLAC. Requirements as per ISO/IEC 17025:2005 or ISO 15189:2007 for accreditation of laboratory. Proficiency testing system – Internal quality control – Inter and intra laboratory testing programmes – Designing and running the proficiency testing programmes – Confidentiality. Advantages of accreditation.
Administration of Laboratories – Types of laboratories – Connection between filed work and laboratory – Educational requirements of laboratory personnel – Routine laboratory work – Research and development – Internal organization of a laboratory.

Module IV: Architectural requirements and Laboratory safety (12 hrs)

Laboratory design – Floor area furniture design – Auxiliary services – Receipt of reports and remnants – Record management – Requirement of equipment, glassware, chemicals and other material – Purchase procedure – Disposal of wastes – Security of the premises. Laboratory Information Management system (LIMS) classification of LIMS functions – Sub-division by functional area – Definition of LIMS – Strategic design of LIMS – System development life cycle – Review of the laboratory – Project proposal – Definition of system requirements – specifications – commercial or Bespoke LIMS – Evaluation – Purchase and installation – Demonstration – Validation – user training and implementation. Laboratory safety: Planning – written safety plan – Safety policies – Safety resources – operations Hazards of chemicals, solvents, poisons and explosives – storage facilities – Biological hazards -Pressure vessels and then handling – Electrical safety – Fume cup boards- Exhausts system – Protective equipment-Emergency care and medical facilities.

Recommended Reading:

1. Woodget, B. W. and Cooper, D.: *Sample and Standards*, ACOL Series, Wiley 1987.
2. Dux, J. P., *Hand Book of Quality Assurance for Analytical Chemistry Laboratory*, Van Nostrand, 1986.
3. Duncan, W. L.: *Total Quality: Key Terms and Concepts*, 1995.
4. Shah, D. H.: *QA Manual*, Business Horizons, 2000.
5. Kumar, K.: *Quality Management*, ABD Pub., 2000.
6. Ross, J.: *Total Quality Management*, Vanity Book, Intl., 1995.
7. Seiler, J. P., *Good Laboratory practice*, Springer, 2000.
8. Diwan, P.,: *Quality in Totality*, Manager's Guide to TQM and ISO 9000, Deepti & Deepti Pub., 2000.
9. Gyani, G. J.,:*Training Manual on ISO 9000; 2000 and TQM*, Raj Pub., 1999
10. Olson, M. H. and Davis, G. B.: *Management Information Systems*, McGraw Hill, 1998.
11. Specific Guidelines for Accreditation of Forensic Science Laboratories, DST, 1998.
12. Guide for Safety in The Chemical Laboratory: Manufacturing Chemist's Association, 1972.
13. Steere N. V.(Ed.): *Hand Book of Laboratory Safety*, CRC, 1967.
14. Tilstone, W. J. and Lothridge, K.: Crime Laboratory Management, Taylor and Francis, 2004.
15. Clair, J. S: *Crime Laboratory Management, Academic Press*, 2003.

FIFTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE OPEN COURSE- III

ECONOMIC OFFENCES
Code: FSC5D 03
(36 ours) (2 hours per week) (2 credits)

Module I: 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. 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. **(18 hrs)**

Module II: Forensic accountancy and forensic auditing. Valuation of economic losses. Violation of Intellectual Property Rights. **(9 hrs)**

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

agencies to deal with different forms of economic offences. International perspectives – measures adopted by INTERPOL. Case histories of economic offences. **(9 hrs)**

Recommended Reading:

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.

SYLLABUS

ELECTIVE COURSES
FSC6B 15(E) 01, 02 & 03

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE ELECTIVE COURSE- I

ARSON AND EXPLOSIVES
Code: FSC6B 15(E) 01T
(54 hours) (3 hours per week) (3 Credits)

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

a. The method of searching, collecting, preserving and analyzing arson evidence.
b. The classification of explosives, including the synthesis and characterization of representative analogs.
c. The significance of bomb scene management.
d. The techniques of locating hidden explosives.

Module I: Arson **(20 hrs)**

Chemistry of fire. Conditions for fire. Fire scene patterns. Location of point of ignition. Recognition of type of fire. Searching the fire scene. Collection and preservation of arson evidence. Analysis of fire debris. Analysis of ignitable liquid residue. Post-flashover burning. Scientific investigation and evaluation of clue materials. Information from smoke staining.

Module II: Classification, Synthesis and characteristics of explosives (24 hrs)
Low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents. TNT, PETN and RDX. Explosion process. Blast waves.

Module III: Blast scene management (10 hrs)
Searching the scene of explosion. Mechanism of explosion. Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives.

Recommended Reading:

1. J.D. DeHaan, *Kirk's Fire Investigation*, 3rd Edition, Prentice Hall, New Jersey (1991).
2. 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).
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).
5. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in *Forensic Science*, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

CORE COURSE XVII: ELECTIVE COURSE PRACTICALS III*D

ARSON AND EXPLOSIVES

1. To analyze arson accelerators.
2. To prepare a case report on a case involving arson.
3. To carry out analysis of explosive substances.
4. To separate explosive substances using thin layer chromatography.
5. To prepare a case report on bomb scene management.

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE ELECTIVE COURSE- II

FORENSIC BOTANY AND WILD LIFE FORENSICS
Code: FSC6B 15(E) 02T

(54 hours) (2 hours per week) (3 credits)

Module I: Forensic Botany (18 hrs)
Plant morphology, plant anatomy, Cell structure and functions. Basic plant tissues plant systematic, palynology, Plant architecture- roots, stems, flowers, leaves. Practical plant classification schemes.

Module II: Identification and matching (18 hrs)
Various types of woods, timbers, seeds and leaves and their forensic importance. Identification and matching . Various types of Planktons and diatoms and their forensic importance. Study and identification of pollen grains, Identification of starch grains,

powder and stains of spices etc. Paper and Paper Pulp identification. Types of poisonous plants. Types of plants yielding drugs of abuse.

Module III: Wildlife Forensics (18 hrs)

Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals. Birds flight and means of locomotion, Strikes and collisions, Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts, Applications of Forensic Ornithology, Feather structure and topography.

Recommended Reading:

1. Hosetti, B.B; *Concept in wildlife Management*, Daya Publishing House,(2005)
2. Linarce, Adrian; *Forensic science in wildlife investigation*, CRC Press, Taylor & Francis,(2009)
3. Baalu, T.R.; *The wild life (protection) act, 1972*, Nataraj Publication,(2001)
4. Universal Publication; *Wild life (Protection act,1972)*, Universal Publication,(2005)
5. K.Ramesh Rao & S.K. Purkayastha; *Indian woods*, FRI Press, (1972)
6. N. Clifford; *Timber Identification*, Leonard Hill ltd.,(1957)
7. Herbert L. Edlin; *A manual of wood identification*, Viking Press, (1976)
8. Herbert Stone; *The timbers of commerce*, International book distributors, (1985)
9. Erdtman, G; *Pollen morphology & Plant taxanomy: angiosperms (an introduction to palynology)*, Hafner Publishing Co., (1971)
10. Coyle, Heather Miller; *Forensic botany*, CRC Press, (2005)
11. Gangulee, Hirendra Chandra; *College botany*, New Central Book Agency, (1972).

CORE COURSE XVII: ELECTIVE COURSE PRACTICALS III*D

FORENSIC BOTANY AND WILD LIFE FORENSICS

1. Morphological & microscopic examination of fibers.
2. Microscopic and chemical comparison of paper pulp.
3. Identification of diatoms.
4. Identification of starch granules.
5. Common staining techniques and laboratory exercises for identification of different plant cell types.
6. Microscopy of various plants fibers.
7. Differentiation of fibers including sisal, manila, jute and cotton based on ashing.
8. Microscopical examination of man-made fibers.
9. Section and cutting of plant material and their examination.
10. To prepare a case report on problems of wildlife forensics.

SIXTH SEMESTER B.Sc. DEGREE PROGRAMME (Theory)

FORENSIC SCIENCE ELECTIVE COURSE- III

FORENSIC AUDIO VIDEO ANALYSIS
Code: FSC6B 15(E) 03T
(54 hours) (3 hours per week) (3 credits)

Module I: Introduction of Sound (18 hrs)

The generation of sound**,** Speech anatomy and mechanism, Physical properties of vibrating systems**,** Phonemes. Articulation. Phonetic aspects of speech, principles of speaker recognition.

Module II: Audio evidences (18 hrs)

Collection and specimen sample collection. Speaker recognition – manual, semi – automatic and automatic methods and familiarization of some software. Fourier analysis, Fourier transforms, acoustic speech production, error in speaker identification, application in automatic speaker identification and verification system.

Module III: Video evidences (18 hrs)

The generation of video, the concepts of editing, Image clarification in a video – methods and familiarization of software. Forensic audio video analysis, voltage, decibels, audio line levels, frequency measurements, spectrum analysis, noise characteristics, digital filters and audio enhancement, authentication off-recorded audio, speech spectrographic analysis, magnetic developing and optical methods. Falsification in video recording, video frame sequence, method – waveform – vectroscope, videogrametry and photogrametry techniques, video image analysis, facial image recognition from video frame image

Recommended Reading:

1. Arthur R Weeks Jr; *Fundamentals of Electronic Image*. SPIE Press, (2003).
2. Bengold & Nelson Moryson; *Speech and Audio signal processing*, John Wiley & Sons, USA (1999).
3. D.B. Fry; *The Physics of Speech*, Cambridge University Press. (2004).
4. David Cheshire; *The Complete Book of Video Techniques Subjects Equipment*, Dorling Kindersley, London (1992).
5. Gloria J. Borden *et al. Speech Science Primer (Physiology, Acoustics and perception of Speech)*, 6th Ed, a Wolters Kluwer Company, USA. (2011)
6. Harry Hollien; *Forensic Voice Identification*, Academic Press, London. (2001).
7. John C. Russ; *Forensic Uses of Digital Imaging* CRC Press, (2001).
8. Taylor and Francis, *Forensic Science Series*, London (2002)

CORE COURSE XVII: ELECTIVE COURSE PRACTICALS III*D

FORENSIC AUDIO VIDEO ANALYSIS

1. Recording of speech samples using tape recorder & digital recorders and measures for keeping it in the safe custody.
2. Speaker wise segregation of speech sample of recorded conversation spoken between two speakers.
3. Transfer of audio file from a digital media to other media using standard software and authentication of recorded speech.
4. Comparison of linguistic and phonetic features of audio recording voice samples of two speakers.

MODEL QUESTION PAPETR

FIRST SEMESTER B.Sc DEGREE EXAMINATION
Part III Forensic Science (Core)
FSC1B01T – Core course I – Fundamentals of Forensic Science

Time: 3 Hour **Maximum Marks: 80**

I. One Word Questions (Answer all the questions)

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

(10 x 1 = 10 Marks)

II. Paragraph Questions (Answer any ten questions)

11.
12.
13.
14.
15.
16.
17.
18.
19.
20.
21.
22.

III. Short Answer Questions (Answer any five questions) (10 x 2 = 20 Marks)

23.
24.
25.
26.
27.
28.
29.
30.

(5 x 6 = 30 Marks)

IV. Essay Questions (Answer any two questions)

31.
32.
33.
34.

(2 x 10 = 20 Marks)

SYLLABUS

UNIVERSITY OF CALICUT B.Sc. DEGREE

COURSE COMPLEMENTARY COURSE – FORENSIC SCIENCE

With effect from 2018-19 admission onwards

MARK DISTRIBUTION AND INDIRECT GRADING SYSTEM

Mark system is followed instead of direct grading for each question. After external and internal evaluations marks are entered in the answer scripts. All other calculations, including grading, will be done by the university using the software. Indirect Grading System in 7 point scale is followed. Each course is evaluated by assigning marks with a letter grade (A_+, A, B, C, D, E or F) to that course by the method of indirect grading.

SEVEN POINT INDIRECT GRADING SYSTEM

% of Marks Grade	***Grade***	***Interpretation***	***Grade Point Average***	***Range of Grade points***	***Class***
90 and above	A_+	Outstanding	6	5.5 - 6	First Class with distinction
80 to below 90	A	Excellent	5	4.5 – 5.49	
70 to below 80	B	Very good	4	3.5 – 4.49	First Class
60 to below 70	C	Good	3	2.5 – 3.49	
50 to below 60	D	Satisfactory	2	1.5 – 2.49	Second Class
40 to below 50	E	Pass/Adequate	1	0.5 – 1.49	Pass
Below 40	F	Failure	0	0 – 0.49	Fail

SCHEME OF INSTRUCTION

Forensic Science forms one of the Complementary courses of the B.Sc. Degree programme. It is to be taught during the first four semesters of the programme. The syllabus includes Theory as well as Practical components

B.SC. FORENSIC SCIENCE COMPLEMENTARY COURSE

STRUCTURE Total Credits 12 (Internal 20% & External 80%)

Semester	Code No	Course Title	Hours/ Week	Total Hours/ Semester	Credits	Marks
I	FSC1C01	Complementary Course I: Forensic Science-I	2	36	2	80
		Complementary Course V: Forensic Science Practical-I	2	36	*	--
II	FSC2C02	Complementary Course II: Forensic Science –II	2	36	2	80
		Complementary Course V: Forensic Science Practical-II	2	36	*	--
III	FSC3C03	Complementary Course III: Forensic Science –III	3	54	2	80
		Complementary Course V: Forensic Science Practical-III	2	36	*	--
IV	FSC4C04	Complementary Course IV: Forensic Science –IV	3	54	2	80
		Complementary Course V: Forensic Science Practical-IV	2	36	*	--
	FSC4C05(P)	Complementary Course V: Forensic Science Practical-V	2	36	4*	80
				Total	12	400

* Examination will be held at the end of 4th semester

SCHEME OF EVALUATION

The evaluation scheme for each course contains two parts viz. internal evaluation and external evaluation.

THEORY

1. INTERNAL EVALUATION

20% of the total marks in each course are for internal evaluation. The colleges shall send only the marks obtained for internal examination to the university. Assignments/ seminars are compulsory for all theory papers. Topics allotted for assignments/ seminars shall be considered for internal assessments only and can be subdivided among students.

Table 1:- Components of Evaluation

Sl. No.	Components	Marks
1	Attendance	4
2	Test Papers: I & II	4 + 4
3	Assignment	2
4	Seminar	2
	Total Marks	**16**

Table 2:- Percentage of Attendance and Eligible Marks

% of attendance	Marks
Above 90%	4
85-89%	3.2
80-84%	2.4
76-79%	1.6
75%	0.8

Table 3:- Pattern of Test Papers

Duration	Pattern	Total number of questions	Number of questions to be answered	Marks for each question	Marks
1.5 Hours	One word	4	4	1	4
	Short answer	4	4	2	8
	Paragraph	3	2	5	10
	Essay	2	1	10	10
				Total Marks*	**32**

*Marks: 80% & above = 4, 60 to below 80% = 3, 50 to below 60% = 2
35 to below 50% = 1 below 35% = 0

2. EXTERNAL EVALUATION

External Evaluation carries 80% of the total marks. University Examination will be conducted at the end of each semester.

Table 1:- Pattern of Question Paper

Duration	Pattern	Total number of questions	Number of questions to be answered	Marks for each question	Marks
3 Hours	One word	10	10	1	10
	Short answer	10	7	2	14
	Paragraph	6	4	5	20
	Essay	4	2	10	20
				Total Marks*	**64**

PRACTICAL

1. INTERNAL EVALUATION

Table 1:- Components of Evaluation

Sl. No.	Components	Marks
1	Attendance	5
2	Performance & Punctuality	3
3	Test Papers	4
4	Record	4
	Total Marks	**16**

Table 2:- Percentage of Attendance and Eligible Marks

% of attendance	Marks
Above 90%	5
85-89%	4
80-84%	3
76-79%	2
75%	1

Table 3:- Percentage of Eligible Marks for Performance & Punctuality

Criteria	Marks
Excellent	3
Good	2
Moderate	1

Table 4:- Percentage of Eligible Marks for Test Papers

Criteria	Marks
85% and above	4
70 - 84%	3
55 - 69%	2
40-54%	1

Table 5:- Percentage of Eligible Marks for Record

Criteria	Marks
Excellent	4
Good	3
Average	2
Below average	1

2. EXTERNAL EVALUATION

The Practical Examination will be held at the end of fourth semester. External Evaluation carries 80% of the total marks. The question paper for the conduct of practical examination shall be prepared by the Board of External Examiners appointed by the university. The duration for the conduct of examination is **4 hours.**

SYLLABUS

First Semester B. Sc. Degree Programme

Complementary Course I: Forensic Science-I

FORENSIC PSYCHOLOGY
Code: FSC1C01

(36 hours) (2 hours per week) (Credits - 2)

Module I: Investigative psychology (12 hrs)

Criminal Psychological Profiling-Nature, Definition. Ethical Guidelines for Criminal profiler. Psychological Investigative Tools- Mental Status Examination, Psychological Testing, Polygraph Testing-Scientific base of Polygraph, Psychophysical Process, Question Formation, Procedure of Polygraph, Analysis of Graph and Limitations. Narco Analysis- Theoretical Viewpoint of Narcoanalysis, Procedural Requirements, Methodology and Ethical Considerations. Forensic Hypnosis- Theories of Hypnosis, Procedure of Hypnosis, Forensic Hypnosis on Criminals. Brain Electrical Oscillation Signature Profiling- Scientific base of BEOS, Knowing and Remembrance Psychological Autopsy- Manner of Death Defined, Types of Psychological Autopsies. Modus Operandi- Nature, Elements of Modus Operandi, Modus Operandi Risk-Low MO risk and High MO risk.

Module II: Causes of Criminal Behavior and Psychological Therapies (12 hrs)

Major Disorders and it's Symptoms and Features. ADHD, Conduct Disorder, Antisocial Personality Disorder, Sexual Disorder, Substance-Use Disorder-Substance Dependence, Substance Abuse. Psychoanalytic Therapy-Free Association, Resistance, Dream Analysis, Manifest Contents, Latent Contents, Transference, Interpretation, Behaviour Therapy-Systematic Desensitization, Assertive Training, Modeling, Token Economy, Aversive Conditioning. Cognitive Behaviour Therapy- REBT Model, Aron Beck's Cognitive Therapy. Biofeedback.

Module III: Rehabilitation & Counseling (12 hrs)

Rehabilitation- Models of Rehabilitation- Psychiatric Rehabilitation, Psychological Rehabilitation, Cognitive Rehabilitation and Social Rehabilitation. Rehabilitation of Prisoners, Rehabilitating victims of crime, Techniques & skills in rehabilitation. Counseling- Definition, Nature of Counselling, Goals of Counselling, Levels of Counselling Techniques- Non-verbal Behaviour, Verbal Behaviour, Covert Behaviour and Interpersonal Manner. Counselling Process- Relationship Establishment, Problem Identification & Exploration, Planning for Problem Solving, Solution Application & Termination. Characteristic of Counsellor, Type of counselling: Crisis, Preventive Skill to counsel criminal.

Recommended Reading:

1. '*Criminal Profiling-An Introduction to Behavioral Evidence analysis'*, Brent Turvey, Edition 2nd, 2006, Elsevier Academic press.
2. '*Handbook of Forensic Psychology'*, Prof Dr. Vimala Veeraraghwan, Edition 1st, 2009, Selective and Scientific Books Publications, New Delhi.
3. '*Handbook of Forensic Psychology*', Irving B. Weiner, Allen K. Hiss, Edition 3rd, 2006, Wiley Publication.
4. '*Theoretical Psychology'*, Moazziz Ali Beg, Sangeeta Gupta Beg, Vol [04], Edition 2nd, 2013, Global Vision Publishing House, New Delhi.
5. '*Abnormal Psychology-The Problem of Maladaptive Behaviour'*, Irwin G. Sarson, Barbara R. Sarson, Editon 11th, 2012, PHI Publication, New Delhi.
6. '*Abnormal Psychology'*, James N. Butcher, Susan M. Mineka, Jill M. Hooley, Edition 15th, 2014, Pearson.
7. '*Theories Of Counselling and Psychotherapy- Systems, Strategies, and Skills'*, Linda Seligman, Lourie W. Reichenberg, 2010, third edition, Pearson Education.

COMPLEMENTARY COURSE I: FORENSIC SCIENCE PRACTICAL - I
(36 hours) (2 hours per week)

1. Forming Relevant Questions with Polygraph.
2. Forming Irrelevant Questions with Polygraph.
3. Forming Control Questions with Polygraph.
4. Perceived Loneliness Scale.
5. Rosenswieg Picture Frustration (adult).
6. Neuroticism Scale Questionnaire (NSQ) - Ivan H. Scheier & R.B. Cattell.
7. Eight state questioner (8SQ) – M. Kapoor, M. Bhargava.
8. Mental Depression Scale.
9. Dimensional Personality Inventory.
10. Maudsley Personality Inventory (MPI) - H.J. Eyesenk.

SYLLABUS

Second Semester B.Sc. Degree Programme

Complementary Course II: Forensic Science –II

APPLIED FORENSIC PHYSICS
Code: FSC2C02

(36 hours) (2 hours per week) (Credits - 2)

Module I: Footwear Impressions (10 hrs)

Casting 3-D Footwear Impressions: Introduction to casting, Importance of casting, Benefits of casts over photographs, Casting materials, Methods of casting with dental stone, Casting footwear impressions in snow. Treatment of 2-D Footwear Impressions: Lifting 2-D footwear impressions, Lifting impressions electro statically and electrostatic lifting devices, Gelatin and adhesive lifting, Other lifting materials and choices, Powdering impressions, Deformable impressions, Impressions on carpets, cushions, grass and skin. Enhancement of Footwear

Impressions: Specialized lighting and photographic methods, Chemical enhancement, other enhancement techniques.

Module II: Forensic Applications in Trace Analysis (14 hrs)

Physical properties of materials: temperature, weight and mass, density, refractive index and their forensic importance. Glass: Composition of glass, Comparison of glass fragments, Measuring and comparing density and refractive index of glass, classification of glass samples, Glass fractures, Collection and preservation of glass evidence. Soil: Significance of soil evidence, Variations in soil, Collection and preservation of soil evidence, Forensic examination of soil. Fibre: Types, Identification and comparison of manufactured fibres (Microscopic examination, Dye composition, Chemical composition, Other properties for examination), Significance of match, Collection and preservation of fibre evidence. Forensic examination of cloth and cloth fibres. Paint: Composition of paint, Classification of common paints, Pigment Volume concentration number, Microscopic examination of paint, Analytical tools used in paint comparison, significance of paint evidence, collection and preservation of paint evidence. Forensic examination of paint. Plastic: Classification of plastics according to thermal and mechanical property, Plastics in common use.

Module III: Tool marks (12 hrs)

Types of tool marks: compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks, photographic examination of tool marks and cut marks on clothes and walls etc., wounds, cuts & injuries on human body, comparison of tool marks by comparison microscope. Restoration of erased / obliterated marks: Method of marks making-cast, punch, engrave; methods of obliteration, method of restoration- etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks – restoration of marks on wood, leather, polymer etc., resuscitation of obliterated numbers in metal surfaces, scope and limitations of techniques.

Recommended Reading:

1. Footwear Impressions Evidence Detection, Recovery, and Examination Second Edition by William J. Bodziak CRC Press.
2. Criminalistics- An Introduction to Forensic Science By Richard Saferstein.
3. Measurement, Instrumentation and Experiment Design in Physics and Engineering By Michael Sayer and Abhaaiman Singh.
4. Trace Evidence By Max M. Houck.

COMPLEMENTARY COURSE II: FORENSIC SCIENCE PRACTICAL - II
(36 hours) (2 hours per week)

1. Photography of 3-D /2- D shoe/bear foot prints.
2. Casting of 3-D Shoeprint using plaster of Paris/dental stone in mud or clay.
3. Casting of 3-D print in snow using sulphur and other methods.
4. Identification of foot prints by crime lights and lifting by gelatin and adhesive lifting.
5. Development of latent shoe /bear foot print using physical developer (powder method).
6. Development and lifting of 2-D print by electrostatic methods.
7. Examination of fibers under biological microscope along with photography.
8. Examination of soil sample using soil testing kit.

9. Comparison of soil/glass using density gradient column method.
10. Study of glass fractures due to impacts / heat.
11. Study the refractive index of glass samples.
12. Determination of density of solid material by volume displacement method.
13. To perform Thermal Decomposition test (TDT) test on soil sample.
14. Microscopic examination of paint sample.
15. Stress / Breaking point determination.
16. Studies of cut-marks/tear marks characteristic on cloths using different cutting and tearing tools.
17. Studies of cut-marks striations on metallic wire cut-ends using cutting pliers and its linkages with cutting plier tools.
18. Studies of different characteristics hammer impressions of iron metal sheet and their linkage with the hammers used.
19. Studies of cut marks striations using motorized hacksaw blade and hand driven hacksaw tool. Photographic juxtaposition comparison of tool marks striation.
20. Restoration of erased punched marks on the iron sheets using chemical etching method.

SYLLABUS

Third Semester B.Sc. Degree Programme

Complementary Course III: Forensic Science-III

APPLIED FORENSIC BIOLOGY
Code: FSC3C03

(54 hours) (3 hours per week) (Credits - 2)

Module I: Forensic serology (24 hrs)

Immuno electrophoretic and Immunodiffusion techniques for determination of human and animal origin from bones, hairs, nails, skin, body tissue, fluids etc., Blood group typing (Blood group typing techniques: Lattes crust assay, Absorption-elution assay) and protein profiling (Methods for profiling: Matrices supporting protein electrophoresis, Separation by molecular weight, separation by isoelectric points). Erythrocyte protein polymorphism, Serum protein polymorphism Biochemistry and genetics of ABO, Rh, MN, systems, blood specific ABH substances, Lectins – their forensic significance, determination of secretor / non secretor Lewis antigen, Bombay Blood group, HLA typing, role serogenetic markers in individualization, paternity disputes etc.

Module II: Wild life forensic, forensic ornithology and forensic entomology (15 hrs)

Introduction and importance of wild life, Protected and endangered species of Animals and Plants. Study of spore, powdered minerals and pollens of forensic importance, Use of pollen grains & spores in criminal or civil investigation. Types of wildlife investigations, Application of forensic science to wildlife investigation, Identification of wild life materials by conventional and modern methods. Identification of Pug marks of various animals census of wild life population. Genetic methodologies in wildlife investigation. Birds flight and means of locomotion, Strikes and collisions, Quarantine issues, Crime Scenes, Confiscated Bird Goods, Anthropological Arte facts, Applications of Forensic Ornithology, Feather structure and

topography. 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.

Module III: Forensic microbiology (15 hrs)

Development of forensic microbiology, Types and identification of microbial organisms/ fungi of forensic significance, mode of action of Anthrax, botulinum and ricin toxin, fungal toxin with special reference to Aflatoxin. Techniques in forensic microbiology. Understanding Bioterrorism: - Types of biological agents – Category A, B, C. Planning and response to bioterrorism – Preparedness Biosurveillance, Biodefense. Epidemiology of Bioterrorism, Punishments for Bioterrorism act Under Prevention of Terrorism Act, 2002.

Recommended Reading:

1. Forensic biology – Richard Li.
2. Forensic Medicine – P.V. Guharaj & M. R. Chandran.
3. A textbook of Medical jurisprudence and toxicology- Modi.
4. Wildlife forensic investigation-Principles and practice: Cooper and Cooper, CRC press.
5. Forensic Palynology in the United States of America (1990)- Bryant, V.M. Jr, Mildenhall, D.C. and Jones, J.G.14.PP.193-208.
6. Textbook of Pollen Analysis 4th Edition- Faegri, K. Iverson, J. and Krzywinski, K. John Wiley & Sons, New York 1989.
7. Microbial forensics -Roger Breeze, Bruce Budowle, Steven E. Schutzer. Elsevier.

COMPLEMENTARY COURSE III: FORENSIC SCIENCE PRACTICAL - III
(36 hours) (2 hours per week)

1. To perform precipitin test for species of origin determination.
2. To perform Immuno diffusion test for species of origin.
3. Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption inhibition.
4. Absorption-elution for determination of Secretor non secretor status.
5. Identification of orders of insects and other arthropods of forensic significance.
6. Study of pugmarks of animals.
7. To examine Barr bodies from blood sample.
8. To identify blood, semen and saliva stains.
9. To determine species of origin from blood.
10. Isolation of Aspergillus flavus and identification of its toxin by fluorescence.
11. Identification of birds from feathers.
12. Study of pollen grains and spores of forensic significance.
13. Examination of fur, nails, horn, teeth.
14. Examination of hair of different animals such as Dogs, Cats, Cow, Horse, Goats etc.
15. Determination of human hair morphology.

SYLLABUS

Fourth Semester B.Sc. Degree Programme

Complementary Course IV: Forensic Science-IV

APPLIED FORENSIC CHEMISTRY
Code: FSC4C04
(54 hours) (3 hours per week) (Credits-2)

Module I: General Forensic Chemistry (18 hrs)

Arson: chemistry of fire, fire extinguisher, investigation and evaluation of clue material, analysis of arson exhibits by instrumental methods: Management of Arson cases, Food adulteration: Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material cases. Sampling of food, Determination of moisture, ash, titrable acidity, pH and Sodium chloride, Butter water, salt, curd, lactose, fat, ash. Pesticides: Introduction, Classification, synthesis of DDT, Malathion, BHC, Parathion, applications. Relevant provision of:- Prevention of Food Adulteration Act 1954 (Definition, Power of Food Inspector, Offences and Penalties), Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation, Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties), Prevention of Illicit Trafficking in NDPS Act 1985 (Detention of a Person Under the Act), Drugs Control Act 1940 (Definition, Power of Chief Commissioner Under the Act), Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics.

Module II: Forensic Toxicology (18 hrs)

Introduction to toxicology, different branches of toxicology, concepts of forensic toxicology. Scope and application forensic toxicology. Poisons: General classification of poisons, classification on the basis of occurrence, natural availability, chemical nature, mode of action. Plant, Animal Poison, Metallic Poison, types of poisoning, collection and preservation of toxicological exhibits in fatal and survival cases, signs and symptoms of poisoning, mode of action and its effect on vital functions, medico-legal and post mortem examination report/finding studies, specific analysis plan/ approach to toxicological examination of poisoning samples, excretion of poisons, detection of poisons on the basis of their metabolic studies, interpretation of analytical data and forming of opinion. Terpenoids:- i) Introduction, Isolation, Classification. ii) Structure determination, preparation, properties and applications of - Citral, Geraniol, limonene, menthol, alpha-pinene, camphor.

Module III: Explosives, Drugs and Polymers (18 hrs)

Classification of explosive, types of chemical explosive, Combustion, Deflagration and Detonation, Ignition, Initiation and Thermal Decomposition, preparation of picric acid, Trinitrotoluene, TATB (1,3,5-Triamino-2,4,6- trinitrobenzene), HNS (Hexanitrostilbene). Analysis of Narcotic Drugs and Psychotropic Substances, Drug effects, drug Hazards, Tolerance and dependence of drugs, Problems of drug addiction, Identification of drug addict, Drug addicts and crimes, Classification of Narcotics and other drugs, Analytical techniques for identification of drugs. Polymers Polymers-Introduction-General idea of structures, types, polymerization processes with examples, radical and ionic mechanism of polymerization, characteristic properties of polymers, Structure, preparation and applications of Polyethylene (types and Ziegler-Natta process), Teflon, PVC, Polystyrene, General idea of plasticizers,

stabilizers, fillers, Epoxy Resins, Feviseal. Plastics- Classification of plastics, application of plastics. Rubber- types of rubber, vulcanization of rubber, synthetic rubbers, Fibres: (synthetic fibres)-preparation, classification and properties of polyamides Nylon, polyesters-Terylene or Dacron. Relevant provisions of: The Poisons Act, 1919, and Section 284 of IPC, 1860 (Negligent conduct with respect to poisonous substance). Explosives Act 1984, (Definition, Powers of Central Govt. and Licensing Authority, Offences and Penalties) and Section 286 of IPC, 1860, (Negligent conduct with respect to explosive substance), Explosive Substances Act 1908, (Definition, Offences and Penalties).

Recommended Reading:

1. Instrumental Method of Chemical Analysis. Chatwal & Anand, Himalya Publication.
2. S. N. Tiwari, Analytical Toxicology, Govt. of India publications, New Delhi 1987.
3. Brown P. R., Advance in Chromatography.
4. Introduction of Forensic Science in Crime Investigation by Dr. (Mrs.) R. Krishnamurthy.
5. Bahl and Bahl, Organic chemistry.
6. Bahl and Bahl, Physical chemistry.
7. Mehta and Mehta Organic chemistry.
8. S.V.Bhat Natural Product. John Kenkel, Analytical Chemistry for Technicians.
9. Feigl, Spot Test in Organic chemistry.
10. Feigl, Spot Test in Inorganic chemistry.
11. Vogel's Qualitative Inorganic Analysis.
12. D.C. Garratt, The Quantitative Analysis of Drugs.
13. Lee and Gaensslem.: Advances in Forensic Science (Vol. 2) Instrumental Analysis.
14. Settle F. A.: Handbook of Instrumental Technique for Analytical Chemistry, Prentice Hall 1997.

COMPLEMENTARY COURSE IV: FORENSIC SCIENCE PRACTICAL - IV (36 hours) (2 hours per week)

1. Identification of food adulteration.-vegetable oil, Cold drinks etc.
2. Quantitative or qualitative study of drug opiates.
3. Examination of fire arson cases by GC, TLC.
4. Detection and determination of various adulterants in alcohol, by color tests (Qualitative analysis).
5. Chemical analysis of explosive materials (Gun powder) - Color test, Microscopic examination.
6. Analysis of alcohol from blood (quantitative by GC).
7. Extraction methods of drugs, Poisons.
8. Color Tests for identification of poisons, drugs.
9. Plant, animal, Metallic poison analysis.
10. Polymer Testing.
11. Separation of Sampling Material by TLC (drugs, poison etc.)
12. Study of Steroids (separation by TLC).
13. Examination of chemicals used in Trap cases by UV-visible spectroscopy.
14. Estimation of CaO in the given sample of Portland cement by gravimetric method.

MODEL QUESTION PAPER

FIRST SEMESTER B.Sc DEGREE EXAMINATION

Part III- FORENSIC SCIENCE

COMPLIMENTARY COURSE - I FORENSIC PSYCHOLOGY

Code: FSC1CO1

Time: 3 Hours **Maximum marks: 64**

I .One word questions (Each question carries 1 mark) Answer all questions.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10. **(10X1=10 marks)**

II. Short answer question (Answer any 7. Each question carries 2 marks)

11.
12.
13.
14.
15.
16.
17.
18.
19.
20. **(7x2=14 marks)**

III. Paragraph question (Answer any 4, Each question carries 5marks)

21.
22.
23.
24.
25.
26.

(4x5=20 marks)

IV. Essay question (Answer any 2, Each question carries 10 marks)

27.
28.
29.
30. **(2x10=20 marks)**