Name of the Program : B. Sc. (H) Forensic Science   Session : 2021-22
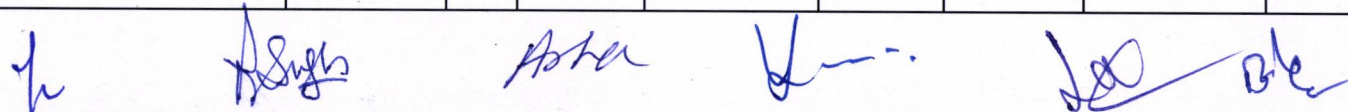### Scheme of Study/Examination

#	Sem/Year	Subject Code	Nomenclature	Type	Cat	L	T	P	C	Theory Max	Theory Pass	Midterm	Assignment	Prof. Activities	Int Max	Int Pass	Demonstration/Conduct/Presentation	Viva-voce	Prac Max	Prac Pass	Attendance & Regularity in Lab Work	Project/Laboratory work report	Midterm Oral Exam/Assessment	Conduct/Demonstration	PInt Max	PInt Pass	Total marks	Overall Pass	Scheme of Examination
1	I/I	--	English	Theory	AECC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
2		17040101	Introduction to Forensic Science	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
3		17040102	Introduction to Forensic Science Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
4		17040103	Crime Scene Investigation	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
5		17040104	Crime Scene Investigation Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
6		17040105	Technological Methods in Forensic Science	Theory	SEC	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
7		--	Multi-disciplinary General Elective (MGE-1)	Theory	MGE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
8		--	Value Added Course (VAC-1)	Theory	VAC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
9	II/I	--	Environmental Science	Theory	AECC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
10		17040201	Questioned Document Examination	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
11		17040202	Questioned Document Examination Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
12		17040203	Fingerprints and other Impression Evidence	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
13		17040204	Fingerprints and other Impression Evidence Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
14		17040205	Proactive and Reactive Forensics	Theory	SEC	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
15		--	Multi-disciplinary General Elective (MGE-2)	Theory	MGE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
16		--	Value Added Course (VAC-2)	Theory	VAC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
	III/II	--	Human Values & Ethics	Theory	AECC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
17		17040301	Forensic Accounting	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
18		17040302	Forensic Accounting Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
19		17040303	Crime Scene Ethics and Evidence Management	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
20		17040304	Crime Scene Ethics and Evidence Management Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
21		17040305	Accidental Investigation	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
22		17040306	Accidental Investigation Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
		--	Multi-disciplinary General Elective (MGE-3)	Theory	MGE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
		--	Value Added Course (VAC-3)	Theory	VAC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
	IV/II	--	Soft Skills	Theory	AECC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
23		17040401	Smart Device Forensics	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
24		17040402	Smart Device Forensics Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
25		17040403	Photography and its Forensic Significance	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
26		17040404	Photography Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
27		17040405	Psychology and Criminology	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
28		17040406	Psychology and Criminology Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
29		--	Multi-disciplinary General Elective (MGE-4)	Theory	MGE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
30		--	Value Added Course (VAC-4)	Theory	VAC	2	0	0	2	30	12	10	5	5	20	8											50	20	Theory+Internal
31	V/III	17040501	Adulteration in Edible Items	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
32		17040502	Adulteration in Edible Items Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
33		17040503	Forensic Ballistics	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
34		17040504	Forensic Ballistics Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
35		17040505	Forensic Biology	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
36		17040506	Forensic Biology Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
37		17040507	Forensic Serology	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
38		17040508	Forensic Serology Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
39		17040509	Forensic Chemistry	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
40		17040510	Forensic Chemistry Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
41		17040511	Forensic Toxicology	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
42		17040512	Forensic Toxicology Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
43		17040513	Advanced Questioned Document Examination	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
44		17040514	Advanced Questioned Document Examination Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
45		17040515	Advanced Fingerprint and Other impression Evidence	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
46		17040516	Advanced Fingerprint and Other impression Evidence Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal

No	Sem	Code	Course	Type	Cat	L	T	P	C																			Total	Pass	Remarks
		17040517	Introduction to Computer Forensics	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
48		17040518	Introduction to Computer Forensics Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
49		17040519	Cyber Security and Data Protection	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
50		17040520	Cyber Security and Data Protection Lab	Practical	DSE	0	0	4	2								20	20	40	●	10	10	10	30	60	24	100	40	Practical +Internal
51		17040601	Forensic Odontology	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
52		17040602	Forensic Odontology Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
53		17040603	Forensic Anthropology	Theory	Core	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
54		17040604	Forensic Anthropology Lab	Practical	Core	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
55		17040605	Forensic Genetics and DNA Profiling	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
56		17040606	Forensic Genetics and DNA Profiling Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
57		17040607	Bioinformatics	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
58		17040608	Bioinformatics Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
59		17040609	Pharmacokinetics and Pharmacology	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
60	VI/III	17040610	Pharmacokinetics and Pharmacology Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
61		17040611	Instrumentation in Chemical Sciences	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
62		17040612	Instrumentation in Chemical Sciences Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
63		17040613	Security Documents and its Examination	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
64		17040614	Security Documents and its Examination Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
65		17040615	Instrumentation in Questioned Documents	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
66		17040616	Instrumentation in Questioned Documents Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
67		17040617	Network Forensics	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
68		17040618	Network Forensics Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
69		17040619	Data acquisition and Cloud Forensics	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
70		17040620	Data acquisition and Cloud Forensics Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
71		17040701	Forensic Medicine	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
72		17040702	Forensic Medicine Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
73		17040703	Research Methodology and Statistics	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
74		17040704	Research Methodology and Statistics Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
75	VII/IV	17040705	Ecology and Biodiversity	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
76		17040706	Ecology and Biodiversity-Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
77		17040707	Air and Noise Pollution	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
78		17040708	Air and Noise Pollution-Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical+Internal
79		17040709	Project-I	Practical	DSE	0	0	8	8								40	40	80	32	20	20	20	60	120	48	200	80	Practical +Internal
80		17040801	Forensic Engineering	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
81		17040802	Forensic Engineering Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
82		17040803	Analytical Laboratory Techniques and Quality Management	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
83		17040804	Analytical Laboratory Techniques and Quality Management Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
84	VIII/IV	17040805	Soil and water Pollution	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
85		17040806	Soil and water Pollution-Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
86		17040807	EIA and Sustainable development	Theory	DSE	4	0	0	4	60	24	20	10	10	40	16											100	40	Theory+Internal
87		17040808	EIA and Sustainable developmen-Lab	Practical	DSE	0	0	4	2								20	20	40	16	10	10	10	30	60	24	100	40	Practical +Internal
88		17040809	Project-II	Practical	DSE	0	0	8	8								40	40	80	32	20	20	20	60	120	48	200	80	Practical +Internal

DEPARTMENT OF FORENSIC SCIENCE

B.Sc. (H) Forensic Science

Program Structure based on Choice Based Credit System CBCS 2020-23

Semester	Course Code	Course Name	Course structure			Contact hours/ week	Credits	Max Marks	Formative Assessment	Summative Assessment
			L	T	P					
		SEMESTER-I								
		Ability Enhancement Compulsory Course (AECC)								
	AECC01001	English	2	0	0	2	2	50	20	30
		Core Courses (CC)								
	17040101	Introduction to Forensic Science	4	0	0	4	4	100	40	60
	17040102	Introduction to Forensic Science Practical Lab	0	0	4	4	2	100	60	40
	17040103	Crime Scene Investigation	4	0	0	4	4	100	40	60
	17040104	Crime Scene Investigation Lab	0	0	4	4	2	100	60	40
		Skill enhancement course (SEC)								
	17040105	Technological Methods in Forensic Science	4	0	0	4	4	100	40	60
		Multidisciplinary General Elective (MGE)								
	MGE-1		4	0	0	4	4	100	40	60
		Value Added Course (VAC)								
	VAC-1		2	0	0	2	2	50	20	30
	TOTAL CREDITS		**16**	**0**	**8**	**28**	**24**	**600**	**320**	**380**
		SEMESTER-II								
		Ability Enhancement Compulsory Course (AECC)								
	AECC01002	Environmental Science	2	0	0	2	2	50	20	30
		Core Courses (CC)								
	17040201	Questioned Document Examination	4	0	0	4	4	100	40	60
	17040202	Questioned Document Examination Lab	0	0	4	4	2	100	60	40
	17040203	Fingerprints and other Impression Evidence	4	0	0	4	4	100	40	60
II	17040204	Fingerprints and other Impression Evidence Lab	0	0	4	4	2	100	60	40

Note: In the "Semester" column, "I" spans the first block (Semester-I rows) and "II" spans the Semester-II rows.

Skill enhancement course (SEC)									
	17040205	Proactive and Reactive Forensics	4	0	0	4	4	100	40	60
Multidisciplinary General Elective (MGE)									
		MGE-2	4	0	0	4	4	100	40	60
Value Added Course (VAC)									
		VAC-2	2	0	0	2	2	50	20	30
	TOTAL CREDITS		16	0	8	28	24	600	320	380
SEMESTER-III									
Ability Enhancement Compulsory Course (AECC)									
	AECC01003	Human Values and Ethics	2	0	0	2	2	50	20	30
Core Courses (CC)									
	17040301	Forensic Accounting	4	0	0	4	4	100	40	60
	17040302	Forensic Accounting Lab	0	0	4	4	2	100	60	40
III	17040303	Crime Scene Ethics and Evidence Management	4	0	0	4	4	100	40	60
	17040304	Crime Scene Ethics and Evidence Management Lab	0	0	4	4	2	100	60	40
	17040305	Accidental Investigation	4	0	0	4	4	100	40	60
	17040306	Accidental Investigation Lab	0	0	4	4	2	100	60	40
Multidisciplinary General Elective (MGE)									
		MGE-1	4	0	0	4	4	100	40	60
Value Added Course (VAC)									
		VAC-1	2	0	0	2	2	50	20	30
	TOTAL CREDITS		20	0	12	32	26	800	380	420
SEMESTER-IV									
Ability Enhancement Compulsory Course (AECC)									
	AECC01004	Soft Skills	2	0	0	2	2	50	20	30
Core Courses (CC)									
	17040401	Smart Device Forensics	4	0	0	4	4	100	40	60
	17040402	Smart Device Forensics Lab	0	0	4	4	2	100	60	40
IV	17040403	Photography and its Forensic Significance	4	0	0	4	4	100	40	60
	17040404	Photography Lab	0	0	4	4	2	100	60	40
	17040405	Psychology and Criminology	4	0	0	4	4	100	40	60
	17040406	Psychology and Criminology Lab	0	0	4	4	2	100	60	40

Multidisciplinary General Elective (MGE)									
	MGE-1	4	0	0	4	4	100	40	60
Value Added Course (VAC)									
	VAC-1	2	0	0	2	2	50	20	30
TOTAL CREDITS		20	0	12	32	26	800	380	420
SEMESTER-V									
Core Courses (CC)									
17040501	Adulteration in Edible Items	4	0	0	4	4	100	40	60
17040502	Adulteration in Edible Items Lab	0	0	4	4	2	100	60	40
17040503	Forensic Ballistics	4	0	0	4	4	100	40	60
17040504	Forensic Ballistics Lab	0	0	4	4	2	100	60	40
Discipline Specific Elective (DSE)									
17040505	Forensic Biology	4	0	0	4	4	100	40	60
17040506	Forensic Biology Lab	0	0	4	4	2	100	60	40
17040507	Forensic Serology	4	0	0	4	4	100	40	60
17040508	Forensic Serology Lab	0	0	4	4	2	100	60	40
17040509	Forensic Chemistry	4	0	0	4	4	100	40	60
17040510	Forensic Chemistry Lab	0	0	4	4	2	100	60	40
17040511	Forensic Toxicology	4	0	0	4	4	100	40	60
17040512	Forensic Toxicology Lab	0	0	4	4	2	100	60	40
17040513	Advanced Questioned Document Examination	4	0	0	4	4	100	40	60
17040514	Advanced Questioned Document Examination Lab	0	0	4	4	2	100	60	40
17040515	Advanced Fingerprint and Other impression Evidence	4	0	0	4	4	100	40	60
17040516	Advanced Fingerprint and Other impression Evidence Lab	0	0	4	4	2	100	60	40
17040517	Introduction to Computer Forensics	4	0	0	4	4	100	40	60
17040518	Introduction to Computer Forensics Lab	0	0	4	4	2	100	60	40
17040519	Cyber Security and Data Protection	4	0	0	4	4	100	40	60
17040520	Cyber Security and Data Protection Lab	0	0	4	4	2	100	60	40

(The leftmost column of the table is labelled **V** spanning the SEMESTER-V rows.)

	TOTAL CREDITS		20	0	12	32	26	800	380	420

SEMESTER-VI
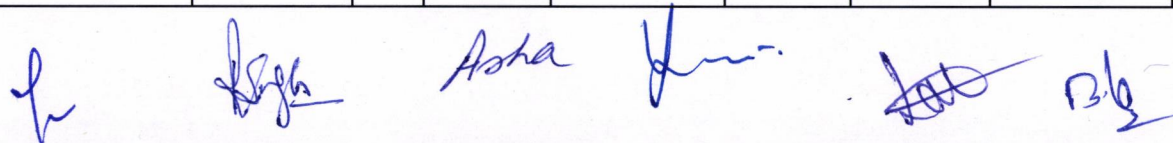
Core Courses (CC)

	Code	Name								
VI	17040601	Forensic Odontology	4	0	0	4	4	100	40	60
	17040602	Forensic Odontology Lab	0	0	4	4	2	100	60	40
	17040603	Forensic Anthropology	4	0	0	4	4	100	40	60
	17040604	Forensic Anthropology Lab	0	0	4	4	2	100	60	40

Discipline Specific Elective (DSE)

	Code	Name								
VI	17040605	Forensic Genetics and DNA Profiling	4	0	0	4	4	100	40	60
	17040606	Forensic Genetics and DNA Profiling Lab	0	0	4	4	2	100	60	40
	17040607	Bioinformatics	4	0	0	4	4	100	40	60
	17040608	Bioinformatics Lab	0	0	4	4	2	100	60	40
	17040609	Pharmacokinetics and Pharmacology	4	0	0	4	4	100	40	60
	17040610	Pharmacokinetics and Pharmacology Lab	0	0	4	4	2	100	60	40
	17040611	Instrumentation in Chemical Sciences	4	0	0	4	4	100	40	60
	17040612	Instrumentation in Chemical Sciences Lab	0	0	4	4	2	100	60	40
	17040613	Security Documents and its Examination	4	0	0	4	4	100	40	60
	17040614	Security Documents and its Examination Lab	0	0	4	4	2	100	60	40
	17040615	Instrumentation in Questioned Documents	4	0	0	4	4	100	40	60
	17040616	Instrumentation in Questioned Documents Lab	0	0	4	4	2	100	60	40
	17040617	Network Forensics	4	0	0	4	4	100	40	60
	17040618	Network Forensics Lab	0	0	4	4	2	100	60	40
	17040619	Data acquisition and Cloud Forensics	4	0	0	4	4	100	40	60
	17040620	Data acquisition and Cloud Forensics Lab	0	0	4	4	2	100	60	40

		40	0	40	80	60	2000	1000	1000
TOTAL CREDITS		40	0	40	80	60	2000	1000	1000
	SEMESTER-VII								
	Discipline Specific Elective (DSE)								
17040701	Forensic Medicine	4	0	0	4	4	100	40	60
17040702	Forensic Medicine Lab	0	0	4	4	2	100	60	40
17040703	Research Methodology and Statistics	4	0	0	4	4	100	40	60
17040704	Research Methodology and Statistics Lab	0	0	4	4	2	100	60	40
17040705	Ecology and Biodiversity	4	0	0	4	4	100	40	60
17040706	Ecology and Biodiversity-Lab	0	0	4	4	2	100	60	40
17040707	Air and Noise Pollution	4	0	0	4	4	100	40	60
17040708	Air and Noise Pollution-Lab	0	0	4	4	2	100	60	40
17040709	Project-I	0	0	8	8	8	200	120	80
TOTAL CREDITS		16	0	24	32	32	1000	520	480
	SEMESTER-VII								
	Discipline Specific Elective (DSE)								
17040801	Forensic Engineering	4	0	0	4	4	100	40	60
17040802	Forensic Engineering Lab	0	0	4	4	2	100	60	40
17040803	Analytical Laboratory Techniques and Quality Management	4	0	0	4	4	100	40	60
17040804	Analytical Laboratory Techniques and Quality Management Lab	0	0	4	4	2	100	60	40
17040805	Soil and water Pollution	4	0	0	4	4	100	40	60
17040806	Soil and water Pollution-Lab	0	0	4	4	2	100	60	40
17040807	EIA and Sustainable development	4	0	0	4	4	100	40	60
17040808	EIA and Sustainable developmen-Lab	0	0	4	4	2	100	60	40
17040809	Project-II	0	0	8	8	8	200	120	80
TOTAL CREDITS		16	0	24	32	32	1000	520	480

Note: VII (left label spanning the first SEMESTER-VII block), VIII (left label spanning the second block).
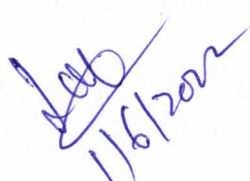
SEMESTER I

1. Name of the Department: Forensic Science						
2. Course Name	Introduction to Forensic Science		**L**	**T**	**P**	
3. Course Code	17040101		4	0	0	
4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

In this core paper, the student will be able to know about the basic knowledge of forensic sciences, its principles, history of Forensic Science, and organizational setup in forensic science. The students will also understand about the criminal justice system.

9. Course Objectives

1. To develop an understanding of scope of Forensic Sciences.
2. To develop an understanding on historical development of Forensic Science, mobile forensic units and expert's testimony.
3. To develop brief knowledge about different divisions in a forensic science laboratory.
4. To understand the organizational setup of forensic laboratory in India

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:
1. Understand about the basic principles and history of Forensic science in India and worldwide.
2. Understand the concept of expert witness and report writing with Indian justice system.
3. Understand about the organizational set up of forensic science laboratories.
4. Understand and again scientific aptitude regarding the working and functioning of mobile forensic units.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: History and Development of Forensic Science

Functions of forensic science. Historical aspects and major contributions in forensic science. Definitions and concepts in forensic science. Scope and need of forensic science. Basic principles of forensic science. Frye case and Daubert standard.

Unit – 2	Number of lectures = 13	Title of the unit: Branches of forensic Science

Branches of forensic science. Functions of forensic science. Forensic science in international perspectives, roles and responsibilities of forensic scientists and investigating officer. Emerging areas in Forensic Science.

Unit – 3	Number of lectures = 13	Title of the unit: Organizational set up of Forensic Science Laboratories in India I

Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Divisions in forensic science laboratories and their services. Government Examiners of Questioned Documents, Fingerprint Bureaus. National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories.

Police Academies. Services of crime laboratories: Basic services and optional services.

Unit -4	Number of lectures = 13	Title of the unit: Organizational set up of Forensic Science Laboratories in India II

Criminal Procedure Code and Indian Penal code. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses, report writing

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=fdxXPFKESO0
2. https://www.youtube.com/watch?v=OIjkZXfFBgI
3. https://www.youtube.com/watch?v=7NFCOH2GSRw
4. https://www.youtube.com/watch?v=a4dwypa12c4
5. https://www.youtube.com/watch?v=KE_E128mHQo
6. https://www.youtube.com/watch?v=_YjcI3nXOKA

13. Books Recommended

1. Houck, M.M. & Siegel, JA; Fundamentals of Forensic Science, Academic Press, London, 2006.
2. Sharma, B.R., Forensic Science in Criminal Investigation &Trials, Universal Publishing Co., New Delhi, 2003
3. Nanda B.B and Tiwari, R.K. Forensic Science in India- A vision for the Twenty First Century, Select publisher, Delhi, 2001.
4. James, SH and Nordby, J.J., Forensic Science- An Introduction to Scientific and investigative Techniques, CRC Press, USA (2003)
5. Saferstein; Criminalistics- An Introduction of Forensic Science, Prentice Hall Inc, USA, 2007.
6. Sharma, B.R. (1974) Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
7. Indian Evidence Act
8. Criminal Procedure code.
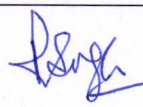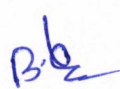
1. Name of the Department: Forensic Science					
2. Course Name	Introduction to Forensic Science Lab	**L**	**T**	**P**	
3. Course Code	17040102	**0**	**0**	**4**	
4. Type of Course (use tick mark)	Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

In the core paper of forensic science laboratory, the students will learn various case studies where forensic science has been applied successfully. They will also study the organisational setup of forensic lab and other related laboratories.

9. Course Objectives

1. To study the organisational setup of forensic science lab.
2. To study the annual crime data as per NCB and CFB
3. To observe case studies pertaining to different crimes in the country.
4. To prepare comprehensive report of the crime data

10. Course Outcomes (COs):

Upon successful completion of this course, the students will able to

1. Cite examples of crime cases and study the history of crime cases from forensic science perspective
2. Study the annual reports of National Crime Records Bureau and depict the data
3. Review the Central Fingerprint Bureau coordinates and prepare reports on different types of criminal cases.
4. Learn and apply the practical knowledge of mobile forensic units.

11. Unit wise detailed content

Practicals		

1. To study the history of crime cases from a 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 the National Crime Records Bureau and depict the data on different types of crime cases by way of smart art/templates.
5. To write reports on different types of crime cases.
6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
7. To examine the hierarchical set up of different forensic science establishments and suggest improvements.
8. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
9. To compare and contrast the role of a Police Academy and a Police Training School.
10. To compare the code of conduct prescribed by different establishments for forensic scientists

12. Books Recommended

1. DFS Manuals of Forensic Science

1. Name of the Department: Forensic Sciences						
2. Course Name	Crime Scene Investigation			**L**	**T**	**P**
3. Course Code	17040103			4	0	0
4. Type of Course (use tick mark)	Core (✓)	DSE ()		AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This core paper describes the basic knowledge of the crime scene management, investigation, and reconstruction. It also discusses about the documentation of crime scene and maintaining the chain of custody.

9. Course Objectives:

The course emphases on the following objectives-
1. To Develop an understanding of types of crime scenes and crime scene investigation techniques.
2. To Develop an understanding on collection and preservation of different types of physical and trace evidence.
3. To Provide the knowledge of chain of custody and its importance in legal system
4. To enumerate commonly encountered evidences at the scene of crime and various techniques used to analyse them.

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:
1. Understand the methods of securing, searching and documenting the crime scenes.
2. Develop scientific aptitude of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
3. Develop ethical and scientific skills to maintain chain of custody
4. Gain analytical skills to use the tools and techniques for analysis of different types of crime scene evidence.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit- Crime Scene Investigation

Defining Crime Scene. Types of crime scenes – indoor and outdoor. Concept of primary and secondary crime scenes. Securing and isolating the crime scene, Crime Scene Protection. 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 1 H (how?). Crime scene logs.

Unit – 2	Number of lectures = 13	Title of the unit- Crime Scene Evidence

Classification of crime scene evidence – physical, testimonial, and circumstantial. Locard's principle. Collection, labeling, sealing of evidence. Hazardous evidence. Preservation of evidence. Chain of custody.

Unit – 3	Number of lectures = 13	Title of the unit- Crime Scene Management & Reconstruction

Crime Scene Management: Concept and procedure, Crime Scene Reconstruction: Procedure, steps and requirement for Reconstruction; Guidance from field notes, and documentation; Modus operandi, role of Investigating Officer.

Unit – 4	Number of lectures = 13	Title of the unit: Handling, preservation and brief analysis of common evidences

Glass evidence – collection, packaging, analysis. 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.
Soil evidence – importance, location, collection and comparison of soil samples.
Cloth evidence – importance, collection, analysis of adhering material. Matching of pieces. Tool mark evidence. 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 gemology.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=rl_Zsk3HjdI
2. https://www.youtube.com/watch?v=ex4FaIaOjlA
3. https://www.youtube.com/watch?v=A_CSjKrSeUY
4. https://www.youtube.com/watch?v=v5cJOWR9CP8
5. https://www.youtube.com/watch?v=FJWaUZvTXdA&t=1100s
6. https://www.youtube.com/watch?v=ccXGS5z51nQ

13. Books Recommended

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(2010).
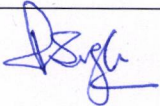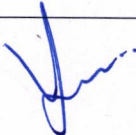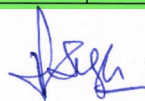
1/6/2022

1. **Name of the Department: Forensic Sciences**						
2.Course Name	Crime Scene Investigation Lab		**L**	**T**		**P**
3. Course Code	17040104		0	0		4
4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10 +2 with science stream	**6. Frequency (use tick marks)**	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This laboratory course provides an opportunity to learn the art of crime scene investigation, documentation, and reconstruction. This course also describes the analyses procedures of examination and comparison of certain evidences.

9. Course Objectives:

The objectives of this course are to:
1. Learn how to protect and search the scene of crime.
2. Learn how to investigate and document the scene of crime.
3. Learn how to reconstruct the crime scene.
4. Describe Chain of custody in forensic science.

10. Course Outcomes (Cos):

Upon successful completion of this course, the students will be able to
1. Understand the methods to search different types of Crime Scenes.
2. Relate their scientific aptitude to various evidences with crime scene and with particular crime.
3. Utilize different physical evidences to create probable hypothesis
4. Understand the criminal case and role of the expert witness.

11. List of Practicals

1. To create probable hypothesis on the basis of the evidence
2. To conduct search of the given crime scene using various searching methods.
3. To understand crime scene protection and measurements.
4. To photograph the given crime scene (Indoor and outdoor) with photographic log.
5. To reconstruct a crime scene (outdoor and indoor).
6. To identify and compare tool marks.
7. To prepare a report on evaluation of crime scene.
8. To cite example of a current criminal case.

12. Books Recommended

1. Lab Manuals Of DFSS

1. Name of the Department: Forensic Sciences							
2. Course Name	Technological Methods in Forensic Science			**L**	**T**	**P**	
3. Course Code	17040105			4	0	0	
4. Type of Course (use tick mark)		Core ()	DSE ()	GE ()	SEC (✓)		
5. Pre-requisite (if any)	10+2 with Science Stream	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()	

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

In this core paper the student will be able to know about the modern and sophisticated instruments to examine the various forensic evidences and different aspects of forensic photography.

9.Course Objectives:

1. To learn about the different chromatographic techniques
2. To understand the basics of spectroscopy and different spectroscopic techniques
3. To learn about the principles, different types of microscopy and photography.
4. To understand the forensic application of instrumental techniques

10. Course Outcomes (COs):

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

1. Understand the importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
2. Gain analytical skills to utilize colorimetry, electrophoresis and neutron activation techniques in identifying chemical and biological materials.
3. Develop scientific aptitude to understand the significance of microscopy in visualizing trace evidence and comparing it with control samples.
4. Understand and develop moral values while performing photography and videography for recording the crime scenes.

11. Unit wise detailed content

Unit-1	Number of lectures=13	Title of the unit- Instrumentation- I

Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography.
Spectroscopic methods. Fundamental principles (Lambert-Beer law) and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, and atomic absorption spectroscopy

Unit-2	Number of lectures=13	Title of the unit- Instrumentation- II

X-ray spectrometry, mass spectroscopy, and electrophoresis – fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.

Unit – 3	Number of lectures=13	Title of the unit- Microscopy

Fundamental principles, concept of image formation. Different types of microscopes used in forensic science-Simple microscope, compound microscope, stereo-microscope, comparison microscope, polarized microscope, and electron microscope (SEM, and TEM). Forensic applications of microscopy

Unit – 4	Number of lectures=13	Title of the unit: Forensic photography

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. DSLR Camera functions.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=HFGRXL9Ihds
2. https://www.youtube.com/watch?v=KiOzQ-K0gEQ
3. https://www.youtube.com/watch?v=citMv0hvfyc
4. https://www.youtube.com/watch?v=CzQAtSXaKVs
5. https://www.youtube.com/watch?v=hRer5xSP2HQ
6. https://www.youtube.com/watch?v=3bXFuccJqko

13. Books Recommended

1. D.A. Skoog, D.M. West and F.J. Holler, *Fundamentals of Analytical Chemistry,* 6thEdition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, *Organic Spectroscopy*, 3rdEdition, Macmillan, Hampshire (1991).
3. J.W. Robinson, *Undergraduate Instrumental Analysis*, 5thEdition, Marcel Dekker, Inc., New York (1995).
4. 4. D.R. Redsicker, *The Practical Methodology of Forensic Photography*, 2ndEdition, CRC Press, Boca Raton(2000).

1. Name of the Department: Forensic Sciences						
2. Course Name	English		**L**	**T**	**P**	
3. Course Code	AECC01001		4	0	0	
4.Type of Course (use tick mark)		Core ()	DSE ()	GE ()	AEC (✓)	
5. Pre-requisite (if any)	10+2 with Science stream	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = Nil	Practical = Nil

8. Course Description:

In this Ability Enhancement Compulsory course, the students will be able to know about the basic knowledge of English Comprehension, Speeches with its terminologies.

9.Course Objectives (COs):
1. To learn basics of English language
2. To gain knowledge of English terminology and concept
3. To study the concept of grammar and its appropriate implications
4. To enhance writing and communication skills.

10. Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:
1. Understand bout the English Language
2. Describe the terminology and basics concept of English Grammar.
3. Improve writing skills, note making etc.
4. Apply the concept of English language in their written and verbal communications.

11. Unit wise detailed content

Unit-1	Number of lectures=13	Title of the unit: Listening Comprehension

Speeches, Interviews, audio-video clippings followed by exercises, Introduction to Communication, Importance of Communication, Barriers to Communication and ways to overcome them

Unit – 2	Number of lectures=13	Title of the unit: Conversation skills

Greetings and Introducing oneself, Framing questions and answers, Role play, Buying: asking details etc., Word formation strategies, Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution

Unit – 3	Number of lectures=13	Title of the unit: Reading Comprehension

Simple narration and Stories, Newspaper and articles clippings, Sentence types, Note Making, Paragraph Writing, Comprehension

Unit – 4	Number of lectures=13	Title of the unit: Writing Comprehension

Report Writing: types, characteristics. Letters: types, format, style, Précis Writing, Paragraph: Order, Topic sentence, consistency, coherence, Report and Proposal, Project Writing: Features, Structure. Pronunciation, Syllable and Stress, Intonation and Modulation

12. Brief Description of self-learning / E-learning component
1. https://www.youtube.com/watch?v=G_ZeBr6bhyw
2. https://www.youtube.com/watch?v=4l5RciQZxyk
3. https://www.youtube.com/watch?v=ijrMpZWUUcc
4. https://www.youtube.com/watch?v=OgNVUZvB9Ow
5. https://www.youtube.com/watch?v=OfTIrsSliLM
6. https://www.youtube.com/watch?v=LquflXdZRVo

13. Books Recommended

1. Fluency in English-II, Department of English, Delhi University, Oxford University Press.
2. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
3. English Vocabulary in Use (Advanced), Michael McCarthy and Felicity, CUP.
4. Learning Spoken English by Lynn Lundquist-ASIN: B0094XNOPW.
5. Essential English Grammar: A Self-Study Reference and Practice Book for Elementary

SEMESTER II

1. Name of the Department: Forensic Sciences					
2. Course Name	Questioned Document Examination	**L**	**T**	**P**	
3. Course Code	17040201	4	0	0	
4.Type of Course (use tick mark)		Core (✓)	DSE ()	GE ()	SEC ()	
5. Pre-requisite (if any)	10+2 with science stream	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals		
Lectures = 52	Tutorials = 00	Practical =00

8. Course Description:

This is core paper in Forensic Sciences; the students will be able to know about the basic importance of examining questioned documents in crime cases. Tools required for examination of questioned documents and significance of comparing handwriting samples.

9. Course Objectives:

1. To introduce the concept of Questioned Document examination in forensic cases.
2. To learn about the examination of various categories of disputed documents.
3. To understand the aspects of handwriting comparison.
4. To familiarize students with various types of forgeries.

10. Course Outcomes (COs):

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

1. Understand the importance of examining questioned documents in crime cases.
2. Become acquainted with the tools required for examination of questioned documents
3. Develop scientific aptitude for comparing hand writing samples.
4. Understand the importance of detecting frauds and forgeries by analyzing questioned documents

11. Unit wise detailed content

Unit-1	Number of lectures=13	Title of the unit- Nature and Scope of Questioned Documents
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 relative age of documents		
Unit-2	Number of lectures=13	Title of the unit- Disputed Documents
Disputed documents – Property papers, cheques, suicidal letter, threatening letters, anonymous letters, fake currency notes, and Disguised writings. Examination of disputed documents.		
Unit – 3	Number of lectures=13	Title of the unit- : Comparison of Documents
Comparison of handwriting. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and individual characteristics. Exemplar and non-exemplar samples during comparison of handwriting. Standards for comparison of handwriting. Comparison of paper, ink, printed documents, typed documents, Xeroxed documents		

Unit – 4	Number of lectures=13	Title of the unit: Forgeries

Definition, and types of forgeries, Alterations in documents, including erasures, additions, over-writings and obliterations. Indented and invisible writings. Charred documents. Examination of counterfeit documents: passports, visas and stamp papers. Tools and techniques in questioned documents examination.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=e2pzkdkUxLU
2. https://www.youtube.com/watch?v=Z1ojNCWRuFk
3. https://www.youtube.com/watch?v=OzTuFudWbQk
4. https://www.youtube.com/watch?v=AxubbuQJ9LU
5. https://www.youtube.com/watch?v=eOfa0RrBxbI
6. https://www.youtube.com/watch?v=RQdou4CCBUI
7. https://www.youtube.com/watch?v=TZA7zEXIg0M
8. https://www.youtube.com/watch?v=p9bmGt1_Pxo
9. https://www.youtube.com/watch?v=-x5S4X9mhMM

13. Books Recommended.

1. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982).

2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4thEdition, Foundation Press, New York(1995).

3. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London(2000).

4. E. David, The Scientific Examination of Documents – Methods and Techniques, 2ndEdition, Taylor & Francis, Hants(1997).

1. Name of the Department: Forensic Sciences						
2. Course Name	Questioned Document Lab		**L**	**T**		**P**
3. Course Code	17040202		0	0		4
4. Type of Course (use tick mark)	Core (✓)	DSE ()	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science Stream	6. Frequency (use tick marks)	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8.Course Description:

In this laboratory course, the students will be able to apply the knowledge of Questioned Document for the examination of handwriting characteristics and various categories of forgeries.

9. Course Objectives:

1. The students will be able to compare different handwriting samples.
2. To detect the simulated and traced forgery.
3. To learn about the security features of currency notes and plastic money.
4. To perform the analysis of alterations, obliterations and erasures in handwriting samples.

10. Course Outcomes (COs):

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

1. Understand the importance of examining questioned documents in crime cases.
2. Get hands on training with the tools required for examination of questioned documents
3. Develop scientific aptitude for comparing hand writing samples.
4. Understand the importance and methods of detecting frauds and forgeries by analyzing questioned documents

11. Practicals

1. To identify handwriting characteristics.
2. To study natural variations in handwriting.
3. To compare handwriting samples.
4. To detect simulated forgery.
5. To detect traced forgery.
6. To study the line quality defects in handwriting samples.
7. To examine the security features of currency notes, passports and plastic money.
8. To study alterations, obliterations and erasures in handwriting samples.

12. Books Recommended

1. Lab Manuals Of DFSS

1. Name of the Department: Forensic Sciences					
2. Course Name	Fingerprints and other Impression Evidence	**L**	**T**	**P**	
3. Course Code	17040203	4	0	0	
4.Type of Course (use tick mark)		Core (✓)	DSE ()	GE ()	SEC ()	
5. Pre-requisite (if any)	10+2 with science Stream	6. Frequency (use tick marks)	Even(✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = Nil	Practical = Nil

8. Course Description:

In this core paper of forensic sciences, the student will be able to know about the basic knowledge of fingerprints and other impression evidence, types, and their examination by developing the latent prints and significance in crime scene investigation.

9. Course objectives:

1. To learn about the basics of fingerprints
2. To understand the different classification systems in fingerprint
3. To understand the different methods and techniques of developing fingerprints on various surfaces at crime scene
4. To learn about different types of prints/impressions and their comparisons

10. Course Outcomes (COs):

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

1. Understand the working of different instrumental techniques that are used in fingerprint examinations.
2. Understand the analytical process of individual identification from fingerprint and its use in the crime investigation.
3. Know the significance of foot, palm, ear and lip prints.
4. Develop latent fingerprints on crime scene using analytical methods

11. Unit wise detailed content:

Unit-1	Number of lectures=13	Title of the unit- Basics of Fingerprinting

Introduction and history, 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.

Unit – 2	Number of lectures=13	Title of the unit- Development of Fingerprints

Fingerprints at crime scene: Latent, patent and plastic 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.

Unit – 3	Number of lectures=13	Title of the unit: Other Impressions/ Prints

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.

Unit – 4	Number of lectures=13	Title of the unit: comparison of prints and report writing

Comparison of fingerprints, footprints, footwear and other impression evidences. Report writing and expert witnessing.

12. Brief Description of self-learning / E-learning component
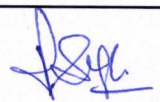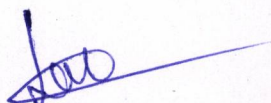
1. https://www.youtube.com/watch?v=0piLHJkjLAQ
2. https://www.youtube.com/watch?v=fMLGROOcvWQ&t=50s
3. https://www.youtube.com/watch?v=InPyy5tpBLM
4. https://www.youtube.com/watch?v=OONfQcGd-uE
5. https://www.youtube.com/watch?v=BUhyV3WC6y8
6. https://www.youtube.com/watch?v=ARdEifU_KVg

13. Books Recommended
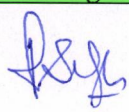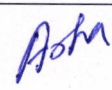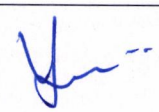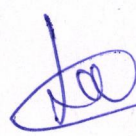
1. Bridges, B.C; Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting expert Testimony, Opinion Evidence., Univ. Book Agency, Allhabad,2000
2. Mehta, M.K; Identification of Thumb impression & cross examination of Fingerprints,
3. N.M. Tripathi Pub. Bombay, 1980.
4. Chatterjee, S.K; Speculation in Fingerprint Identification, Jantralekha printing Works, Kolkata, 1981.
5. Cowger James F; Friction Ridge Skin- Comparison & Identification of Fingerprints, CRC Press, NY, 1993
6. Cossidy, M.J; Footwear Identification, Royal Canadian, Mounted Police, 1980.
7. Iannavelli, A.V; Ear Identification, Forensic Identification Series, Paramount,1989.
8. Henry, C.L. & Ganesslen, R.E; Advances in Fingerprint Technology, CRC Press, London,1991.
9. Jain, A.K., Flynn, P.& Ross A.A., Handbook of Biometrics, Springer, New York 2008

1. Name of the Department: Forensic Sciences						
2. Course Name	Fingerprints and other Impression Evidence Lan		**L**	**T**		**P**
3. Course Code	17040204		0	0		4
4. Type of Course (use tick mark)	Core (✓)	DSE ()	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8.Course Description:

In this laboratory course students will be able to apply knowledge of fingerprinting to develop fingerprints from various surface using different techniques and preparing cast to develop other impressions

9.Course Objectives:

1. To learn about recording of fingerprints
2. To understand the different types of fingerprints and their classification
3. To develop fingerprints from various surfaces
4. To understand the development of footprints

10. Course Outcomes (COs):

Upon successful completion of this course, the students will be able to
1. Developing scientific aptitude to collect and classify fingerprints.
2. Understand and compare fingerprints.
3. Utilize different developing methods of latent/chance prints.
4. Analyze, cast and compare footprints

11. Practical

1. To record plain and rolled fingerprints.
2. To carry out ten-digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To carry out ridge tracing and ridge counting
5. To investigate physical methods of fingerprint detection.
6. To investigate chemical methods of fingerprint detection.
7. To use different light sources for enhancing developed fingerprints.
8. To prepare cast of footprints.

12. Books Recommended

1. Lab Manuals Of DFSS

1.	**Name of the Department: Forensic Science**					
2.	**Course Name**	Proactive and Reactive Forensics		**L**	**T**	**P**
3.	**Course Code**	17040205		4	0	0
4.	**Type of Course (use tick mark)**		Core ()	DSE ( )		SEC (✔)
5.	**Pre-requisite (if any)**	10+2 with Science stream	6. **Frequency (use tick marks)**	Even (✔)	Odd ()	Either Sem ( ) / Every Sem ()

7. **Total Number of Lectures, Tutorials, Practicals**

Lectures = 52	Tutorials = 0	Practical = 0

8. **Course Description**

This core paper in Forensic Sciences provides the basic knowledge and basis of Proactive Forensics, its application and scope in different fields of Forensic Science. This course will also discuss about the tools and techniques in proactive forensics.

9. **Course Objectives**

The objectives of this course are:
1. To understand the basics of Proactive Forensics.
2. To differentiate between Proactive and Reactive Forensics.
3. To understand about different types of proactive and preventive techniques and tools.
4. To understand the aim and scope of Proactive Forensics in current scenario.

10. **Course Outcomes (COs)**

Upon successful completion of this course, the students will be able to:
1. Know about the basic requirements and implications of Proactive Forensics.
2. Know the difference between the Proactive and the Reactive Forensics.
3. Apply the knowledge of Proactive Forensics in the current scenario to combat criminal and crime issues.
4. Know the various edge cutting tools and techniques used in Proactive Forensics.

11. **Unit wise detailed content**

Unit-1	Number of lectures = 10	Title of the unit: Introduction to Proactive Forensics

Introduction to proactive forensics, proactive vs reactive forensics, public awareness about crime , forensic readiness to combat and prevent crimes, people participation in assisting forensic investigations. Case studies related to proactive forensics.

Unit – 2	Number of lectures = 10	Title of the unit: Various Components and Tools in Proactive Forensics

Body armors: Manufacturing, types, uses, and limitations; License plate recognition: Components, working and effectiveness; Trace portal machines, CCTV: Working, functions, types, and uses in forensic investigations, surveillance; Body Scanners: Types, working, legal and ethical issues etc.

Unit – 3	Number of lectures = 10	Title of the unit: Forensic Nursing and Forensic Psychiatry

Introduction: Definition, scope, role and responsibilities, types of forensic nurses. Documentation and their appearance in the court of law. Introduction to forensic psychiatry, role in forensic investigation, testimony in court room, legal and ethical issues.

Unit – 4	Number of lectures = 10	Title of the unit: Forensic Auditing and Cyber Forensics

Introduction to forensic auditing, scope and role of forensic auditors, statuary and investigative auditing, role of forensic auditing in preventive forensics.
Proactive cyber forensics, search and seizers, Anti-forensic methods, preventive evidence collection, court presentation.

12. **Brief Description of self-learning / E-learning component**

1. https://www.youtube.com/watch?v=cxyJRGxWN0k
2. https://www.youtube.com/watch?v=I3i19qRjSSg
3. https://www.youtube.com/watch?v=QVjFjw8uYRc
4. https://www.youtube.com/watch?v=530Xv_EKnKs
5. https://www.researchgate.net/publication/220849931_The_Proactive_and_Reactive_Digital_Forensics_Investigation_Process_A_Systematic_Literature_Review
6. https://link.springer.com/chapter/10.1007/978-3-642-23141-4_9
7. https://www.digitalforensicsmagazine.com/index.php?option=com_content&view=article&id=573

13. Books Recommended
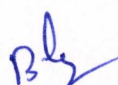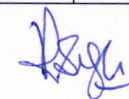
1. Alharbi, S. Proactive System for Digital Forensic Investigation.
2. Gritzalis, D., Furnell, S., &Theoharidou, M. (2012). Information Security and Privacy Research. Berlin, Heidelberg: Springer Berlin Heidelberg.
3. Bruchey, W. (2003). Suppression of material failure modes in titanium armors. Aberdeen Proving Ground, MD: Army Research Laboratory.
4. Lynch, V., & Duval, J. (2006). Forensic nursing. St. Louis, MO: Elsevier Mosby.
5. Taylor, J. (2011). Forensic accounting. New York: Financial Times Prentice Hall.

1. Name of the Department: Forensic Sciences							
2. Course Name	Environmental Science			L	T	P	
3. Course Code	AECC01002			4	0	0	
4. Type of Course (use tick mark)		Core ( )	DSE ()	AECC(✓)	SEC ( )		
5. Pre-requisite (if any)	10+ 2 with Science Stream	6. Frequency (use tick marks)	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ( )	

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course study of environmental problems is inherently interdisciplinary, blending perspectives from the sciences, social sciences, and humanities.

9. Course Objectives:

1. To learn the Organizational level of ecological systems
2. To understand the scope of environmental sciences in the current scenario.
3. To gain the knowledge and impact of various types of pollutions along with their preventive measures.
4. To understand the different environmental issues and there social impact.

10. Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:
1. Know the Importance of environmental studies and methods of conservation of natural resources..
2. Describe the structure and function of an ecosystem and explain the values and Conservation of bio-diversity.
3. Recall social issues and legal provision and describe the necessities for environmental act
4. To describe the impact of various pollutants in society and the parameters to overcome these pollutants.

11. Unit wise detailed content

Unit-1	Number of lectures=13	Title of the unit:- The Multidisciplinary nature of environmental studies.

The Multidisciplinary nature of environmental studies, Definition, scope and importance. Need for public awareness. Natural Resources, Renewable and non-renewable resources: Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Unit – 2	Number of lectures=13	Title of the unit:- Ecosystems

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Biodiversity and its conservation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit – 3	Number of lectures=13	Title of the unit: Environmental Pollution

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Fireworks, their impacts and hazards. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Unit – 4	Number of lectures=13	Title of the unit: Social Issues and the Environment

Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Consumerism and waste products. Environmental Legislation (Acts and Laws) Issues involved in enforcement of environmental legislation. Human Population and the Environment. Population growth, variation among nations with case studies, Population explosion – Family Welfare Programmes and Family Planning Programmes, Human Rights, Value Education, Women and Child Welfare

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=9TmZRZ-w1Y4
2. https://www.youtube.com/watch?v=YaRkQ6mYNC4
3. https://www.youtube.com/watch?v=bCVtowxwqR8
4. https://www.youtube.com/watch?v=v-RMhW4Xcyw
5. https://www.youtube.com/watch?v=InD80_yGLR0
6. https://www.youtube.com/watch?v=QzP2mnrVdeY
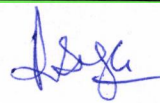
13. Books Recommended

1. Dhameja, S. K., Environmental Engineering and Management, S. K. Kataria and sons, New Delhi, 1st Edition2015.
2. Anubha Kaushik and Kaushik C.P., Environmental Science & Engineering" New Age international Publishers, New Delhi, 2010.
3. Gilbert M. Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., 2nd edition, 2004.
4. Erach Bharucha, Textbook for Environmental Studies, UGC, New Delhi, 2004.
5. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Co. USA, 2nd Edition2004.
6. Erach Bharucha, "The Biodiversity of India", Mapin publishing Pvt. Ltd., Ahmedabad India, 2002.
7. Trivedi R.K., "Handbook of Environmental Laws", Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro media, 2003.
8. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001. 7. Wager K.D., "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
9. Sawyer C. N, McCarty P. L, and Parkin G. F., Chemistry for Environmental Engineering, McGraw-Hill, Inc., New York, 1994.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Accounting		**L**	**T**		**P**
3. Course Code	17040301		4	0		0

4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

The course forensic accounting deals with issues that have significant implications for both corporations and individuals. Funds misappropriation, tax fraud, fictitious revenue are a few examples of the disputes that are prevalent in today's era which requires investigations to get the truth out. Student will understand the methods applied to investigate a fraud committed and also will learn the importance of fraud prevention and forensic accounting principles.

9. Course Objectives:

1. Imparting fundamental knowledge that is crucial for understanding and practicing forensic accounting principles.
2. Develops skills to understand the balance sheet and audit reports.
3. To inculcate the qualities for working effectively in multicultural environment.
4. Promoting self-learning through discussion of case studies.

10. Course Outcomes (COs):

Upon completion of the course the student will be able to:

1. Apply forensic principles in solving financial crimes.
2. Classify and understand various acts and laws pertaining to fraud and its examination
3. Reproduce the crucial steps involved in fraud investigation.
4. Analyze the reports of internal and external audits and reconstruct the timeline associated with fraud.

11. Unit wise detailed content

Unit-1	Number of lectures: 13	Title of the unit: Introduction to Forensic Accounting

Forensic Accounting, Forensic Auditing, Scope of Forensic Accounting, Auditing Vs Accounting, Criminology and Digital Forensics, Accounting Information Systems, Risk Analysis, Communication, Psychology of Fraud, Information Technology, Problem Solving, Legal Considerations.

Unit – 2	Number of lectures: 13	Title of the unit: Basics of Forensic Accounting

Fraud Schemes: ACFE fraud tree, financial statement schemes, corruption schemes and other schemes (Ponzi schemes, bank frauds, wire frauds, insurance fraud etc.) The effect of suspected fraud on the audit of financial statements or a forensic investigation; common indicators of fraud; common analytical procedures; sources of forensic evidence; Case studies of accounting frauds.

Unit – 3	Number of lectures:13	Title of the unit: Fraud Risk Assessment and Detection

Different types of Frauds – Cash Fraud, Inventory Fraud, Accounts Payable Fraud, Accounts Receivable Fraud, Payroll Fraud, Revenue Recognition Fraud, Identification of Red Flags of frauds, Technical Literature and Risk Assessment, Risk Assessment Factors, Best Practices, Checklist and Documentation, Prevention Environment, Perception of Detection, Classic Approaches, Other Prevention Measures, Accounting Cycles

Unit -4	Number of lectures: 13	Title of the unit: Fraud Response

Fraud Investigation and Response Protocols, Objectives of Fraud Investigations. Evidence Gathering, Fraud Theory Approach, Evidence Collection Process, Document Analysis, Digital Evidence Analysis, Interviewing, Tools (Access, Excel, PowerPoint) utilized in data analysis, Benford's Law, Purchasing card transaction Analysis.

12. Brief Description of self-learning / E-learning component

1. https://enterslice.com/financial-investigations-and-forensic-accounting
2. https://www.youtube.com/watch?v=UThPs0lie-I
3. https://www.youtube.com/watch?v=3ia_oYibTUM
4. https://www.youtube.com/watch?v=x865G3hr5b4
5. https://www.youtube.com/watch?v=EPgqj3V40C8
6. https://www.youtube.com/watch?v=u49q2uFGxIU
7. https://www.youtube.com/watch?v=HiXwC91r6cY
8. https://www.youtube.com/watch?v=i-RPqKF8z2g
9. https://www.youtube.com/watch?v=eZOIacH5RJY
10. https://www.youtube.com/watch?v=7uhAn19V1EY

13. Books Recommended

1. Mark J. Nigrini, FORENSIC ANALYTICS- Methods and Techniques for Forensic Accounting Investigation, John & Wiley Sons, Inc, 2011.
2. Michael A. Crain, William S. Hopwood, Carl Pacini and George R. Young, Essentials of Forensic Accounting, American Institute of Certified Public Accountants, Inc, 2015.
3. Tommie W. Singleton and Aaron J. Singleton, Fraud Auditing and Forensic Accounting, John & Wiley Sons, Inc, 2011.
4. Mary-Jo Kranacher and Richard Riley. Forensic Accounting and fraud examination. Wiley, 2020.
5. Joseph Ugwulali. Essential of forensic accounting and fraud management. Design publishing 2019

1. Name of the Department: Forensic Science					
2. Course Name	Forensic Accounting Laboratory	L	T		P
3. Course Code	17040302	0	0		4

4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

The course forensic accounting deals with issues that have significant implications for both corporations and individuals. As committing fraud has become quite prevalent in today's time, the students should have insight and knowledge to indicate the red flags associated with fraud. Through this course the student will understand the methods applied to investigate a fraud committed. They will learn the importance of fraud prevention and forensic accounting principles.

9. Course Objectives:

1. Inculcating skills that are crucial for understanding and practicing forensic accounting.
2. Develops knowledge to understand the balance sheet and audit reports.
3. Imparting qualities for working effectively in a multicultural environment.
4. Promoting self-learning through discussion of case studies.

10. Course Outcomes (COs):

Upon completion of the course the student will be able to:

1. Evaluate the various tools used in forensic auditing.
2. Analyze the account's summary for indications of red flags.
3. Apply the forensic principles in fraud identification.
4. Reproduce the timeline associated with fraud.

11. List of Experiments

1. To understand the fraud triangle and fraud diamond through relevant case studies.
2. To learn the five accounting cycles.
3. To understand the data that is collected during fraud analysis.
4. To understand and apply Benford's Law.
5. To understand the framework of the software ACCESS for identification of fraud.
6. To understand the use of MS-EXCEL while analysing sheets.
7. To understand the use of Correlation to detect fraudulent sales numbers.
8. To establish the details and red flags in stock market data using Time-Series Analysis.
9. To detect financial statement fraud.

12. Books Recommended

1. Mark J. Nigrini, Forensic Analytics- Methods and Techniques for Forensic Accounting Investigation, John &Wiley Sons, Inc, 2011.
2. Michael A. Crain, William S. Hopwood, Carl Pacini and George R. Young, Essentials of Forensic Accounting, American Institute of Certified Public Accountants, Inc, 2015.
3. Tommie W. Singleton and Aaron J. Singleton, Fraud Auditing and Forensic Accounting, John &Wiley Sons, Inc, 2011.

1. Name of the Department: Forensic Science

2. Course Name	Crime Scene Ethics and Evidence Management	L	T	P
3. Course Code	17040303	4	0	0

4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical =00

8. Course Description:

Evidence management has become a crucial component for the law enforcement community. This core course will provide the knowledge of professional ethics of crime scenes and management of physical evidences occurs at crime scene.

9. Course Objectives

1. To provide knowledge of professional ethics at crime scene.
2. To provide the knowledge of professional behaviour during testimony in court.
3. To recognize and preserve physical evidence that will yield reliable information to aid in the investigation.
4. To make students learn to maintain chain of custody and evidence integrity throughout the course of evidence collection, storage, preservation, and processing.

10. Course Outcomes (COs):

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

1. To know about the disciplinary knowledge of the crime scene management.
2. To develop critical thinking and problem-solving strategies by management of real life forensic Investigations
3. To develop analytical and scientific reasoning for crime scene investigation
4. To practice moral values and professional ethics while keeping up with their expertise and genuineness at the crime scene and during court testimony.

11. Unit wise detailed content

Unit-1	Number of lectures - 13	Title of the unit: Code of Ethics

Ethics: Code of ethics, Importance of Codes of Professional Ethics, Legal vs. Scientific Practices, Ethics and Morals, Credibility as a Reason for a Code of Ethics, Obligations of the Expert Witness, Application of Codes of Ethics: How Ethical Requirements Impact the Daily Work of a Forensic Scientist.

Unit – 2	Number of lectures- 13	Title of the unit: Ethical Issues

Ethical Issues Involving Professional Practice, Ethical Issues Involving Technical Competence, Moot court, Behaviour and duties of forensic investigator at crime scene and court.

Unit – 3	Number of lectures- 13	Title of the unit: Physical evidence management

Scene Security, Scene Integrity, Scene Walk-Through and Initial Documentation, Evidence Recognition and Observation, Scene Documentation, Collection and preservation of physical evidences, contamination of evidence, evidences management of fingerprints, Collection and Preservation of Biological Evidence, General Principles and Techniques of Trace Evidence Collection, Firearm evidences and its collection, preservation,

drug evidence handling procedure, evidence collection and management for forensic toxicological analysis, question documents collection and preservation, evidence collection and management for digital evidences, evidence collection and management in arson cases.

Unit -4	Number of lectures-13	Title of the unit: Case studies related to failure of crime scene management

The Aarushi- Hemraj murder case, important cases related to negligence at crime scene, The Innocence project

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=7KL_JT-jUiI
2. https://www.youtube.com/watch?v=kpjFQmCn9EI
3. https://www.youtube.com/watch?v=F7B9gicu20k
4. https://www.youtube.com/watch?v=N0wfVBXbwJk&t=12s
5. https://www.youtube.com/watch?v=HvYXFNPW3KA

13. Books Recommended

1. https://www.ojp.gov/pdffiles1/nij/grants/254340.pdf
2. Peter D. Barnett. ETHICS in FORENSIC SCIENCE Professional Standards for the Practice of Criminalistics, CRC press
3. Mozayani A and Fisher CP. forensic evidence management from the crime scene to the courtroom. CRC Press Taylor & Francis Group, 2018.
4. Baxter E. Jr. Complete crime scene investigation HANDBOOK. CRC Press, 2015

1. Name of the Department: Forensic Science

2. Course Name	Crime Scene Ethics and Evidence Management Lab	L	T	P
3. Course Code	17040304	0	0	4

4. Type of Course (use tick mark)		Core (√)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd (√)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This practical core course provides an overview of the basic techniques and practises utilised in crime scene investigation, including documentation and processing, physical and trace evidence recovery and processing, and evidence chain of custody and continuity protocols.

9. Course Objectives

1. To provide knowledge of legal and ethical implication of crime scene processing.
2. To provide the knowledge of process of testimony in court.
3. To provide practical knowledge of collection and preservation of the physical evidence.
4. To learn the maintenance of chain of custody and evidence integrity from crime scene to court.

10. Course Outcomes (COs):

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

1. To know about the practical knowledge of the crime scene management.
2. To develop critical thinking and problem solving strategies during crime scene investigation.
3. To develop analytical and scientific reasoning for crime scene investigation.
4. To develop practical approach for collection and preservation of the physical evidence.

11. List of Practicals

1. To consider the protection of the crime scene and ethical issues.
2. To study the do and don't practice at crime scene.
3. To document (Sketching, note making and photography) the crime scene.
4. To evaluate the ethical and environmental reasons in collection of blood samples.
5. To study the collecting and preserving guidelines of trace evidences.
6. To study the crime scene negligence cases.
7. To determine the moral and admissible behaviour of an expert in the court of law.
8. To perform a case study on media effect during crime scene investigation.
9. To understand and study the innocence project.

12. Books Recommended

1. Peter D. Barnett. Ethics In Forensic Science Professional Standards for the Practice of Criminalistics, CRC press
2. Mozayani A and Fisher CP. Forensic evidence management from the crime scene to the courtroom. CRC Press Taylor & Francis Group, 2018.
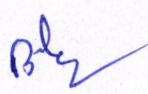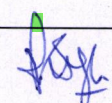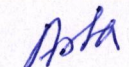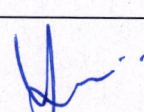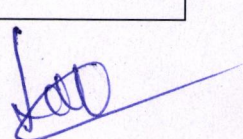
1. Name of the Department: Forensic Sciences						
2. Course Name	Accident Investigations			**L**	**T**	**P**
3. Course Code	17040305			4	0	0
4.Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science Stream	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This core paper in Forensic Sciences, the student will be able to know about the basic knowledge of injuries resulting from accident. Biomechanics of injuries. Hit and run investigations. Trace evidence at accident sites.

9. Course Objective:

1. To impart fundamental and necessary knowledge essential for practicing solving accidental scenes.
2. To provide a platform to exchange views and develop the skills to take up
3. Entrepreneurships and higher studies in the field of forensic science.
4. To improve student's knowledge on investigating accidental scenes and present them in the form of reports, case studies and research studies.

10. Course Outcomes:

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

1. Investigate and explain the real time forensic issues in accidental scenes.
2. Precisely hypothesize and reconstruct the events surrounding an accidental scene based on their critical thinking and observation skills.
3. Analyse and describe theoretical, conceptual and experimental data in accident investigation
4. Collate and interpret scientific information for writing review articles, short communications, case reports.

11.Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Motor Vehicle Accidents

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

Unit – 2	Number of lectures = 13	Title of the unit: Accident Analysis

Pre-crash movement. Post-crash movement. Collision model. vehicle and road kinematics, coefficient of friction and drag factor, methods of determining drag factor, influence on braking distance, Speed determination.

Unit – 3	Number of lectures = 13	Title of the unit: Medico-legal Aspects of RTA

Types of injuries resulting from accident. Biomechanics of injuries. Hit and run investigations: Examination of suspect vehicle, collection of evidence & control samples. Motor Vehicles Act, Legal Jurisprudence of Vehicular accidents.

Unit -4	Number of Lectures=13	Title of Unit: Tachographs

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

12. Brief Description of self-learning / E-learning component
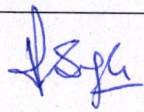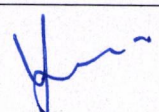
1. https://www.emsa.europa.eu/retro/Docs/marine_casualties/annex_13.pdf
2. https://www.hse.gov.uk/pubns/hsg245.pdf
3. https://dgfasli.gov.in/sites/default/files/inline-files/rlifaridabad_uncovered_pdis201920.pdf
4. https://www.youtube.com/watch?v=MV4DAuR1O1M
5. https://epgp.inflibnet.ac.in/ahl.php?csrno=16
6. https://drive.google.com/file/d/122C9NaIYt5xamwKhiUa2X_tJCvR3x6vE/view
7. https://www.nebosh.org.uk/qualifications/nebosh-hse-introduction-to-incident-investigation/

13. Books Recommended
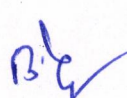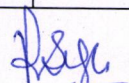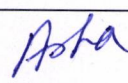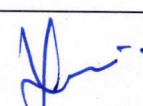
1. T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York (1988).
2. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
3. T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
4. S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. Kenneth S. Obenski et. al.; "Motorcycle Accident Reconstruction and Litigation", Lawyers & Judges Pub. Company. 2011.
6. Lynn B. Fricke.; "Traffic Crash Reconstruction", Northwestern University Center for Public Safety, 2010.
7. Kirk (2000) Vehicular Accident investigation and reconstruction

1. Name of the Department: Forensic Sciences							
2. Course Name	Accident Investigations Lab			**L**	**T**	**P**	
3. Course Code	17040306			0	0	4	
4. Type of Course (use tick mark)		Core (✓)	DSE 0	AEC 0	SEC 0	OE ()	
5. Pre-requisite (if any)	10+2 with Science Stream	**6. Frequency (Use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()	

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

08. Course Description:

In this laboratory course, the students will be able to apply the knowledge of Accident Investigations for the examination of various skid marks, scuff marks, hit and run case and collection of evidences in RTA.

9. Course Objectives:

1. To impart knowledge on examination of Road Traffic Accidents To collect, preserve and document evidences found in RTA cases
2. To improve student's knowledge on injuries and legal jurisprudence in accidental scenes and present them in the form of reports, case studies and research studies.
3. To develop self-learning and be aware of recent trends and technological advances in accident investigations.

10. Course Outcome

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

1. Characterize different tyre marks and skid marks
2. Collect and analyse scuff marks and other evidences found in the crime scene
3. Identify the injuries caused in RTA cases.
4. Understand how to use technology in investigating major accidents like train or road accidents.

11. List of Experiments

1. To conduct collection, preservation and examination of tire marks.
2. To study the pattern of skid marks.
3. To study the pattern of scuff marks.
4. To estimate the speed of the vehicle from skid marks.
5. To collect evidences and conduct examination in hit and run case.
6. To prepare a report on a major road accident.
7. To prepare a report on a major train accident.
8. To identify and examine types of Injuries in RTA

12. Books Recommended

1. Lab Manuals of DFSS
2. T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York (1988).
3. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
4. T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
5. S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
6. Kenneth S. Obenski et. al.; "Motorcycle Accident Reconstruction and Litigation", Lawyers & Judges Pub. Company. 2011.

1. Name of the Department: Forensic Science						
2. Course Name	Smart Device Forensics			**L**	**T**	**P**
3. Course Code	17040401			4	0	0

4. Type of Course (use tick mark)		**Core (√)**	**DSE ()**	**AEC ()**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	**Even (√)**	**Odd()**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This core course will make the students proficient with the latest malware, smartphone operating systems, third-party applications, acquisition shortfalls, extraction techniques (jailbreaks and roots) and encryption. It offers the most unique and current instruction to arm the student with mobile device forensic knowledge that can be immediately apply to forensic cases.

9. Course Objectives

Students will be able to learn:
1. To locate the key evidence on a smartphone or any other smart device.
2. To recover deleted mobile device data with the aid of forensic tools.
3. To decode evidence stored in third-party applications.
4. To detect, decompile, and analyze mobile malware and spyware

10. Course Outcomes (COs):

1. Disciplinary knowledge of smart devices operating systems
2. Gaining the critical thinking about the evidences on smart devices and their retrieval with the help of forensic tools and software.
3. Enhancement of Analytical skills of data acquisition, detection, and analyses of data in forensic investigations.
4. Decompile and analyze mobile malware using open-source tools

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Introduction to Smart Devices and Operating Systems

Different Types of Smart Devices; History of Smart Phones; Working and function of smartphones; Android operating system; iOS operating system; Storage Mediums, SD Cards, Inbuilt Memory, Cloud-based backups and storage; Cloud-synced data - Google and more; Mobile devices in incident-response cases

Unit – 2	Number of lectures = 10	Title of the unit: Malware and Spyware on Smartphones

Types of Malwares and spywares; mode of intrusion and action; Determining if malware or spyware exist in a device; Handling the isolation of the malware; Decompiling malware to conduct in-depth analysis; Determining what has been compromised

Unit – 3	Number of lectures = 16	Title of the unit: Forensic Examination of Smartphone File Systems

Recovering deleted information from smartphones; Examining SQLite databases in-depth; Finding traces of user activities on smartphones; Recovering data from third-party applications; Tracing user online activities on smartphones (e.g., messaging and social networking); Manually decoding to recover missing data and verify results; Identifying devices that have intentionally been modified - deletion, wiping and hiding applications

Unit -4	Number of lectures = 13	Title of the unit: Smartphone Forensic Tools and Applications

Carving data; Developing custom SQL queries; Conducting physical and logical keyword searches; Manually creating timeline generation and link analysis using information from smartphones; Tool validation based on trusted datasets; Using geolocation information from smartphones; Extracting evidence from locked smartphones; Bypassing encryption (kernel and application level); Cracking passcodes; Hot and Cold devices; prevent remote access on the device; mobile device management

12. Brief Description of self-learning / E-learning component
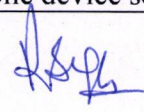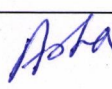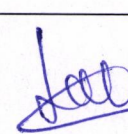
1. https://www.youtube.com/watch?v=PW8-TGGAE3o
2. https://www.youtube.com/watch?v=9kvh8go_jcw
3. https://www.youtube.com/watch?v=ftk_5bjpDu0
4. https://www.youtube.com/watch?v=iUHgHlhbOMI
5. https://www.youtube.com/watch?v=o52Z1x60lBk

13. Books Recommended

1. Lee, S., 2022. Mobile Digital Forensics Framework for Smartphone User Analysis. Webology, 19(1), pp.4335-4351.
2. Doherty, J., n.d. Wireless and mobile device security.
3. 2010. Test results for mobile device acquisition tool. Washington, DC: U.S. Dept. of Justice, Office of Justice Programs, National Institute of Justice.
4. Hoog, A. and McCash, J., 2011. Android forensics. Waltham, MA: Syngress.
5. Easttom, C., n.d. In-depth guide to mobile device forensics.
6. Bommisetty, S., Mahalik, H., Skulkin, O., Tamma, R. and Mikhaylov, I., 2018. Practical Mobile Forensics. Birmingham: Packt Publishing.
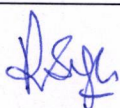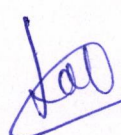
1. **Name of the Department**: Forensic Science					
2. Course Name	Smart Device Forensics Lab	**L**	**T**		**P**
3. Course Code	17040402	0	0		4

4. Type of Course (use tick mark)		**Core (√)**	**DSE ()**	**AEC ()**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	**Even(√)**	**Odd()**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 0	Practical = 52

8. Course Description:

This core course will make the students proficient with the latest malware, smartphone operating systems, third-party applications, acquisition shortfalls, extraction techniques (jailbreaks and roots) and encryption. It offers the most unique and current instruction to arm the student with mobile device forensic knowledge that can be immediately apply to forensic cases.

9. Course Objectives

Students will be able to learn:
1. To locate the key evidence on a smartphone or any other smart devices.
2. To recover deleted mobile device data with the aid of forensic tools.
3. To decode evidences stored in third-party applications.
4. To detect, decompile, and analyze mobile malware and spyware

10. Course Outcomes (COs):

1. Disciplinary knowledge of smart devices operating systems
2. Gaining the critical thinking about the evidences on smart devices and their retrieval with the help of forensic tools and software.
3. Enhancement of Analytical skills of data acquisition , detection, and analyses of data in forensic investigations.
4. Detect smartphones compromised by malware and spyware using forensic methods

11. List of Experiments

1. Studying the security and privacy measures of smart devices.
2. Studying and analysing the features of Android Operating System.
3. Studying and analysing the features iOS.
4. Understand and enumerating Mobile Device Hardware
5. Understanding the Functioning of SIM/USIM system.
6. Understanding Mobile device characteristics.
7. Studying and understanding various Mobile Device Tool Classification System
8. Working on Manual extraction of data.
9. Working of Logical Extraction of data.
10. Understanding the Hex Dumping and JTAG
11. Studying the Preservation and Isolation of data.
12. Learning sophisticated mobile forensic tools like "Encrypted Disk Detector", RAM Capture, FAW (Forensic Acquisition of Websites), VOLATILITY etc.

12. Books Recommended

1. Lee, S., 2022. Mobile Digital Forensics Framework for Smartphone User Analysis. Webology, 19(1), pp.4335-4351.
2. Doherty, J., n.d. Wireless and mobile device security.

3. 2010. Test results for mobile device acquisition tool. Washington, DC: U.S. Dept. of Justice, Office of Justice Programs, National Institute of Justice.
4. Hoog, A. and McCash, J., 2011. Android forensics. Waltham, MA: Syngress.
5. Easttom, C., n.d. In-depth guide to mobile device forensics.
6. Bommisetty, S., Mahalik, H., Skulkin, O., Tamma, R. and Mikhaylov, I., 2018. Practical Mobile Forensics. Birmingham: Packt Publishing.
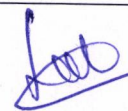
1. Name of the Department: Forensic Science					
2. Course Name	Photography and Its Forensic Significance	**L**	**T**		**P**
3. Course Code	17040403	4	0		0

4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

The course forensic photography deals with the visual documentation of various aspects prevalent at the crime scene. It is imperative for the law enforcement to establish the location of the crime and its perimeter with correct measurements. This course will enable the students to establish the location of physical evidences at the crime scene and simultaneously link circumstantial evidences. They will also learn the importance of reconstruction of the crime scene and how valid evidences are presented before the court of law.

9. Course Objectives:

1. Building fundamental knowledge crucial for understanding and practicing photography.
2. Developing skills to understand the elements of photography.
3. To inculcate the qualities for working effectively in multicultural environment.
4. Promoting self-learning by practising the art of photography.

10. Course Outcomes (COs):

Upon completion of the course the student will be able to:

1. Appling photography principles to conduct crime scene photography.
2. Classify and understand the exposure triangle.
3. Reproduce the crucial steps involved in crime scene photography.
4. Analyze the pictures after photography and reconstruct the timeline associated with crime.

11. Unit wise detailed content

Unit-1	Number of lectures: 13	Title of the unit: Introduction to Forensic Photography

Introduction, Importance, Scope and features of Forensic Photography, methods employed for conducting photography at the crime scene, principles of photography, exposure triangle, hue, contrast and color, equipment utilized, admissibility of evidence in the court of law.

Unit – 2	Number of lectures: 13	Title of the unit: Camera and its parts

Definition, history and development of cameras, camera parts, types of cameras, SLR and DSL camera, concept of pixels, frames per second, resolution, magnification, shutter speed, aperture and their significance. Image exposure, ISO, depth of field, different setting modes and tripod.

Unit – 3	Number of lectures:13	Title of the unit: Crime Scene Photography

Types of photographs taken at the crime scene, importance, Specialized photography- UV, IR, close-up, transmitted light, side light, trick photography, contact print photography, oblique light photography. Photography using scientific equipment, preparation of demonstrative images and juxta pose charts, Scope of photography in various disciplines of forensic science- finger prints, foot prints, physics, chemistry, biology, ballistics, computer forensics etc.

Unit -4	Number of lectures: 13	Title of the unit: Digital Photography

Digital photography, software for digital photography, file formats-jpg, gif, bmp, tiff, raw etc., digital watermarking, digital imaging, photomicrography, microphotography, Videography-basics of video camera and their function, video standard formats, application of videography in police work. CCTV image enhancement, processing of digital images and its manipulation. Case studies.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=_krYKDYURQ4
2. https://www.youtube.com/watch?v=x-i-U67oCVc
3. https://www.youtube.com/watch?v=AOazriXe6ec
4. https://www.youtube.com/watch?v=z3h1F99woDU
5. https://www.youtube.com/watch?v=BsSjEhktkzU
6. https://www.youtube.com/watch?v=PIaxWT8XobY
7. https://www.youtube.com/watch?v=phd2vbGw1LI
8. https://www.youtube.com/watch?v=E54PrUf13ds
9. https://www.youtube.com/watch?v=hRer5xSP2HQ
10. https://www.youtube.com/watch?v=x2WAKqIe2UU
11. https://www.youtube.com/watch?v=GddZfLV7G3Q
12. https://www.youtube.com/watch?v=NolmF2_birY
13. https://www.youtube.com/watch?v=QjfCoLp9s1w
14. https://www.youtube.com/watch?v=g3kLoqY-hkU
15. https://photographylife.com/photography-basics

13. Books Recommended

1. David R. Redsicker; "The Practical Methodology of Forensic Photography", 2nd Ed. CRC Press LLC, 2001.
2. R.E. Jacobson, S.F. Ray, G.G. Attridge; "The Manual of PhotographyPhotographic and Digital Imaging", N.R. Oxford, 2000.
3. Allan Matchett; "CCTV for Security Professionals", Elsevier, Butterworth Heinemann, 2003.
4. Nick Marsh; "Forensic Photography: A Practitioner"s Guide", 2014.

1. **Name of the Department:** Forensic Science							
2. **Course Name**	Photography Lab			**L**	**T**		**P**
3. **Course Code**	17040404			0	0		4

4. **Type of Course (use tick mark)**		Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. **Pre-requisite (if any)**	10+2 with Science stream.	6. **Frequency (use tick marks)**	**Even** (✓)	Odd()	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

The course forensic photography will help student learn, understand and perform crime scene photography. It is extremely imperative for the student's to have a basic knowledge and skill to perform photography efficiently for forensic purpose. The photographs taken should be admissible in the court of law. Thus through this course they will inculcate the skills required for conducting photography.

9. Course Objectives:

1. Imparting fundamental knowledge that is crucial for understanding and practicing forensic photography.
2. Develops skills to understand the ambient light required for conducting photography.
3. To inculcate the qualities for working effectively in multicultural environment.
4. Promoting self-learning through practising photography.

10. Course Outcomes (COs):

Upon completion of the course the student will be able to:

1. Apply forensic principles in conducting forensic photography.
2. Classify and understand various tools and equipment used in photography.
3. Recognize the various parts of a DSLR.
4. Analyze the built-up and manipulated documents and reconstruct the crime scene through photographs.

11. List of experiments

1. To understand the exposure triangle through photographs.
2. To understand the parts of a DSLR.
3. To identify, measure and conduct photography of a road.
4. To conduct crime scene photography (overall, mid-range and close-up).
5. To conduct photography of outdoor crime scene.
6. To conduct photography of indoor crime scene.
7. To take photographs of currency notes and other documents under UV light.
8. To conduct Crime Scene Videography.
9. To manipulate and identify a document/photograph digitally.
10. To conduct photographs with scale of trace and latent(post development) evidence.

12. Books Recommended

1. DFSS Lab Manual
2. Nick Marsh; "Forensic Photography: A Practitioner"s Guide", 2014.

1. Name of the Department: Forensic Sciences					
2. Course Name	Psychology and Criminology		L	T	P
3. Course Code	17040405		4	0	0
4.Type of Course (use tick mark)		Core (✓)	DSE ()	GE ()	SEC ()
5. Pre-requisite (if any)	10+2 with Science stream	6. Frequency (use tick marks)	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals		
Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

In this core paper, the students will be able to understand the basics of psychology and criminology, relationship between psychology and criminal behaviour. They will also be able to get knowledge about various theories, causes and types of crimes and tools used for detection in cases of deception.

9. Course Objectives:

1. To understand the fundamentals of forensic psychology.
2. To understand the relationship between psychology and criminal behavior.
3. To study various theories related to cause of crime along with different types of crimes
4. To understand the applications of various detection and deception techniques used in forensic psychology.

10. Course Outcomes (COs):

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

1. Understand and explain the concepts and real time issues related to forensic psychology
2. Develop critical thinking skills for assessing the psychology behind criminal behaviour.
3. Understand the theories associated with crime and criminal behaviour
4. Summarize the importance and reports of psychological assessment in gauging criminal behaviour by tools and techniques required for detection of deception.

11. Unit wise detailed content

Unit-1	Number of lectures=13	Title of the unit: Basics of Forensic Psychology

Definition and fundamental concepts of forensic psychology and forensic psychiatry. Psychology and law. Ethical issues in forensic psychology. Assessment of mental competency. Mental disorders and forensic psychology. Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling. Psychology in the courtroom, with special reference to Section 84 and 85 of IPC.

Unit – 2	Number of lectures=13	Title of the unit: Psychology and Criminal Behaviour

Psychopathology and personality disorder. Psychological assessment and its importance. Serial murderers. Psychology of terrorism. Introduction of Victimology. Causes of crime. Social, Economic, Psychological, Political, Culture, and Geographical and their prevention. Juvenile Delinquency.

Unit- 3	Number of lectures=13	Title of Unit: Introduction to Criminology and its theories

Criminology –Definition Nature and Scope. Criminal Action and Criminal Behaviour, School of Criminology-Classical School and Positive School, Crime Typologies and Theories of Criminology: White collar crime, Organized crime, Terrorism, Theory of Criminology-Differential Association Theory, Self-Concept and Containment theory, Labelling theory, Barrier Theory. Sexual Offences- Prostitution and Abortion, Rape, Sexual Abuse of Child.

Unit – 4	Number of lectures=13	Title of Unit: Detection of Deception

Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer (VSA), Hypnosis. Polygraphy – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test. Narco analysis and brain electrical oscillation signature (BEOS) – principle and theory, ethical and legal issues.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=HMPIvOUvqPA
2. https://www.youtube.com/watch?v=z_4tvjT-Q88
3. https://www.youtube.com/watch?v=t3yzPbeBXGQ
4. https://www.youtube.com/watch?v=wYTmbpaiYYU
5. https://www.youtube.com/watch?v=tpJcBozuF6A
6. https://www.youtube.com/watch?v=XDkVnHG6WDQ
7. https://www.youtube.com/watch?v=tdaqqlFQdTE
8. https://www.youtube.com/watch?v=ei5n_MK_KTQ

13. Books Recommended

1. AldertVrij. Detecting Lies and Deceit: Pitfalls and Opportunities (2nd ed). Wiley, 2008.Brent Turvey. Criminal profiling: An Introduction to Behavioral Evidence Analysis. Academic Press, 2011.
2. C.R. Mukundan. Brain Experience: Neuroexperiential Perspectives of Brain-Mind. Atlantic Publishers & Distributors (P) Ltd., 2007.
3. David A. Crighton & Graham J. Towl. Forensic Psychology (2nd ed).. Wiley, 2015.
4. Irving B. Weiner & Randy K. Otto. The Handbook of Forensic Psychology (4th ed). Wiley, 2010.
5. Murray Kleiner. Handbook of Polygraph testing (1st ed). Academic Press, 2001.
6. Nathan J. Gordon. Essentials of Polygraph and Polygraph testing (1st ed). CRC Press, 2016.
7. Sandie Taylor. Forensic Psychology-The Basics. Routledge, 2015
8. William O'Donohue & Eric Levensky. Handbook of Forensic Psychology (1st ed). Academic Press, 2003.
9. Rama Ahuja. Criminology. Prabhat Prakashan, 2000.
10. Edwin Hardin Sutherland & Donald R Cressey. Criminology, Philadelphia, Lippincott, 1974.

1. Name of the Department: Forensic Science						
2. Course Name	Psychology and Criminology Lab		**L**	**T**		**P**
3. Course Code	17040406		0	0		4
4. Type of Course (use tick mark)	**Core (✓)**	**DSE ()**	**AEC ()**	**SEC ()**		**OE ()**
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	**Even (✓)**	**Odd ()**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

In the course, the students will learn about relationship between crime and psychology of the criminal. They will also be able to review and prepare reports on different types of cases in which psychology of a criminal played a crucial role. Students will also be able to perform certain tests to determine the psychological status of a suspect or criminal.

9. Course Objectives

1. To study various crime cases depicting relationship between crime and psychology of an individual.
2. To understand various theories related to cause of crime along with different types of crime
3. To understand the applications of polygraphs and brain mapping in the aspects of criminal investigation.
4. To gain practical exposure on various advanced instrumental techniques for detection of deception

10. Course Outcomes (COs):

Upon successful completion of this course, the students will able to

1. Develop critical thinking skills to understand the psychology of a victim or suspect.
2. Collate and interpret the case findings for writing reports.
3. Gain knowledge about real time crime cases related to psychological behaviour of a person
4. Apply scientific reasoning in cases related to forensic psychology

11. List of Experiments

1. To cite a crime case where legal procedures pertaining to psychic behaviour had to be invoked.
2. To prepare a report on relationship between mental disorders and forensic psychology.
3. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
4. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.
5. To study a criminal case in which hypnosis was used as a means to detect deception.
6. To study a case supporting the theories of criminology.
7. To review a crime case involving organized crime.
8. To review a crime case involving juvenile delinquency.
9. To cite a criminal case in which narco analysis was used as a means to detect deception.
10. To cite a criminal case in which polygraph test and brain mapping was used as a means to detect deception.

12. Books Recommended

1. DFS Manuals of Forensic Science
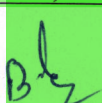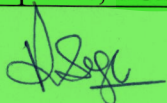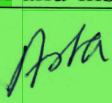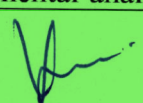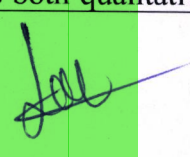
1. Name of the Department: Forensic Sciences						
2. Course Name	Adulteration in Edible Items			**L**	**T**	**P**
3. Course Code	17040501			4	0	0
4.Type of Course (use tick mark)		Core (✓)	DSE ()	GE ()	SEC ()	
5. Pre-requisite (if any)	10+2 with Science stream	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

In this core paper, the students will be able to understand the concept of adulteration in edible items, the difference between adulterants and additives, types of additives and adulterants used. The students will also be made acquainted with an examination of adulterants and various laws related to it.

9. Course Objectives:

1. To understand the concept of adulteration in food articles
2. To understand about additives, its types and use in edible items.
3. To gain knowledge about examination of adulterants in edible items.
4. To become well versed with various laws related to adulteration of edible items.

10. Course Outcomes (COs):

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

1. Understand and explain the concepts and real time issues related to adulteration of food items.
2. Understand the theories associated with additives and its uses.
3. Develop critical thinking skills for examining the level of adulteration in different types of edible items
4. Summarize the importance and reports on adulteration in accordance to various acts and laws related to it.

11. Unit wise detailed content

Unit-1	Number of lectures=13	Title of the unit: Food and Adulteration

Introduction to adulteration in edibles, Definition and types of adulteration, common adulterants in different edible items, Cheap substitutes, spoiled parts. Means of adulteration, Adulterants in the following food articles: Milk, Oil, Grain, Sugar, Spices and condiments, Processed food, Fruits and vegetables, Effects and side-effects of adulteration, and its forensic significance.

Unit – 2	Number of lectures=13	Title of the unit: Additives

Introduction to additives, types of additives: nature and characteristics and use of additives in food such as antioxidants, chelating agents, colouring agents, curing agents, emulsions, flavours and flavour enhancers, flour improvers, humectants and anti-caking agents, nutrient supplements, non-nutritive sweeteners, pH control agents, stabilizers and thickeners. Raising agents – types and their role in food processing., artificial colours, Artificial flavours, FDA guidelines, preservatives-permitted and non-permitted, colours and other chemicals used in edible items and their harmful effects. General Impact of additives on Human Health.

Unit- 3	Number of lectures=13	Title of Unit: Examination of Adulteration in edibles

Evaluation of quality and assessment of edibles like milk and milk products, fruits and vegetables, beverages, freshly prepared food, cereals and pulses, Detection and instrumental analysis both qualitative

and quantitative methods for detection and examination of various adulterants in edible items i.e. colour tests, chromatographic and spectrophotometric techniques.

Unit – 4	Number of lectures=13	Title of Unit: Laws related to adulteration

Prevention of Food Adulteration Act 1954. Food Safety and Standards Act 2006 (FSSA): Provisions under FSSA, Food Safety and Standards (Licensing and Registration of Food Businesses) Regulation, 2011, Food Safety and Standards (Packaging and Labelling) Regulation, 2011, Food Safety and Standards (Laboratory and Sampling Analysis) Regulation, 2011, Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011. Section 272 and 273 IPC. Role of voluntary agencies: Agmark, I.S.I.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=duXdyAeh-Bs
2. https://www.youtube.com/watch?v=l0BthUI_MMA
3. https://www.youtube.com/watch?v=V4Xw6i6W6Yo
4. https://www.youtube.com/watch?v=Pz6i1EMc6mo
5. https://www.youtube.com/watch?v=e-UKv6TA-G0
6. https://www.youtube.com/watch?v=2GbJdwdGGDs
7. https://www.youtube.com/watch?v=ue9cE7YdjNU
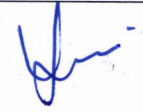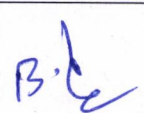
13. Books Recommended

1. H.D. Belitz: Food chemistry, Springer, 1999.
2. R.J. Taylor: Food Additives, Wiley–Blackwell, 1980
3. Patricia and Curtis A, An operational Text Book, Guide to Food Laws and Regulations, Wiley-Blackwell, 2005)
4. The Food Safety and Standards act, 2006 along with Rules & Regulations 2011

1. **Name of the Department**: Forensic Science					
2. Course Name	Adulteration in Edible Items Lab	**L**	**T**	**P**	
3. Course Code	17040502	0	0	4	
4. Type of Course (use tick mark)	Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

In the course, the students will learn about qualitative and quantitative examination of adulteration of food articles. It will give them knowledge about various types adulterants and additives used in various edible items.

9. Course Objectives

1. To conduct qualitative analysis of food articles for detection of adulterants.
2. To conduct quantitative analysis for detection of adulteration in edible items
3. To gain practical exposure on various advanced instrumental techniques for detection of adulteration
4. To understand the examination procedure for detection of non-permitted additives and preservatives.

10. Course Outcomes (COs):

Upon successful completion of this course, the students will able to
1. Investigate the real time forensic issues related to food adulteration
2. Critically analyse the situations related to food adulteration and use of non-permitted additives.
3. Analyze and detect adulteration in various edible items
4. Practice moral values and ethics while examining and reporting the presence of non-permitted additives and adulterants in food articles.

11. List of Experiments

1. To detect the adulteration in milk and milk products using physical methods.
2. To detect the adulteration in milk and milk products using chemical methods.
3. To detect adulteration in spices and condiments using physical methods.
4. To detect adulteration in spices and condiments using chemical methods.
5. To detect adulteration in edible oils using physical and chemical methods.
6. To detect adulteration in edible items using advanced instrumental techniques
7. To examine the processed food articles for different types of additives and preservatives
8. To detect the adulteration of edible food items for non-permitted colours, preservatives and other additives.

12. Books Recommended

1. DFS Manuals of Forensic Science

1. Name of the Department: Forensic Science					
2. Course Name	Forensic Ballistics		**L**	**T**	**P**
3. Course Code	17040503		4	0	0
4. Type of Course (use tick mark)		**Core** (✓)	**DSE ()**	**AEC ()**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)	10+2 with Science Stream	**6. Frequency (use tick marks)**	**Even ()**	**Odd (✓)**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

In this core paper the student will be able to know about the basic knowledge of firearms, their classifications, firing mechanisms, Types of ammunition, concepts of forensic ballistics, identification of ballistic evidences at the scene of crime, tools and techniques used in Forensic Ballistics and other related topics.

9. Course Objectives:

1. To gain the disciplinary knowledge of Forensic Ballistics and its branches.
2. To understand the basics of firearms, their classifications and firing mechanism.
3. To develop the conceptual knowledge and critical thinking about the concepts of internal, external and terminal ballistics.
4. To develop understanding about reconstruction and ethical reporting of firearm related cases.

10. Course Outcomes (COs):

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

1. Gain the disciplinary knowledge of Forensic Ballistics and its concepts.
2. Classify the firearms on the basis of characteristic features and their firing mechanisms.
3. Identify, examine and compare the bullet and cartridge cases for control and crime samples.
4. Develop analytical skills of estimate the range of firing, and to develop critical thinking about the trace evidences encountered at the scene of crime.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Firearms & Classification

Defining Ballistics and Forensic Ballistics and its concept. Need and scope of Forensic Ballistics. History and development of firearms. Classification of firearms according to bore, barrel, action, firing mechanism and handling. Weapon types and their operation. Parts of the firearm.

Unit-2	Number of lectures = 13	Title of the unit: Internal, External & Terminal Ballistics

Internal ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics.

External Ballistics – Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity.

Terminal Ballistics – Effect of projectile on hitting the target and wound ballistics. Cavitation. Tensile Strength of Tissues. Bullet Proof Jackets, and Stopping Mechanism. Ricochet.

Unit – 3	Number of lectures = 13	Title of the unit: Ammunition, and its types

Defining Ammunition. Types of ammunition. Constructional features and characteristics of different types of cartridges and bullets. Primers and priming compounds. Propellant charges and compositions. Projectiles. Class and Individual Characteristics of fired cartridge cases and bullets. Headstamp markings on ammunition. Different types of marks produced during the firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejector marks, rifling marks, and individual striations.

Unit – 4	Number of lectures = 13	Title of the unit: Firearm, related Evidences, and Techniques

Identification and comparison of bullets and cartridge cases. Techniques for identification. Improvised, and country made firearms. IBIS, Determination of range of fire. Accidental Discharge. GSR analysis. Reconstruction with respect to accident, suicide, murder and self-defence. Forensic Report writing.

12. Brief Description of self-learning / E-learning component
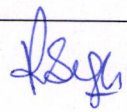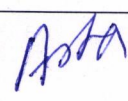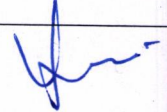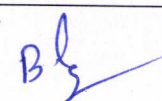
1. https://www.youtube.com/watch?v=3kXNIoGUshs
2. https://www.youtube.com/watch?v=jietpKOrTJA
3. https://www.youtube.com/watch?v=7GVTV6oA6fk
4. https://www.youtube.com/watch?v=yCxBxbT5mkI
5. https://www.youtube.com/watch?v=1_ILUNXvecM
6. https://www.youtube.com/watch?v=Jd3o1nuvcrI
7. https://www.youtube.com/watch?v=2qVQmnFKb8o
8. https://www.youtube.com/watch?v=rPYTQlFNk5Q
9. https://www.youtube.com/watch?v=hNmX7Ybli1o

13. Books Recommended

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. Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
5. Sharma, B.R., Firearms In Criminal Investigation & Trials, Universal Law Publishing, 6th Edition (2020).

1. Name of the Department: Forensic Sciences					
2. Course Name	Forensic Ballistics Lab		**L**	**T**	**P**
3. Course Code	17040504		0	0	4
4. Type of Course (use tick mark)	Core (✓)	DSE ()	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical's		
Lectures = 00	**Tutorials = 00**	**Practical = 52**

8. Course Description:

In this laboratory course of Forensic Ballistics, the student will learn to identify various types of firearms and their functioning. They will develop an understanding various parts of firearms, their identification and linkage to the crime evidences. They will gain problem solving skills related to the shooting incident and evidences encountered and the scene of crime.

9. Course Objectives:

1. To understand various types and parts of firearms.
2. To understand the firing mechanism, functioning of firearms, and the marks created on the cartridge case and bullets during firing.
3. To examine the firearm and related evidences encountered at the scene of crime.
4. To study the nature of firearm injuries, GSR, and medico-legal aspects of firearm injuries.

10. Course Outcomes (COs):

After the successful completion of this course the students will able to:

1. Obtain the disciplinary knowledge of Ballistics, firearms and their types.
2. Critically identify the firearms, and related evidences at the scene of crime.
3. Learn the firing mechanism and its impact on bullet and cartridge cases.
4. Solve problems related to the fired cartridge cases and bullets.

11. List of Experiments

1. To study various parts of firearm.
2. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
3. To estimate the range of fired bullets.
4. To carry out the comparison of fired bullets.
5. To carry out the comparison of fired cartridge cases.
6. To identify gunshot residue and its components.
7. To correlate the nature of injuries with distance from which the bullet was fired.
8. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

12.Books Recommended

1. Manual of DFSS
2. B.J. Heard, Handbook of Firearms and Ballistics, Wiley and Sons, Chichester (1997).
3. W.F. Rowe, Firearms identification, Forensic Science Handbook, Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey (1988).
4. A.J. Schwoeble and D.L. Exline, Current Methods in Forensic Gunshot Residue Analysis, CRC Press, Boca Raton (2000).
5. Sharma, B.R., Firearms In Criminal Investigation & Trials, Universal Law Publishing, 6th Edition (2020).

1. Name of the Department: Forensic Sciences							
2. Course Name	**Forensic Biology**			**L**	**T**		**P**
3. Course Code	17040505			4	0		0
4.Type of Course (use tick mark)	Core ()		DSE (✓)	GE ()	SEC ()		
5. Pre-requisite (if any)	10+2 with science stream	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()		Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical =00

8. Course Description:

This paper in Forensic Sciences, the student will be able to know about the basic knowledge of biological and serological evidence. Importance of biological evidences like hair, fibre and entomological evidences in crime scene investigation

9.Course Objectives:

1. To impart fundamental and necessary knowledge essential for examination of biological evidences.
2. To provide a platform to exchange views and develop the skills to take up entrepreneurships and higher studies in the field of forensic science.
3. To improve student's knowledge on investigating biological specimens and present them in the form of reports, case studies and research studies.
4. To develop self-learning and be aware of recent trends and technological advances in forensic biology

10. Course Outcomes (COs):

After the successful completion of this course the students will able to:

1. Investigate and explain presence of biological evidences
2. Precisely hypothesize and reconstruct the events surrounding crime scenes containing biological specimens.
3. Analyse and describe theoretical, conceptual and experimental data in analysing biological and serological evidences
4. Collate and interpret scientific information for writing review articles, short communications, case reports.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit- Biological Evidence

Nature and importance of biological evidence. Significance of hair evidence. Transfer, persistence and recovery of hair evidence. Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair. Identification of wood, leaves, pollens and juices as botanical evidence.

Unit – 2	Number of lectures = 13	Title of the unit-: Wildlife Forensics

Fundamentals of wildlife forensic. Significance of wildlife forensic. Wildlife Protection Act Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of various animals. Offences and Penalties regarding wildlife crimes with relevant case studies.

Unit – 3	Number of lectures = 13	Title of the unit: Diatom Examination

Diatoms: Types, Nature, Collection of diatoms as evidences, their examination and medico legal significance. Relevant Case Studies

Unit – 4	Number of lectures = 13	Title of the unit: Forensic Entomology and Microbiology

Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations. Types and identification of microbial organisms of forensic significance.

12. Brief Description of self-learning / E-learning component

1. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000016FS/P000699/M011528/ET/1516257136FSC_P12_M2_e-text.pdf
2. http://dfs.nic.in/pdfs/biology%20manual%202019%2007.08.2019%2089%20PAGES.pdf
3. https://www.sjsu.edu/people/steven.lee/courses/c2/s2/Wecht_29.pdf
4. https://www.sja.gos.pk/assets/presentations/april2016Pres/Forensic%20Serology%20by%20Capt%20Farhat%20H%20Mirza.pdf
5. https://www.youtube.com/watch?v=hOZpQ8Ykksg
6. https://www.youtube.com/watch?v=kF6EGa8GpD0
7. https://www.youtube.com/watch?v=MZTDjix4_Zw

13. Books Recommended.

1. L. Stryer, Biochemistry, 3rdEdition, 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).
6. Robertson (1999) : Forensic examination of Hair. Francis & Taylor, USA
7. Li R. (2008) Forensic Biology, Taylor & Francis Group LLC.
8. Esau Katherine; "Plant Anatomy", Wiley Eastern Ltd., 1965.
9. Heather Miller Coyle; "Forensic Botany", CRC Press, 2005

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Biology Lab			**L**	**T**	**P**
3. Course Code	17040506			0	0	4
4. Type of Course (use tick mark)		Core ()	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with science stream	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

07. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

08. Course Description:

In this laboratory course, the students will be able to apply the knowledge of Forensic Biology for the examination of various biological samples like human hair, pollen grains and diatoms.

09. Course Objectives:

1. To impart fundamental and necessary knowledge essential for examination of hair and fibre evidences
2. To provide a platform to understand collection and significance of biological evidences
3. To improve student's knowledge on investigating wildlife crimes
4. To develop self-learning and be aware of recent trends and technological advances in forensic biology

10. Course Outcomes (COs):

After the successful completion of this course the students will able to:

1. Investigate and explain the types of hair evidences
2. Precisely hypothesize and reconstruct the events surrounding crimes scenes containing biological evidences
3. Analyse crimes pertaining to wildlife forensics and forensic palynology
4. Collate and interpret scientific information for writing review articles, short communications, case reports on microbial and entomological evidences.

11. List of Practicals:

1. To examine hair morphology and determine the species to which the hair belongs.
2. To prepare slides of scale pattern of human hair.
3. To examine human hair for cortex and medulla.
4. To carry out analysis of fibre.
5. To carry out microscopic examination of pollen grains.
6. To carry out microscopic examination of diatoms
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics.

12. Books Recommended

1. Lab Manuals of DFS
2. 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).
3. Robertson (1999) : Forensic examination of Hair. Francis & Taylor, USA
4. Li R. (2008) Forensic Biology, Taylor & Francis Group LLC.
5. Nataraj Publishers; "Wildlife (Protection Act, 1972)", Nataraj Publishers, 1997.
6. G. Erdtman; "Pollen Morphology & Plant Taxonomy: Angiosperms (an introduction to Palynology), Hafner Publishing Co., 1971.
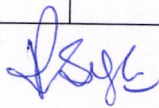
1. Name of the Department:	Forensic Science						

2. Course Name	Forensic Serology	**L**	**T**	**P**			
3. Course Code	17040507	4	0	0			

4. Type of Course (use tick mark)		Core ( )	DSE (✓)		SEC ( )		
5. Pre-requisite (if any)	10+2 with Science	6. Frequency (use tick marks)	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

This course provides students the knowledge of biological evidences along with their forensic significance, Significance of genetic marker typing, Blood grouping of body fluids and Serological techniques will also be explained.

9. Course Objectives

The objectives of this course are to:
1. Introduce the importance of biological fluids (blood, semen, saliva, urine, sweat and milk) in crime investigations.
2. Know about Blood grouping from dried stains of blood.
3. Explain the usefulness of genetic markers in forensic investigations.
4. The forensic importance of bloodstain patterns.

10. Course Outcomes (COs)

Upon successful completion of this course, the students will get:
1. Disciplinary knowledge of different categories body fluids.
2. Analytical skill enhancement of various blood typing techniques.
3. Critical knowledge of different tests in forensic examination of body fluids.
4. Scientific knowledge of different serological techniques.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Forensic Importance and analysis of Blood Evidence

Importance, nature, location, collection and evaluation of Blood: Composition and functions, Human Blood groups ABO & Rh: General Principles, theory of their inheritance, Blood group determination from fresh blood. Definition of antigen and antibody, Various Antigen-antibody reactions. Blood grouping from dried stains of blood by Absorption inhibition, Absorption-elution and mixed agglutination techniques. Blood pattern analysis and their forensic significance.

Unit - 2	Number of lectures = 13	Title of the unit: Forensic Significance of Blood Typing

Identification from fresh blood and stains: Presumptive and Confirmatory tests. Red cell enzymes: Genetics, polymorphism and typing of PGM, GLO-I, ESD, EAP, AK, ADA etc. and their forensic significance.

Unit – 3	Number of lectures = 13	Title of the unit: Forensic Importance and analysis of Body Fluids

Semen: Formation, Composition, Morphology of spermatozoa, forensic significance, Presumptive and Confirmatory tests (including Azoospermic semen stains). Forensic significance of other body fluids like saliva, sweat, milk etc, their collection and Tests for their identifications. Blood grouping from body fluids, determination of secretor/non-secretor status.

Unit – 4	Number of lectures = 13	Title of the unit: Serological Techniques

Primary binding assays (ELISA, Immunochromatographic assays), Secondary binding assays (Precipitation based assays- Immunodiffusion and electrophoretic methods for species Identification, Agglutination based assays-Direct agglutination assay, Passive agglutination assay)

12. Brief Description of self-learning / E-learning component
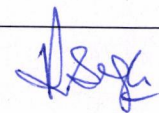
1. https://www.youtube.com/watch?v=ZaRyoVyGsl4
2. https://www.youtube.com/watch?v=VSVYgivfs9c
3. https://www.youtube.com/watch?v=yj7bfZKlIp8
4. https://www.youtube.com/watch?v=noMsCGRkwSE
5. https://www.youtube.com/watch?v=xKFAJkWidFo
6. https://www.youtube.com/watch?v=cKnEdvrmHK4
7. https://www.youtube.com/watch?v=wfqnNuYIY78
8. https://www.youtube.com/watch?v=fwO-k8P67ac
9. https://www.youtube.com/watch?v=cKnEdvrmHK4
10. https://www.youtube.com/watch?v=7uL_m8xEdJk
11. https://www.youtube.com/watch?v=efPx0avVh5w
12. https://www.youtube.com/watch?v=-jKzLLHjRfs
13. https://www.youtube.com/watch?v=Svoipyl6IRc

13. Books Recommended
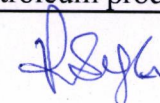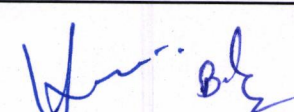
1. Boorman, K. E: Blood Group Serology, Churchill, and Lincolin, P. J. (1988)
2. Saferstein, R. (1982): Science Handbook, Vol. I, II and III, Prentice Hall, New Jersey.
3. Gilblet, E. (1969): Marker's in Human Blood, Davis, Pennsylvania.
4. Culliford, B. E. (1971): The examination and Typing of Blood Stains, US Deptt. of Justice, Washington.
5. Chowdhuri, S. (1971): Forensic Biology, B P R & D, Govt. of India.
6. Dunsford, I. and Bowley, C. (1967): Blood Grouping Techniques, Oliver & Boyd, London.
7. Eckert, W. G. & James, S.H. (1989): Interpretation of Blood Stain, Evidence, Elsevier, New York.
8. Li Richard. Forensic Biology, Taylor & Francis Group LLC., 2008.
9. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey 2004.
10. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton. (2008).
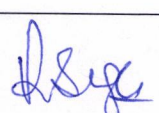
1. Name of the Department: Forensic Science							
2. Course Name	Forensic Serology Lab		**L**	**T**		**P**	
3. Course Code	17040508		0	0		4	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)			SEC ( )	
5. Pre-requisite (if any)	10+2 with Science	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )		Every Sem ( )

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8.Course Description

This course provides students the practical knowledge of different body fluid evidences along with their forensic significance, Significance of Blood grouping of body fluids and Serological techniques will also be explained.

9. Course Objectives

1. Know usefulness of genetic markers in forensic investigations.
2. Identify blood samples by chemical tests and study of blood stains patterns.
3. Determine blood group from fresh and dried blood samples.
4. Gain practical exposure in analysis of body fluids as evidence

10. Course Outcomes (COs)

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

1. Know about the practical knowledge of preliminary tests of blood.
2. Develop practical approach and skills for carrying out blood grouping from fresh blood and stains.
3. Enhance skills to examine various body fluids.
4. Develop analytical and scientific reasoning to understand blood stain pattern examination.

11. List of Experiments

1. To determine blood group from fresh blood samples.
2. To determine blood group from dried blood sample.
3. To identify blood samples by preliminary tests
4. To carry out the Teichmann test for blood
5. To carry out the Takayama test for blood
6. To identify the given stain as semen.
7. To identify the given stain as saliva.
8. To identify the given stain as urine.
9. To study different bloodstain pattern analysis.
10. To study the correlation between impact angle and shape of bloodstain.

13. Books Recommended

1. DFSS, CFSL and SFSL Manuals
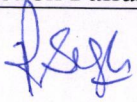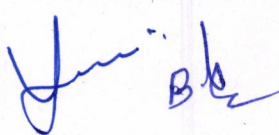
1. Name of the Department: Forensic Science							
2. Course Name	Forensic Chemistry			L	T		P
3. Course Code	17040509			4	0		0
4. Type of Course (use tick mark)		Core ( )	DSE(✓)	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd(✓)	Either Sem ()		Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course offers the basic knowledge of petroleum products in crime scene evidence, classification of explosives, including the synthesis and characterization of representative analog. This course discusses the cases related to arson, characteristics of the narcotics, drugs and psychotropic substances.

9. Course Objectives

1. To understand the chemistry and behaviour fire and management of arson cases for practicing forensic principles and procedures in criminal justice system.
2. To develop the understanding of the examination of petroleum products and adulteration for practicing forensic principles and procedures in criminal justice system.
3. To understand the characteristics and analysis of petroleum products to impart fundamental and necessary knowledge essential for practicing forensic principles and procedures in criminal justice system.
4. To learn the characteristics and analysis of Narcotics and Psychotropic Substances to respond to challenges of an ever-changing environment with the most current knowledge and technology.

10. Course Outcomes (COs):

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

1. Develop understanding of the chemistry and behaviour fire and management of arson cases to explain the real time forensic issues in legal and social context.
2. Develop analytical skills for examination of petroleum products to analyze and describe experimental data related to forensic and adulteration cases.
3. Develop scientific reasoning ability to characterize and analyze petroleum products and adulteration to practice and follow the processes required for a sustainable, healthy, safe and honest environment.
4. Development of the understanding of the characteristics and analysis of Narcotics and Psychotropic Substances in legal and social context.

11. Unit wise detailed content

Unit-1	Number of lectures =13	Title of the unit: Introduction to Arson

Arson: Chemistry and Behaviour of fire, origin and cause and their methods of investigation and evaluation of clue material, analysis of arson exhibits by various methods: Management of Arson cases.

Unit – 2	Number of lectures =13	Title of the unit: Petroleum Products

Examination of petroleum products: distillation and fractionation, various fractions and their commercial uses, standard methods of analysis of petroleum products for adulteration.

Unit – 3	Number of lectures =13	Title of the unit: Explosives

Classification, composition and characteristics of explosives, pyrotechnics, IEDs, systematic examination of explosives and explosion residues in the laboratory using chemical and instrumental techniques in the laboratory and interpretation of results, Explosives Act.

Unit -4	Number of lectures=13	Title of the unit: Narcotics and Psychotropic Substances

Definition of narcotics, drugs and psychotropic substances. Classification and characteristics – Narcotics, stimulants, depressants and hallucinogens. 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.

12. Brief Description of self-learning / E-learning component

1. https://rajasthanjudicialacademy.nic.in/docs/studyMaterial17122020.pdf
2. https://dor.gov.in/sites/default/files/Narcotic-Drugs-and-Psychotropic-Substances-Act-1985.pdf
3. http://dfs.nic.in/pdfs/CHEMISTRY%20MANUAL.pdf
4. https://digilib.bppt.go.id/sampul/Guide_to_ASTM_Test_Methods_for_the_Analysis_of_Petroleum_Products_and_Lubricants_full.pdf
5. http://agrifuelsqcs-i.com/attachments/1207%20/d4057.pdf
6. http://dfs.nic.in/pdfs/EXPLOsive.pdf
7. https://www.ojp.gov/pdffiles1/nij/181869.pdf
8. https://nfa.usfa.fema.gov/ax/sm/sm_r0214.pdf

13. Books Recommended

1. Carper, K. (ed.), Forensic Engineering, 2nd Edn. CRC Press, Bocarida, Florida, 2001.
2. Field, J., and Carper, K., Construction Failure, 2nd Edn. John Wiley and Sons, New York, 1996.
3. James, S.H. and Nordby, J.J. Eds., Forensic Science An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
4. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004)
5. SAE Handbook, Vol. 4, On-Hghway and Off-Highway Machinery, Society of Auto mobile Engineers, 2000
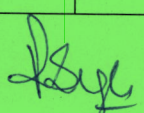
1. Name of the Department: Forensic Sciences						
2. Course Name	Forensic Chemistry Lab		**L**	**T**	**P**	
3. Course Code	17040510		0	0	2	
4. Type of Course (use tick mark)	Core ()	DSE (✓)	AEC ()	SEC ()	OE ()	
5. Pre-requisite (If any)	10+2 with Science stream.	6. Frequency (Use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This course offers the analytical knowledge of petroleum products, explosives, in crime scene investigation. This course discusses the cases and analytical procedures related to arson, characteristics of the narcotics, drugs and psychotropic substances.

9. Course Objectives:

1. To understand the procedures for the analysis of explosives, arson cases, petroleum products for practicing forensic principles and procedures in criminal justice system.
2. To learn the report writing and documentation to make students capable to express their ideas clearly and persuasively in written and oral forms at technical, professional, and legal platforms.
3. To understand and perform the quantitative and qualitative analysis of the explosives and petroleum products to work effectively in any multicultural environment.
4. To understand the current techniques and procedures to face challenges of an ever-changing environment with the most current knowledge and technology.

10. Course Outcomes (COs):

The students will able to –
1. Learn about the various types of explosives used, their investigation to explain the real time forensic issues in legal and social context.
2. Understand the investigation of Fire related cases and the role of expert witnesses to hypothesize and reconstruct the events surrounding a crime scene based on their critical thinking and observation skills.
3. Understand the application of TLC, GC-MS in the analysis of petroleum products and explosives to analyze, and describe the experimental data for interpretation of results efficiently.
4. Understand the report making and documentation to communicate effectively their thoughts, opinions and findings related to professional conduct and social issues.

11. List of Practicals

1. To analyze the given sample of gasoline.
2. To determine the adulterants present in the petrol.
3. To perform the qualitative and quantitative analysis of the given sample of adulterated kerosene oil.
4. To analyze the sample of arson accelerators present on the fabric collected from crime scene.
5. To prepare a case report on a case involving arson.
6. To perform the analysis of GSR deposited on the clothing.
7. To separate explosive substances using thin layer chromatography.
8. To prepare a case report on bomb scene management.

12. Books recommended:

1. Carper, K. (ed.), Forensic Engineering, 2nd Edn. CRC Press, Bocarida, Florida, 2001.
2. Field, J., and Carper, K., Construction Failure, 2nd Edn. John Wiley and Sons, New York, 1996.

3. James, S.H. and Nordby, J.J. Eds., Forensic Science An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
4. SAE Handbook, Vol. 4, On-Hghway and Off-Highway Machinery, Society of Auto mobile Engineers, 2000

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Toxicology			L	T	P
3. Course Code	17040511			4	0	0
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

The course begins with the theoretical study of concept Toxicology, role in forensic Science, poison types and classification, also learn about poisoning and management. The students are then introduced to gaseous poison, biological and war weapon. Animal and plant poisons and their identification.

9. Course Objectives

1. To impart disciplinary knowledge about forensic toxicology
2. To develop critical thinking while examining toxicological evidences for solving related crimes.
3. To develop analytical/ scientific reasoning by analysing evidences and interpreting their final results
4. To develop a problem solving attitude by studying different cases of forensic toxicology

10. Course Outcomes (COs):

Upon successful completion of this course, the students will be able to

1. Understand the concept and significance of toxicological studies in forensic science
2. Gain knowledge about different types of poisons and toxins in criminal cases of toxicological interest.
3. Obtain critical thinking skills to understand the absorption mechanism of poisons in body fluids.
4. Effectively classify, characterize and report the narcotics, drugs and psychotropic substances in the court of law.

11. Unit wise detailed content

Unit-1	Number of lectures : 13	Title of the unit: Basics of Forensic Toxicology

Forensic Toxicology - Scope and Significance. Classification of Poisons based on their mode of action, uses and origin. Poisons - Types, routes of administration, toxicity, sign and symptoms. Factors affecting the effect of poison, medico-legal aspects of poisoning cases.
Guidelines for collecting forensic evidences in poisoning cases at crime scene. Importance of Post mortem examination in poisoning cases. Sample preparation for the analysis of poisons in body tissues/fluids and analysis by various instrumental techniques.

Unit – 2	Number of lectures :13	Title of the unit: Narcotic Drugs & Psychotropic Substances

Scope and significance NDPS drugs in forensic science, NDPS Act, Classification and characterization of NDPS drugs, Drug Law Enforcement, Search & Seizure, Sampling procedure, Forwarding of sample to FSL, Sample preparation for analysis, Preliminary analysis of drugs, Reporting of drug cases, Drug abuse, Drug addiction and its problems, Drug and cosmetics act.

Unit – 3	Number of lectures : 13	Title of the unit: Poisons

Commonly used poisons for suicidal, Homicidal and Accidental deaths Common Poisoning in India: Pesticides: Different types and their formulations, identification of pesticides, standard or sub-standard or substituted pesticides.

Unit -4	Number of lectures : 13	Title of the unit: Analytical methods and techniques

Different extraction methods (Stas Otto Method, Acid digestion method, Wet digestion method, Liquid – Liquid extraction) Basic chromatographic techniques, Hyphenated techniques (HPLC, HPTLC, LC-MS, GC-MS)

12. Brief Description of self-learning / E-learning component
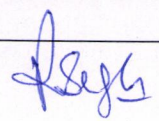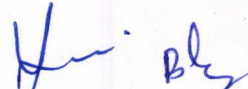
1. http://www.forensicsciencesimplified.org/tox/Toxicology.pdf
2. https://www.researchgate.net/publication/334033207_Forensic_Toxicology
3. https://ccsuniversity.ac.in/bridge-library/pdf/Toxicology_EBook.pdf
4. http://www.eolss.net/sample-chapters/c09/e6-12-23-00.pdf
5. https://meridian.allenpress.com/aplm/article/125/4/581/453023/Principles-of-Forensic-Toxicology
6. https://www.youtube.com/watch?v=r-YgTuO7_ak

13. Books Recommended

1. Finar I.L; "Organic Chemistry: Vol. I Fundamental Principle", Pearson Education,Singapore, 1967.
2. Pearson D; "Chemical Analysis of Food", Chemical Publ. Co. New York, 1971.
3. Morrison R.T and Boyd R. N.; "Organic Chemistry", 6th Edition, Prentice Hall, 2003.
4. "Laboratory Procedure Manual: Petroleum Products", Directorate of Forensic Science,MHA, Govt. of India, 2005.
5. "Working Procedure Manual on Chemistry", Directorate of Forensic Science MHA Govt.of India, 2005.
6. Bureau of Indian Standard Specifications related to Alcohols and Petroleum Products.
7. Welcher Frank; "Standard Methods of Chemical Analysis", 6th Edition, Van Nostrand Reinhold,1969.
8. Watson C.A; "Official and Standardized Methods of Analysis", Royal Society ofChemistry, UK, 1994.
9. "Laboratory Procedure Manual: Forensic Toxicology", Directorate of Forensic Science,MHA, Govt. of India, 2005.
10. Narayanan, T.V; "Modern Techniques of Bomb Detection and Disposal", R. A. Security system, 1995.
11. Jacqueline Akhavan; "The chemistry of explosives", Royal Society of Chemistry, UK,1998.
12. "Working Procedure Manual- Chemistry, Explosives and Narcotics", BPR&D, 2000.
13. Niesink, RJM; "Toxicology- Principles and Applications", CRC Press, 1996.
14. Chadha, PV; "Handbook of Forensic Medicine & Toxicology", Jaypee Brothers, NewDelhi, 2004.
15. Modi, JP; "Textbook of Medical Jurisprudence & Toxicology", N.M. Tripathi Pub, 2001.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Toxicology Lab		**L**	**T**		**P**
3. Course Code	17040512		0	0		4

4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures =00	Tutorials = 00	Practical = 52

8. Course Description:

In this laboratory course, the students will be able to apply the knowledge of Forensic toxicology to analyse samples of volatile poisons, plant poisons and metallic poisons etc.

9. Course Objectives

1. To impart disciplinary knowledge about forensic toxicology
2. To develop critical thinking while examining toxcological evidences for solving related crimes.
3. To develop analytical/ scientific reasoning by analysing evidences and interpreting their final results
4. To develop a problem solving attitude by studying different cases of forensic toxicology

10. Course Outcomes (COs):

Upon successful completion of course, the students will be able to

1. Analyse various volatile poisons from viscera samples
2. Relate the evidence to the crime scene and prepare report accordingly
3. Analyse various plant poisons
4. Understand the extraction procedures of different poisons.

11. List of Experiments

1. To analyse viscera for volatile poisons (Organic and Inorganic) by Conway apparatus.
2. To detection and identify metallic poisons in viscera and food material by chemical test and instrumental technique.
3. To analyse viscera for organochloro, organophosphoro, carbamates and pyrethroids by colour test TLC/HPTLC and UV-visible spectrometry method.
4. To determine alcohol in blood and urine sample.
5. To perform systematic extraction, and identification of non –volatile drugs and plant poisons by various techniques.
6. To identify common plant poisons opium and alkaloids, Kaner, Dhatura and NuxVomica, Aconite by colour test, cannabis and instrumental techniques.
7. To detect and identify quarternary ammonium drugs and poison in viscera by ionpair method and instrumental method.
8. To determine phosphine in aluminum phosphide and zinc phosphide in viscera bychemical and instrumental analysis.
9. To identify psychotropic drugs- barbiturates, benzodiazepines & narcotics in biologicalfluids by colour test, TLC/HPTLC and instrumental techniques.
10. To detect and identify of major metabolites of ethanol, methanol, parathion, carbryland heroin.
11. To perform systematic analysis of unknown poisons.

12. Books Recommended

1. DFS Manual of Forensic Toxicology
2. A C Moffat Clarke's Analysis of Drugs and Poisons, (Formerly Isolation & Identification of Drugs) 3rd Ed. 2 Vol.
3. Casarett & Doll Toxicology (2003) The Basic Science of poisons.
4. Clark, E.G.C. : Isolation and identification of Drugs, VI and Vol. II, 1966, 1975-1986.
5. Curry A.S (1986) Analytical Methods in Human Toxicology, Part II, CRC Press Ohio
6. Curry, A.S. (1976) Poison Detection in Human Organs.
7. Michael J. Deverlanko et al (1995) Hand Book of Toxicology CRC Press.
8. Morgan B.J.T (1996) Statistics in Toxicology, Clarendon Press, Oxford.
9. Modi, Text Book of Medical Jurisprudence Forensic Medicines and Toxicology (1999) CBS Pub. New Delhi
10. Saferstien (1982) Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc. USA.
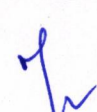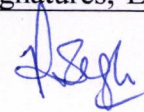
1.Name of the Department: Forensic Science							
2.Course Name	Advanced Questioned Document Examination		**L**	**T**		**P**	
3.Course Code	17040513		4	0		0	
4.Type of Course (use tick mark)		Core ( )	DSE (✓)			SEC ( )	
5.Pre-requisite (if any)	10+2 with Science stream	6.Frequency (use tick marks)	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )	

7.Total Number of Lectures, Tutorials, Practicals		
Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

This course will explain various terminologies related to questioned document examination. It also focuses on court observations and proceedings with reference to questioned document examination including paper and paperless documents as well as typewritten matter. The students will also learn about comparison of handwriting and signature specimens as well as paper and ink examination.

9. Course Objectives

1. To understand the concepts of questioned document and handwriting examination.
2. To identify and compare the handwriting or signature samples on the basis of class and individual characteristics
3. To gain knowledge about various factors which effect handwriting of an individual
4. To understand the concept of paper and ink examination.

10. Course Outcomes (COs)

Upon successful completion of this course, students would be able to,

1. Gain conceptual knowledge about questioned document and handwriting examination
2. Develop problem solving skills in various paper and paperless crime cases
3. Ethically analyze and report various evidence related to questioned document examination.
4. Communicate effectively their thoughts, opinions and findings for the court of law.

11.Unit wise detailed content

Unit-1	Number of lectures = 10	Title of the unit: Introduction to Questioned document
Define: Document, Questioned document. Problems related to Questioned document examination. Paper and paper less document, evidence in case of questioned document, expert and expert opinion, admissibility in court of law, Indian Evidence Act w.r.t. questioned document examination, report on photocopies and scanned copies, typewritten matter examination		
Unit – 2	Number of lectures = 13	Title of the unit: The purpose and complexities of Handwriting examination
The Purposes and complexities in Examination: Comparison of Handwriting, Consideration of Similarities, The Possibility of Chance Match, The Possibility of Simulation, Subjectivity, Identification, Qualified Conclusions, Limited Populations, Consideration of Differences, Consistent Differences, Other Reasons for Differences, Similarities with Differences, Disguise, Simulation, Identification of the Writer of Simulations, Inconclusive Examinations, Complexities of Handwriting Comparisons, Inconsistent Known Writings, Multiple Suspects, Reproduced Writing, Unfamiliar Scripts, Statements, Expressing Conclusions, Qualified Conclusions, Scales of Conclusions, Clarity of Expression, Quality Assurance, Variety of Forms in Handwriting.		
Unit – 3	Number of lectures = 14	Title of the unit: Handwriting Examination
Handwriting Analysis: Accidental Variation of Handwriting, Writing Instruments, Writing Position, Effect of Health of Writer, Guided Hand Signatures, Effect of Drugs and Alcohol on handwriting , Deliberate		

Variation of Handwriting, Disguised Writings, Difficulties of Disguising Writing, Disguised Signatures, Simulated Writings, Freehand Simulation, Slowly Made Simulations, Simulations of Poorly Made Signatures, Rapidly Made Simulations, Traced Signatures, Introduction of Features of the Copier, Digital signature/writings and examination: Forensic stylistics, Forensic linguistics, e-documents, digital signatures, Examination of fake rubber stamps and seals, Examination of printed and photocopied documents

Unit 4	No. of Lectures = 15	Title of the unit: Examination of paper and ink

Examination of Paper: Types of Paper, Manufacture of Paper, Paper gsm, Testing of Paper, Non-destructive Tests, Destructive Tests, Comparison of Paper, Mechanical Fits, Watermarks, Dating of Paper, Envelopes, Writing Materials, Pencils, Inks, Liquid Inks, Ball-Point Inks, Fiber Tipped, Roller Ball, and Gel Pens. Examination of Inks: Visual Examination, Examination of Color, Absorption Spectra and the Examination of Inks, Ultraviolet and Infrared Radiation, Detection of Infrared Radiation, Infrared Absorption, Ultraviolet Fluorescence, Infrared Luminescence, Comparison of Inks Using Infrared Luminescence, Erasures, Obliterations, Other Luminescence Effects, Destructive Techniques, Chromatography, Thin-Layer Chromatography, High-Performance Liquid Chromatography, Chemical Tests, Other Components of Ink, Further Techniques, Relative Aging of Ball-Point Inks, Dating of Inks.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=Zc0yGQbL9qY
2. https://www.youtube.com/watch?v=AxubbuQJ9LU
3. https://www.youtube.com/watch?v=emCPoUKNQ0E
4. https://www.youtube.com/watch?v=4iCBLgMEoNM
5. https://www.youtube.com/watch?v=Wxc-ike51k0
6. https://www.youtube.com/watch?v=34JxLDoF6kM
7. https://www.youtube.com/watch?v=-x5S4X9mhMM
8. https://www.youtube.com/watch?v=p9bmGt1_Pxo

13. Books Recommended

1. Saferstein R. Criminalistics, Prentice Hall, New York, 1990.
2. JA Siegel, PJ Saukko. Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press, 2000.
3. Huber AR. and Headrick, A.M. Handwriting Identification: Facts and Fundamentals CRC LLC, 1999.
4. Ellen D. The scientific examination of Documents, Methods and techniques. 2nd ed., Taylor & Francis Ltd., 1997.
5. Morris. Forensic Handwriting Identification (fundamental concepts and Principles), 2000.
6. Harrison W.R Suspect Documents & their Scientific Examination, Sweet & Maxwell Ltd., London, 1966.
7. Hilton O. The Scientific Examination of Questioned Document, Elsevier North Holland Inc., New York, 1982.
8. Mehta MK. The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad., 1970.
9. Osborn AS. Questioned Documents, Boyd Printing Co., Chicago, 1929
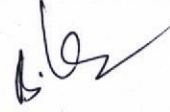
1. Name of the Department: Forensic Science					
2. Course Name	Advanced Questioned Document Examination Lab	**L**	**T**	**P**	
3. Course Code	17040514	0	0	4	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	SEC ( )	
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ( ) / Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

The practical course emphasizes on learning of basic skills helpful during forensic document examination. The students will get practical exposure on comparison of handwriting found on different surfaces, examination of inks, paper, paperless, photocopied and typewritten documents.

9. Course Objectives

1. To gain practical knowledge to compare different handwriting or signature samples.
2. To develop understanding for detecting forgery in paper and paperless documents.
3. To analyze different types of papers and inks for determination of authenticity of the document.
4. To perform the analysis of alterations, obliterations and erasures in handwriting samples.

10. Course Outcomes (COs)

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

1. Gain hands-on experience in analyzing experimental data and interpretation of results.
2. Collect, analyze and report different types of questioned documents as evidence in the court of law.
3. Examine and compare handwriting, ink and paper samples using various tools and techniques
4. Analyze and interpret the observations and opinions ethically and effectively in the form of technical and professional report writing.

11. List of experiments

1. To compare handwriting on different surfaces
2. To examine document for various types of forgeries.
3. To examine and compare different types of Paper using destructive and non-destructive techniques.
4. To examine and compare different types of inks using destructive and non-destructive techniques.
5. To determine the authenticity of digital signatures.
6. To conduct examination of rubber stamps and seals to determine whether it is genuine or not.
7. To determine the authenticity of printed documents.
8. To determine the authenticity of photocopied documents.
9. To determine relative age of ink using destructive and non-destructive techniques.
10. To conduct a moot court session for representation of expert witness (questioned documents)

12. Books Recommended

1.DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science						
2. Course Name	Advanced Fingerprint and Other Impression Evidence			L	T	P
3. Course Code	17040515			4	0	0
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course will explain various methods of developing latent fingerprints, detection of fingerprints on various types of surfaces and Automatic Fingerprint Identification System (AFIS) will be explained.

9. Course Objectives

1. Introduce about the development of latent fingerprints by using various techniques.
2. Explain about how to detect fingerprints on various types of surfaces.
3. Describe working and applications of AFIS.

10. Course Outcomes (COs):

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

1. Develop disciplinary knowledge to develop latent fingerprints by using various techniques.
2. Develop critical thinking and problem-solving techniques used to develop fingerprints on various types of surfaces.
3. Develop analytical / scientific reasoning skills that explains the working and applications of AFIS.
4. Ethically analyse the fingerprint related evidence and present report in the court of law.

11. Unit wise detailed content

Unit-1	Number of lectures-13	Title of the unit: Optical Detection Techniques

Absorption: Definition, principle and application, Luminescence: definition, principle and application, Diffused Reflection: definition, principle and application, Ultraviolet Imaging: definition, principle and application, Laser detection: definition, principle and application

Unit – 2	Number of lectures-13	Title of the unit: Fingerprint Detection Techniques for Porous Surfaces and Non-Porous surfaces

Detection Techniques for Porous Surfaces: Ninhydrin, Ninhydrin Analogs, Diazafluorenone (DFO), Physical Developer, Multimetal Deposition (MMD), Recommended Detection Sequence.
Detection Techniques for Nonporous Surfaces: Fingerprint Powders, Vacuum Metal Deposition (VMD).

Unit – 3	Number of lectures-13	Title of the unit: Miscellaneous Techniques for Latent Fingerprint Detection

Iodine/Benzoflavone, Dimethyl-amino-cinnam-aldehyde (DMAC), Osmium Tetroxide (OsO) and Ruthenium Tetroxide (RTX), Silver Nitrate, Diaminobenzidine (DAB).
Fingerprint Detection on Adhesive Surfaces: Gentian Violet, Sticky-Side Powder, Cyanoacrylate Fuming.

Fingerprint Detection on Firearms and Cartridge Cases, Fingerprint Detection on Human Skin, Enhancement of Fingerprint in Blood, Optical Techniques, Protein Stains.

Finger-mark Detection on Non-Porous Wet Surfaces: Small particle reagent

Unit -4	Number of lectures- 13	Title of the unit: Automated fingerprint identification system
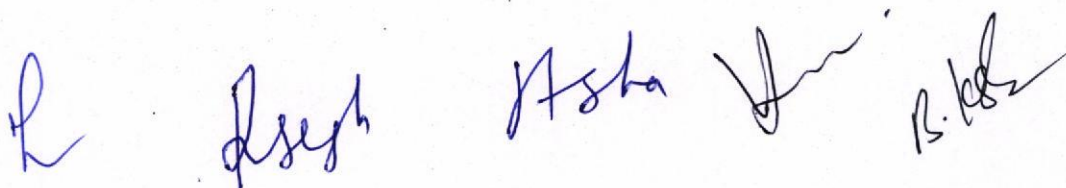
Introduction, Importance, Structure and Techniques, Search possibilities, Live scan, worldwide Status and Networking.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=jxoNqSVLZxc
2. https://www.youtube.com/watch?v=NDwCkj2tuUc
3. https://www.youtube.com/watch?v=2Tgh5GiWZ54
4. https://www.youtube.com/watch?v=e06JfudgPEc
5. https://www.youtube.com/watch?v=HNuYDIsW-eA
6. https://www.youtube.com/watch?v=jFjwKCk4V6I
7. https://www.youtube.com/watch?v=ZFStpz0YVOc
8. https://www.youtube.com/watch?v=eMgavz0l-Go
9. https://www.youtube.com/watch?v=LuRScwzqCss
10. https://www.youtube.com/watch?v=vuGufxxbIb4
11. https://www.youtube.com/watch?v=yvvOOKG-jCc

13. Books Recommended

1. Moenssens, A. A. (1971). Fingerprint techniques (pp. 174-193). London: Chilton Book Company.
2. Kanbar, A. B. (2016). Fingerprint identification for forensic crime scene investigation. International Journal of Computer Science and Mobile Computing, 5(8), 60-65.
3. Ramotowski, R. (Ed.). (2012). Lee and Gaensslen's advances in fingerprint technology. CRC press.
4. Daluz, H. M. (2018). Fundamentals of fingerprint analysis. CRC Press.
5. Ratha, N., & Bolle, R. (Eds.). (2003). Automatic fingerprint recognition systems. Springer Science & Business Media.

1. Name of the Department: Forensic Science						
2. Course Name	Advanced Fingerprint and Other Impression Evidence Lab			**L**	**T**	**P**
3. Course Code	17040516			0	0	4
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This course emphasizes on learning of basic skills helpful for students in the report formation for court of law. It includes studying comparison Fingerprint and detection of fingerprint on Porous/non-porous/adhesive surfaces.

9. Course Objectives

1. To understand the concept of detection of finger mark on different surfaces.
2. To explain how to report cases in the court of law
3. To develop skills for taking photography and enhancement of developed fingerprint

10. Course Outcomes (COs):

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

1. Become self-directed and instil life-long Learning to develop latent fingerprints by using various techniques.
2. Develop critical thinking and problem-solving techniques used to develop fingerprints on various types of surfaces.
3. Analyse and put up scientific Reasoning that explains the working and applications of photography of fingerprints.
4. Acknowledge with ethics of report writing.

11. List of experiments

1. To develop Fingerprint on porous surfaces
2. To develop Fingerprint on non-porous surfaces
3. To develop Fingerprint on adhesive surfaces
4. To develop Fingerprint on wet surfaces
5. To Photograph the developed fingerprints
6. To conduct fingerprint comparison of a developed fingerprint from known sample
7. To study the report writing of fingerprint cases.
8. To study ridge counting in given specimen.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals
2. Ramotowski, R. (Ed.). (2012). Lee and Gaensslen's advances in fingerprint technology. CRC press.
3. Daluz, H. M. (2018). Fundamentals of fingerprint analysis. CRC Press.

1. Name of the Department: Forensic Science					
2. Course Name	Introduction to Computer Forensics	**L**	**T**	**P**	
3. Course Code	17040517	4	0	0	

4. Type of Course (use tick mark)		**Core ( )**	**DSE (✓)**	**AEC ()**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	**Even ()**	**Odd(✓)**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course will explain about the advance aspects of computer hardware, cyber crime, role of first responder and Search and Seizure of Volatile and Non-volatile Digital Evidence. In addition, the process of Windows Systems Artifacts, Linus Systems Artifacts and Cloud Technology Forensics will be highlighted.

9. Course Objectives

The objectives of this course are to:
1. To impart fundamental of advanced aspects of Digital Evidence.
2. To explain forensic tools for Recovery of Deleted, Hidden and Altered files.
3. To describe Cyber Crime, Internal and External Attacks, ATM and Banking Frauds.
4. To track email for assessment of cyber crime.

10. Course Outcomes (COs):

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

1. Develop disciplinary knowledge of computer hardware.
2. Critically think and develop problem solving in advance aspects of Digital Evidence.
3. Analyze and scientifically assess forensic tools for Recovery of Deleted, Hidden and Altered files.
4. Critical Think and solve problem that enable them to answer the legal questions on computer/ cybercrime.

11. Unit wise detailed content

Unit-1	Number of lectures-13	Title of the unit: Introduction to Computer Hardware

Various Components of a Computer, Motherboard, Processor, Memory, Storage Devices and Networking components. Understanding Computer Operating Systems (OS), Booting process of computers. Introduction to File Systems and types of File System

Unit – 2	Number of lectures-13	Title of the unit: Web Browsers and e-mail

Web Browsers: Cookies, Favourites or Bookmarks, Cache, Session Data and Plugins.
Email: Types of Email and Protocols. Analysing the Header details and tracking the email, Spoofed Mails. Virtual Machine and Cloud Technology Forensics

Unit – 3	Number of lectures-13	Title of the unit: Windows, Linus and Mac OS Systems Artifacts

Windows Systems Artifacts: File Systems, Registry, Event logs, Shortcut files, Executables. Alternate Data Streams (ADS), Hidden files, Slack Space.

Linux System and Artifacts: Linux file system: Ownership and Permissions, Hidden Files, User Accounts and Logs. **Mac OS X systems and Artifacts:** System Startup and Services, Network Configuration, Hidden Directories, System Logs and User Artifacts		
Unit -4	**Number of lectures-13**	**Title of the unit: Cyber Crime, First Responder and other forensic investigations**

Cyber Crime- Form of Cyber Crime, Internal and External Attacks, Crimes related to social media, ATM and Banking Frauds. Data Privacy issues, Packet sniffing, Spoofing, Web security.

First responder – role and toolkit. Procedure for search and seizure of digital evidences. Search and Seizure of Volatile and Non-volatile Digital Evidence. Imaging and Hashing Digital Evidence. Analysing and Recovery of Deleted, Hidden and Altered files.

Other tools used for: Data Recovery, Evidence Collection and Data Seizure, Duplication and Preservation of Digital Evidence, Computer Image Verification and Authentication

Computer forensic investigations: Developing Forensic Capabilities, Searching and Seizing Computer Related Evidence, Processing Evidence and Report Preparation – Future Issues.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=qfUZBKDh9BY
2. https://www.youtube.com/watch?v=vBURTt97EkA
3. https://www.youtube.com/watch?v=dRKMlG0KTkY
4. https://www.youtube.com/watch?v=NAcN93O8b6w
5. https://www.youtube.com/watch?v=pjh4HjW9D-A
6. https://www.youtube.com/watch?v=AuYNXgO_f3Y
7. https://www.youtube.com/watch?v=RTtKXBLLGS0
8. https://www.youtube.com/watch?v=HbgzrKJvDRw

13. Books Recommended

1. Bolle R.M., Connell J.H., Pankanti S., Ratha N.K. and Senior A.W. (2004), Guide to Biometrics, Springer publications.
2. Goyal R.M. and Pawar M.S. (1994), Computer crimes- concept, control and prevention, Sysman Computer Pvt. Ltd.
3. Jain A.K., Flynn P. and Ross A.A. (2008), Handbook of Biometrics Springer Publications, Springer. Page 40 of 48
4. Joakim Kävrestad. Guide to Digital Forensics: A Concise and Practical Introduction, Springer 2017
5. John D.W. and Nicholas M.O. (2002), Biometrics: Identity Assurance in the Information age, McGraw Hill.
6. Lee Reiber. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation, 1st edition, McGraw-Hill 2016
7. Maria P. and Costas P. (2010), Image Processing: The Fundamentals, Wiley.
8. Marie-Helen Maras. Computer Forensics: Cybercriminals, Laws, and Evidence, 2nd edition, Jones & Bartlett Learning 2015
9. NCJRS Library collection, Best practices for seizing electronic evidence v.3: A Pocket Guide for First Responders, US department of Homeland Security.
10. Robert Moore. Cybercrime: Investigating High-Technology Computer Crime, 2nd edition, Routledge 2015
11. Special Report (2nd Edition), Electronic Crime Scene Investigation: A Guide for First Responders, NIJ publication.
12. Special Report, Forensic Examination of Digital Evidence: A Guide for Law Enforcement, NIJ Publication.
13. Sridhar S. (2011), Digital Image Processing, Oxford University Press.

1. Name of the Department: Forensic Science					
2. Course Name	Introduction to Computer Forensics Lab	**L**	**T**		**P**
3. Course Code	17040518	0	0		4

4. Type of Course (use tick mark)		**Core ( )**	**DSE (✓)**	**AEC ()**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	**Even ()**	**Odd(✓)**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This practical course emphasizes learning of basic skills helpful. It includes Acquisition and Preservation of Volatile data from standalone computer, Imaging of data storage media devices, Recovery of deleted files and folders, Password recovery of encrypted files and folders, Collection of evidences from mobile devices, Collection and analysis of evidences from Social Media and Cloud Evidence Collection using browser app analysis.

9. Course Objectives

The objectives of this course are to:
1. To impart fundamental of Acquisition and Preservation of Volatile data from standalone computer.
2. To provide a platform to image data storage media devices.
3. To recover deleted files and Password of encrypted files and folders.
4. To collect evidences from mobile devices and Social media.

10. Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:
1. Scientifically extract and preserve volatile data from standalone computer for analysis.
2. Gain disciplinary Knowledge to create imaging of data storage media devices.
3. Recover deleted files and Password of encrypted files and folders.
4. Learn Ethics for the process of Seizure of computers.

11. List of experiments

1. To Analyze the Header details and track the email
2. To Image and Hash the Digital Evidence
3. To Acquire and Preserve of Volatile data from standalone computer.
4. To acquire the Imaging of data storage media devices.
5. To Recover of deleted files and folders.
6. To Hide and Un-hide information.
7. To recover Password of encrypted files and folders.
8. To practice the collection of evidences from mobile devices.
9. To collect and analyze evidences from Social Media.
10. To conduct analysis of Malwares.
11. To study cloud Evidence Collection using browser app analysis.
12. To study the Report writing of cyber cases.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals
2. Special Report, Forensic Examination of Digital Evidence: A Guide for Law Enforcement, NIJ Publication.

1.	Name of the Department: Forensic Science				
2.	**Course Name**	Cyber Security and Data Protection	**L**	**T**	**P**
3.	**Course Code**	17040519	4	0	0
4.	**Type of Course (use tick mark)**	**Core ()**	**DSE (✓)**	**AECC( )**	**SEC ()**
5.	**Pre-requisite (if any)**	10+2 with Science stream	**6. Frequency (use tick marks)**	**Even ()**	**Odd (✓)**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practicals		
Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

In this course, the students will be able get knowledge about cyber space, cyber-crime and malwares. The students will also understand about cyber security and various data protection technologies.

9. Course Objectives

1. To gain understanding of cyber space and cyber-crime.
2. To acquire knowledge about various types of cyber-crimes and malwares.
3. To understand the concepts computer and cyber security .
4. To acquaint students with data protection technologies

10. Course Outcomes (COs)

Upon successful completion of this course, the students will be able to

1. Understand and apply the knowledge of cyber-crimes and malwares for prevention of crime
2. Critically analyze the situations related to breach of cyber security and take appropriate actions.
3. Collate and interpret scientific information for writing research and review articles.
4. Practice professional ethics while dealing with cyber-crime cases.

11. Unit wise detailed content

Unit-1	Number of lectures = 10	Title of the unit: Introduction to Cyber Space

Computer characteristics and classification, hardware and software, Networking and internet concepts, History of Internet, Cyberspace, Cyber security, Cyber-crime, Information security, computer ethics and security policies

Unit-2	Number of lectures = 13	Title of the unit: Cyber-crime and malwares

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.

Unit-3	Number of lectures = 14	Title of the unit: Cyber Security

Computer Security Concepts, Information Security Aspects (Security Attacks, Security Mechanism, Security Services), Computer Security Objective, CIA Triad, Breach of Security Levels of Impact, OSI Security Architecture, Model for network Security.
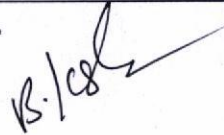
Unit-4	Number of lectures = 15	Title of the unit: Data Protecting Technologies

Scope of Data Recovery, Forensic Significance of Data Protection, Data Protecting Technologies [SMART, SPS (Shake Protecting Technology), DFT(Discrete Fourier Transform)], Cryptography; Types of Ciphers, Encryption, Decryption, Digital Watermarking, Digital Signatures.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=ZUqzcQc_syE
2. https://www.youtube.com/watch?v=nMYapL6RQzU
3. https://www.youtube.com/watch?v=1z0ULvg_pW8
4. https://www.youtube.com/watch?v=bA8Z0mfa5xg
5. https://www.youtube.com/watch?v=a02vGdZ2Mog
6. https://www.youtube.com/watch?v=J2c3th4FY-w
7. https://www.youtube.com/watch?v=NmuhGa4QekU
8. https://www.youtube.com/watch?v=7cJMs8XCm0Y
9. https://www.youtube.com/watch?v=QQ9ZLlj36qs

13. Books Recommended

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).
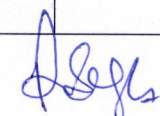
1. Name of the Department: Forensic Sciences							
2. Course Name	Cyber Security and Data Protection Lab			L	T		P
3. Course Code	17040520			0	0		4
4. Type of Course (use tick mark)	Core ()	DSE (✓)	AEC ()	Odd (✓)	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream	6. Frequency (Use tick marks)	Even ()	Odd (✓)	Either Sem ()		Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

In this course, the students will be able get practical knowledge about digital evidence, digital crime and its prevention. The students will also understand and get hands on sessions about cyber security and various data protection technologies.

9: Course Objectives:

1. To gain practical knowledge of digital crime.
2. To acquire knowledge and hands on training in analysis of digital evidence
3. To understand the concepts computer security
4. To acquaint students with data protection technologies

10.Course Outcomes (COs):

Upon successful completion of this course, the students will be able to

1. Understand and apply the knowledge of digital crime for prevention of crime
2. Critically analyze the situations related to breach of cyber security and take appropriate actions.
3. Analyze and take appropriate measures for retrieving data from digital evidence.
4. Practice professional ethics while dealing with cyber-crime cases.

11. List of Experiments

1. To identify, seize and preserve digital evidence from crime scenes.
2. To trace routes followed by emails.
3. To identify the IP address of the computer system involved in suspectful events.
4. To use digital signatures for securing emails and confidential documents.
5. To encrypt the document to maintain its authenticity, integrity and confidentiality.
6. To retrieve the lost data.
7. To configure the advance firewall in iOS and Windows.
8. To protect the confidential data using data protecting techniques.

12. Books recommended:

1. DFSS manual for digital security
2. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, Computer Crimes and Computer Forensics, Select Publishers, New Delhi (2003).
3. E. Casey, Digital Evidence and Computer Crime, Academic Press, London (2000).

1. Name of the Department: Forensic Science							
2. Course Name	Forensic Odontology			**L**	**T**		**P**
3. Course Code	17040601			4	0		0
4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even . (✓)	Odd()	Either Sem ()		Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course will help the students to understand the fundamentals of forensic odontology and the examination and importance of various odontological evidences in forensic investigation.

9. Course Objectives

1. To impart disciplinary knowledge about forensic odontology
2. To develop critical thinking while examining odontological evidences for solving related crimes.
3. To develop analytical/ scientific reasoning by analysing evidences and interpreting their final results.
4. To develop a problem solving attitude by studying different cases of forensic odontology

10. Course Outcomes (COs):

Upon successful completion of this course, students will be able to understand.
1. The basic fundamentals of forensic odontology
2. The importance of forensic odontology in forensic field
3. The various aspects related to bite marks as a evidences
4. The various aspects of cheiloscopy

11. Unit wise detailed content

Unit-1	Number of lectures : 13	Title of the unit: Basics of Forensic Odontology

Fundamentals of Forensic odontology, Types of odontological evidences, Collection of odontological evidences (Dental charts, radiography) , Tooth structure and growth, Human dentition.

Unit – 2	Number of lectures : 13	Title of the unit: Forensic significance of Forensic Odontology

Estimation of age and sex from dental remains. Population differences in size and morphology. Individualisation of tooth pulp. Role of forensic odontology in personal identification.

Unit – 3	Number of lectures : 13	Title of the unit: Bite marks

Definition, types, nature and formation of bite marks, Medicolegal aspects of bite marks, collection & preservation, documentation and analysis of bite marks evidences, report writing of bite marks evidences.

Unit -4	Number of lectures : 13	Title of the unit: Cheiloscopy

Definition, types, nature and formation of lip prints, Medicolegal aspects of lip prints, collection & preservation, documentation and analysis of lip print evidences and report writing.

12. Brief Description of self-learning / E-learning component

1. https://www.dentalage.co.uk/wp-content/uploads/2014/09/aafs_odontology_ebook2011-2012.pdf
2. https://www.perlego.com/book/1478031/manual-of-forensic-odontology-pdf
3. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/Forensic_Science/14._Forensic_medicine/05._Forensic_odontology/et/4704_et_4704_et_05et.pdf
4. https://www.youtube.com/watch?v=m_sa3Su_eyQ
5. https://www.youtube.com/watch?v=8aDT5542lLQ

13. Books Recommended

1. Forensic Dental evidence, Mike Bowers, Elsevier Publ
2. Forensic Radiology, B.G.Brogdon, 2nd Ed, CRP Press, 2010
3. Forensic Radiology, B.G. Brogdon, 1st Ed, CRP Press, 1998
4. Bite Mark Evidence, Robert BJ Dorian, 1st Ed, CRP Press, 2004
5. Dental Autopsy, William E Silver, Richard R Souviron, 1st Ed, CRP Press, 2009
6. Forensic Dentistry, Senn DR and PG Simson, 2nd Ed, CRP Press, 2010
7. Forensic Photography, Sanford L Weiss, 1st Ed, Prentice Hall, 2008
8. Manual of Forensic odontology, Herschaft EE, Alder ME, Ord DK, Rawson RD & Smith ES, 4th Ed
9. A color atlas of forensic dentistry, Whittaker DK and Mc Donald DG, 1st Ed, Mosby Yr Book, 1989
10. Digital analysis of bite mark evidence, RJ Johanson & Bowers CM
11. Forensic dentistry, PG Simson &Mertz CA, 1st Ed, CRP Press, 1997
12. Computer graphic facial reconstruction, JG Clemat, MK Marks, Elsevier,2010
13. Forensic facial reconstruction, C.Wilkinson, 1st press, Cambridge univ press, 2008
14. Forensic odontology, G Willams, Leuven Univ Press, 2000
15. Practical forensic odontology, DH Clark, Butterworth-Heinemman Publis
16. Forensic odontolgy, G Gustafson, 1st Ed, Elsevier, 1966
17. Text Book of Forensic odontology, Yadav, Globalmedik, 2010
18. Text book of Oral Pathology, Shafer, Hine and Levy, 4th,5th,6th Ed
19. Text book of Oral Pathology, Neville, Allan, Bouquot, 3rd, 4th Ed, Elsevier
20. Text book of Oral Pathology, Regezzi, Schuibba, 5th and 6th Ed, Elsevier

1. Name of the Department: Forensic Science							
2. Course Name	Forensic Odontology Lab			**L**	**T**		**P**
3. Course Code	17040602			0	0		4
4. Type of Course (use tick mark)		Core (✓)	DSE ()	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✓)	Odd()	Either Sem ()		Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

In this course, the students will be able to apply the knowledge of forensic odontology to analyse various odontological samples in order to determine age, sex and to perform personal identification in mass disaster.

9. Course Objectives

1. To impart disciplinary knowledge about forensic odontology
2. To develop critical thinking while examining odontological evidences for solving related crimes.
3. To develop analytical/ scientific reasoning by analysing evidences and interpreting their final results
4. To develop a problem solving attitude by studying different cases of forensic Odontology

10. Course Outcomes (COs):

Upon successful completion of this course, students will be able to understand
1. The basic fundamentals of forensic odontology
2. The importance of forensic odontology in forensic field
3. The various aspects related to bite marks as a evidences
4. The various aspects of Cheiloscopy

11. Practicals

1. To study the formation and structure of tooth.

2. To collect and examine bitemarks on different surfaces.

3. To collect and examine lip prints on various surfaces.

4. To study and prepare a case report on examination of dental evidences.

5. To estimate age from dental remains.

6. To determine sex from dental remains.

7. To prepare and study a dental cast for forensic importance.

8. To prepare a case report on DNA analysis from odontological evidences.

12. Brief Description of self-learning / E-learning component

1. https://www.kenhub.com/en/library/anatomy/the-teeth
2. https://www.youtube.com/watch?v=8aDT5542lLQ
3. https://www.youtube.com/watch?v=a1AjWnzybOo
4. https://www.youtube.com/watch?v=3hgz0Bq3exQ
5. https://www.youtube.com/watch?v=1jPzIAntrTQ
6. https://www.youtube.com/watch?v=Qw1rJhyMHog

13. Books Recommended

1. Forensic Dental evidence, Mike Bowers, Elsevier Publ
2. Forensic Radiology, B.G.Brogdon, 2nd Ed, CRP Press, 2010
3. Forensic Radiology, B.G. Brogdon, 1st Ed, CRP Press, 1998
4. Bite Mark Evidence, Robert BJ Dorian, 1st Ed, CRP Press, 2004
5. Dental Autopsy, William E Silver, Richard R Souviron, 1st Ed, CRP Press, 2009
6. Forensic Dentistry, Senn DR and PG Simson, 2nd Ed, CRP Press, 2010
7. Forensic Photography, Sanford L Weiss, 1st Ed, Prentice Hall, 2008
8. Manual of Forensic odontology, Herschaft EE, Alder ME, Ord DK, Rawson RD & Smith ES, 4th Ed
9. A color atlas of forensic dentistry, Whittaker DK and Mc Donald DG, 1st Ed, Mosby Yr Book, 1989
10. Digital analysis of bite mark evidence, RJ Johanson & Bowers CM

1. Name of the Department: Forensic Sciences						
2. Course Name	Forensic Anthropology		**L**	**T**		**P**
3. Course Code	17040603		4	0		0
4.Type of Course (use tick mark)		**Core (√)**	**DSE ()**	**GE ()**	**SEC ()**	
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (√)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This is core paper in Forensic Science. The student will be able to know about the basic knowledge of forensic anthropology, its concepts and its role in forensic investigation.

9. Course Objectives:

1. To provide the knowledge of osteology and forensic anthropology.
2. To understand the scope of forensic anthropology
3. To study the different aspect of biological profiling of unknown skeletal remains.
4. To understand the concept of population variation using somatometric and somatoscopic techniques

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:
1. To know about the disciplinary knowledge of the forensic anthropology.
2. Develop critical thinking and problem solving strategies in real life forensic cases involving skeletal remains.
3. Develop analytical and scientific reasoning by examining the skeletal remains.
4. Understand, analyse and interpret the skeletal indicators of sex, age, race and stature, which will help in biological profiling.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Introduction to Osteology and anthropology

Intro to Osteology/Anatomical Terminology; Anthropology and its types; Population variation in shape and size of bones; Causes of population variation; Forensic Anthropology; History of Forensic Anthropology; Scope of forensic anthropology. Study of human skeleton (Nature, bone formation, and identification of human bones (Skull, pelvis and long bone morphology).

Unit – 2	Number of lectures = 13	Title of the unit: Biological profiling

Biological profiling in skeletal remains; Sex estimation from skull, pelvis, sternum, long bones; age estimation from skull (Sutures, teeth) and long bones; Stature estimation from long bones; Racial identification from skull; Genetic and congenital bone anomalies – causes, types, identification and their forensic significance

Unit – 3	Number of lectures = 13	Title of the unit: Somatoscopy and somatometry

Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, Scar marks and occupational marks.
Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height.
Indices - cephalic index, nasal index, facial index.

Unit – 3	Number of lectures = 13	Title of the unit: Facial Reconstruction

Portrait Parle/ Bertillon system, Photofit/identi kit, Facial superimposition techniques.
Cranio facial super imposition techniques – photographic super imposition, video-superimposition,
Roentgenographic superimposition. Importance of tissue depth in facial reconstruction

12. Brief Description of self learning / E-learning component

1. https://www.youtube.com/watch?v=T_iHm2luYUM
2. https://www.youtube.com/watch?v=_rPBbNfn7pU
3. https://www.youtube.com/watch?v=amqmYJ8IKMg
4. https://www.youtube.com/watch?v=PJ7A6Nw0My4
5. https://www.youtube.com/watch?v=BI4_KInZrBU

13. Books Recommended

1. Krogman, W.M. and Iscan, M.Y. (1986) The Human Skeleton in Forensic Medicine. 2nd Edition, Charles C. Thomas, Springfield.
2. Krishan Vij. Textbook of Forensic Medicine Forensic Medicine and Toxicology and Toxicology Principles and Practice Fifth Edition, Elsevier, 2011.
3. Schmitt, E. Cunha, and J. Pinheiro (Eds.) Forensic Anthropology and Medicine: Complementary Sciences From Recovery to Cause of Death. Humana Press Inc., Totowa, NJ
4. VV Pillay. Testbook of forensic medicine and toxicology. Paras publications.
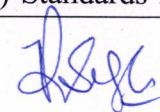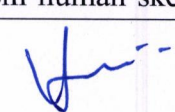
1. **Name of the Department:** Forensic Science				

2. **Course Name**	Forensic Anthropology Lab	**L**	**T**	**P**
3. **Course Code**	17040604	0	0	4

4. **Type of Course** (use tick mark)	**Core (√)**	**DSE ()**	**AEC ()**	**GE ()**	**OE ()**
5. **Pre-requisite** (if any)	10+2 with Science stream.	6. **Frequency** (use tick marks)	**Even (√)**	**Odd ()**	**Either Sem ()**	**Every Sem ()**

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This core course applies the methodology and goals of physical anthropology to medical and legal issues in forensic anthropology. It provides the practical knowledge of different methods of creating the biological profiling of unknown human remains.

9. Course Objectives:

1. To understand the morphological examination of human bones.
2. To understand the biological variability in human bones.
3. To estimate the sex, age and stature of unknown human remains.
4. To understand the limitations of different anthropological techniques.

10. Course Outcomes (COs):

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

1. Understand the practical aspects of forensic Anthropology.
2. Understand scope of forensic anthropologist as well as work of forensic anthropologists how they are helpful for the court of law or law enforcement agencies.
3. Develop knowledge of the traditional methods of identification used in forensic anthropology.
4. Evaluate the potentials and limitations of the scientific methods used to locate and recover human remains in forensic contexts.

11. Unit wise detailed content

Practical		

1. To study the morphology of human skull in norma frontalis and norma lateralis position.
2. To compare the sexual differences in skull.
3. To study the morphology of human pelvis.
4. To compare the sexual differences in pelvis.
5. To estimate the age of human skull.
6. To measure the craniofacial variables of male and female skull (Max cranial length and breadth; nasal height and breadth, Facial height and byzygomatic breadth).
7. To study the long bones of upper extremities (Humerus, radius and ulna).
8. To study the long bones of lower extremities (Femur, Tibia and fibula).
9. To study measure the long bones: lengths, minimum/least circumference and caliber index.
10. To estimate the stature of individual using long bone (Femur).
11. To measure the Cephalometric variables of males and females (Maximum head length, Maximum head breadth, Maximum bizygomatic breadth, Nasal length Nasal breadth, Morphological facial height) and observe the differences
12. To calculate the cephalometric indices (Cepahlic, Nasal and Facial indices).

12. Books Recommended

1. Buikstra JE, Ubelaker DH (1994) Standards for data collection from human skeletal remains.

Arkansas Archaeological Survey research series No44.

2. DFS Manuals of Forensic Science

1. Name of the Department: Forensic Science							
2. Course Name	Forensic Genetics and DNA Profiling		L	T		P	
3. Course Code	17040605		4	0		0	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)			SEC ( )	
5. Pre-requisite (if any)	10+2 with Science	6. Frequency (use tick marks)	Even (✓)	Odd ()	Either Sem ( )		Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

This course provides students the knowledge of Human Genetics and population genetics, usefulness of genetic markers in forensic investigation. Potential Benefits of DNA data banking and forensic significance and the legal importance of DNA profiling will also be explained.

9. Course Objectives

The objectives of this course are to:

1. Provide knowledge about the basic concepts of human genetics.
2. Introduce the usefulness of genetic markers in forensic investigation along with the interpretation of a DNA profile.
3. Understand the need, progress, forensic significance and the legal importance of DNA profiling in various scenarios in India and abroad.
4. Demonstrate use of bioinformatics in Forensic Science.

10. Course Outcomes (COs)

Upon successful completion of this course, the students will be able to understand:

1. Disciplinary knowledge of human genetics.
2. Analytical skill enhancement.
3. Research Ethics in Interpretation of DNA profile.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Human Genetics

Genetics: Human genetic variations, Mendelian Inheritance, Hardy Weinberg Equilibrium, Mutation-their types and causes. Relevance of population genetics. Allele frequency, genotype frequency. Polymorphism and heterozygosity. Measures of genetic variations. Material preferred for DNA profiling, Touch DNA and its recovery from different material.

Unit - 2	Number of lectures = 13	Title of the unit: DNA Profiling I

DNA Profiling: Introduction, History of DNA Typing, molecular biology of DNA, variations, polymorphism, DNA Extraction-Organic and Inorganic extraction, Comparison of Extraction methods, Forensic DNA typing system – RFLP, Amp-RFLP. STR. Mini STR. Y-STR, XSTR. Mitochondrial DNA. STR loci of Forensic significance. STR typing: Manual and Capillary Electrophoresis.

Unit – 3	Number of lectures = 13	Title of the unit: DNA Profiling II

PCR amplification: PCR process, components, controls, advantages and disadvantages, types of PCR, PCR inhibitors, optimization and solution to PCR inhibition. Stochastic effect. DNA separation methods: Slab gel and Capillary Electrophoresis. DNA detection methods: Fluorescent Dyes and Silver–staining. CODIS, Statistical evaluation of DNA typing results and preparation of reports. RNA and its application in Forensics. Human Genome Project: Introduction, History, Goals, Benefits,

Social, Ethical and Legal Issues DNA Forensic Databases. Benefits of DNA Databases, Quality control, certification and accreditation.

Unit – 4	Number of lectures = 13	Title of the unit: Forensic applications of DNA profiling and Bioinformatics

Forensic Significance of DNA profiling: Applications in disputed paternity cases, Importance of Y-STRs in gangrape cases, Rape case, and other sexual assault cases, Child swapping, missing person's identity- civil immigration, veterinary, wildlife. Limitations of DNA profiling. Introduction to bioinformatics and its application in forensics.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=ffn3eJMoCOk
2. https://www.youtube.com/watch?v=0M8PcgTORwg
3. https://www.youtube.com/watch?v=R1J1m6oMWf4
4. https://www.youtube.com/watch?v=z5OMOKr4pHQ
5. https://www.youtube.com/watch?v=kbU_qkVGIc4

13. Books Recommended
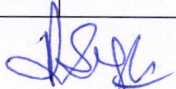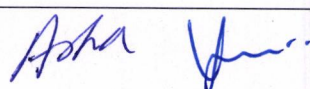
1. Rudin Norah. An Introduction to Forensic DNA Analysis. CRC Press Publishers, 2002.
2. Inman Keith. An Introduction to Forensic DNA Analysis. CRC Press, 1997.
3. Vij Krishan. Basics of DNA and Evidentiary Issues. Jaypee Brothers, 2004.
4. Easteal Simon. DNA Profiling. Harwood Academic Publishers, 1993.
5. Epplen Jorg T. DNA Profiling and DNA Fingerprinting. Birkhauser Verlage, 1999.
6. Lorne Kirby. DNA Fingerprinting. W H Freeman and Co., 1992.
7. Singh, Yashpal. DNA Tests in Criminal Investigation Trial & Paternity Disputes. Asia Law Agency, 2006.
8. JM Butler. Forensic DNA Typing. Elsevier Academic Press, 2005.
9. Mark A. Farley, James J. Harrington. Forensic DNA Technology. CRC Press, 1991.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Genetics and DNA Profiling Lab		**L**	**T**	**P**	
3. Course Code	17040606		0	0	4	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)		SEC ( )	
5. Pre-requisite (if any)	10+2 with Science	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ( )	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical =52

8. Course Description

This course provides students the practical knowledge of DNA evidences along with their forensic significance, **Extraction of DNA from Blood** and other body fluids, PCR amplification of DNA sample, Electrophoresis of DNA sample, PCR cleanup of DNA sample and Quantification of DNA sample.

9. Course Objectives

The objectives of this course are to:

1. Extract DNA from blood.
2. Extract DNA from other biological fluids.
3. Perform Electrophoretic techniques.
4. Perform PCR for DNA samples and Quantify DNA

10. Course Outcomes (COs)

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

1. To develop analytical skills to extract DNA from blood.
2. To develop analytical skills of Electrophoresis techniques.
3. To develop practical knowledge of extraction DNA from other biological evidences.
4. To develop practical approach to perform PCR for DNA samples and quantify DNA.

11. List of Experiments

1. To Prepare chemicals used in DNA extraction
2. To study Extraction of DNA from Blood.
3. To study Extraction of DNA from other biological fluids.
4. To study the Preparation of chemicals used in Electrophoresis
5. To prepare gel plates for electrophoresis
6. To conduct Electrophoresis of DNA sample.
7. To study the PCR amplification of DNA samples.
8. To study the PCR cleanup of DNA sample.
9. To study the Quantification of DNA.
10. To prepare a report on the role of DNA profiling in solving paternity testing.

13. Books Recommended

1. DFSS, CFSL and SFSL Manuals

1. Name of the Department: Forensic Science					
2. Course Name	Bioinformatics	**L**	**T**	**P**	
3. Course Code	17040607	4	0	0	

4. Type of Course (use tick mark)		Core ( )	DSE (✔)	AEC ()	SEC ()	OE ()

5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even (✔)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

In this course, the students will be able to understand the basics of bioinformatics and protein modelling. The students will also learn about sequence alignments and gene identification using various bioinformatic tools used for it.

9. Course Objectives

1. To understand the concept of bioinformatics and its research areas.
2. To understand about protein modelling
3. To get acquainted with various tools and algorithms used for sequence alignment such as BLAST and FASTA.
4. To understand about various tools and algorithms used for gene identification

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:
1. Understand and explain the concepts of bioinformatics.
2. Develop critical thinking and scientific reasoning skills for obtaining sequence alignment
3. Understand the databases associated with protein modelling.
4. Summarize and interpret the results obtained for DNA profiling of samples using bioinformatic tools.

11. Unit wise detailed content

Unit-1	Number of lectures	Title of the unit: Introduction and Databases

Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics. Biological Database and its Types, Introduction to data types and Source. Population and sample, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum).

Unit – 2	Number of lectures	Title of the unit: Protein Modelling

Protein secondary structure classification databases: HSSP, FSSP, CATH, SCOP,Protein secondary structure prediction methods: GOR, Chou-Fasman, PHD, PSI- PRED, J-Pred. Protein Tertiary structure prediction methods: Homology Modelling, Fold Recognition, Ab- intio Method,Protein folding, Molecular Dynamics of Protein, Molecular Docking of Protein, Small molecule and Nucleotide.

Unit – 3	Number of lectures	Title of the unit: Sequence Alignments and its tools

Sequence Alignments and Visualization, Introduction to Sequences, alignments and Dynamic Programming,Local alignment and Global alignment (algorithm and example), Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm).Methods for presenting large quantities of biological data: sequence viewers (Artemis, SeqVISTA), 3D structure viewers (Rasmol, SPDBv, Chime, Cn3D, PyMol), Anatomical visualization.

Unit -4	Number of lectures	Title of the unit: Gene Identification and its tools

Gene identification and prediction. FASTA and BLAST algorithm. Bioinformatics analysis of DNA Microarray, Bioinformatics tools of forensic applications- Clustal family, BioEdit, MEGA, Arlequin, Protein structure prediction and visualization tools. Tools used in proteomics, In-silico simulation for molecular biology experiments. Basic theory of probability and statistics. Bayesian analysis. Likelihood ratio. Statistical evaluation of DNA profiles using Bioinformatics tools

12. Brief Description of self-learning / E-learning component
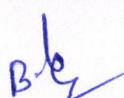
1. https://www.youtube.com/watch?v=w-uk-_TOgR0
2. https://www.youtube.com/watch?v=W-Ov2cUaYQY
3. https://www.youtube.com/watch?v=48Xr-H05raA
4. https://www.youtube.com/watch?v=0mHdm4dpkT4
5. https://www.youtube.com/watch?v=4_eU6A1-HTk
6. https://www.youtube.com/watch?v=8XaA_NtPt2o
7. https://www.youtube.com/watch?v=-7P719PAwlo

13. Books Recommended

1. Bioinformatics: Sequence and Genome Analysis by Mount D., Cold Spring Harbor Laboratory Press, New York. 2004
2. Introduction to bioinformatics by Teresa K. Attwood, David J. Parry-Smith. Pearson Education. 1999 Old editions
3. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellellette, B.F., Wiley India Pvt Ltd. 2009.
4. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
5. Lesk, A.M. 2005, 2nd edition, Introduction to Bioinformatics. Oxford University Press.
6. Fogel, G.B. and Corne, D.W., Evolutionary Computation in Bioinformatics.
7. Mount, D.W., Bioinformatics: 2001, Sequence and Genome Analysis. CSHL Press.
8. Durbin R., Eddy S., Krogh A. and Mithchison G. 2007 Biological Sequence Analysis, Cambridge University Press.

1. Name of the Department: Forensic Science						
2. Course Name	Bioinformatics Lab		**L**	**T**		**P**
3. Course Code	17040608		0	0		4
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

In this course, the students will be able to gain practical exposure on various tools and techniques used in bioinformatics. They will be also be provided hands on experience to determine the protein sequence and alignment using various databases.

9. Course Objectives

1. To understand the concept of bioinformatics through hands on sessions.
2. To analyse and interpret the protein structure and alignment using tools and databases.
3. To get acquainted with various tools and algorithms used for sequence alignment such as BLAST and FASTA.
4. To understand and perform molecular docking using various software.

10. Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:
1. Understand and practically perform the analysis on different databases.
2. Develop critical thinking and scientific reasoning skills for obtaining sequence alignment
3. Analyze and interpret results obtained after analysing proteins using different softwares.
4. Summarize and interpret the results obtained for DNA profiling and molecular docking using bioinformatic tools.

11. Practicals

1. Hands on session with NCBI, Genbank, Expasy,PDB.
2. Analysis of 3D structure of protein and nucleic acid using Cn3D
3. Multiple sequence alignment by using ClustalW.
4. Pairwise and Multiple sequence alignment using BioEdit.
5. Phylogenetic analysis of protein and nucleic acid by using MEGA-4.
6. Similarity search using the Blast and interpretation of the results.
7. Analysis of Secondary and tertiary structure of protein using visualizing software like Rasmol.
8. Analysis of quaternary structure of protein using visualizing software like Rasmol
9. Three-dimensional structure prediction by using the homology modelling technique using SPDBV
10. Molecular Docking of protein and ligand by HEX/ AutoDock.

13. Books Recommended

1. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellellette, B.F., Wiley India Pvt Ltd. 2009.
2. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.

1. Name of the Department: Forensic Science						
2. Course Name	Pharmacokinetics and Pharmacology		**L**	**T**		**P**
3. Course Code	17040609		4	0		0
4. Type of Course (use tick mark)	Core ( )	DSE (✓)	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course offers the various necessary concepts of pharmacology required to understand the drug development, mechanism and toxicological concepts. Pharmacological applications in forensic sciences for the identification of drug toxicity and symptoms.

9. Course Objectives

1. To develop the fundamental and necessary knowledge of pharmacology essential to understand the concepts of forensic toxicology.
2. To develop the understanding of the concepts of Pharmacokinetics and Pharmacodynamics clearly and persuasively.
3. To understand the practical applications of pharmacology to work effectively in any multidisciplinary environment.
4. To develop the understanding of the applications of Pharmacokinetics and Pharmacokinetics in Forensic Science with the most current knowledge and technology.

10. Course Outcomes (COs):

1. Development of fundamental knowledge of pharmacology for the investigation and explanation of real-time forensic issues in legal and social context.
2. Development of the understanding of the concepts of Pharmacokinetics and Pharmacodynamics to enhance critical thinking and observation skills.
3. Development of the understanding of the practical applications of pharmacology to analyse and describe theoretical, conceptual and experimental data.
4. Development of the understanding of the applications of Pharmacokinetics and Pharmacokinetics in Forensic Science following professional ethics while keeping up with their expertise and genuineness.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Introduction to Pharmacology

General Principles of Pharmacology, Subdivisions of Pharmacology, Laws governing drugs (Drug Schedules), Nature and Sources of drugs, Dosage forms of Drugs, Routes of Drug Administration, Bio-transportation of Drugs.

Unit – 2	Number of lectures = 13	Title of the unit: Pharmacokinetics

Factors influencing dosage and drug action, Drug absorption, Bioavailability of drugs, Bioequivalence, Pharmaceutical and pharmacological factors influencing absorption and bioavailability, Physiological barriers to drug distribution, Chemical pathways of drug biotransformation, Drug metabolising enzymes, combination of drug: Addition, Potentiation, Synergism, Antagonism, Drug Interaction.

Unit – 3	Number of lectures = 13	Title of the unit: Pharmacodynamics

Definition and concept of Pharmacodynamics, Site and Mechanism of Drug Action, Receptors Types and Signal Transduction Mechanism, Adverse Drug Reactions, Measurement of Drug Effects, Types of Toxicity, Intensity of Drug Response, Placebo Effects, Therapeutic index.

Unit -4	Number of lectures = 13	Title of the unit: Discovery and Development of New Drugs

Drug Discovery (Random Screening, Molecular manipulation, molecular designing, metabolites of drugs, Serendipity) Drug Development (Preclinical Evaluation, Animal Screening Programme, Toxicity Studies, Pharmacokinetic Studies), Clinical Evaluation (Clinical Pharmacology, Clinical Trials), Phases of Clinical Trials, Forensic Significance of drug discovery, drug development and clinical trials.

12. Brief Description of self-learning / E-learning component

1. https://www.ncbi.nlm.nih.gov/books/NBK12815/
2. https://www.msdmanuals.com/en-in/professional/clinicalpharmacology/pharmacodynamics/overview-of-pharmacodynamics
3. https://www.youtube.com/watch?v=NKV5iaUVBUI
4. https://www.youtube.com/watch?v=-9YWHXmHBEI
5. https://www.youtube.com/watch?v=PGzT3cTPah8
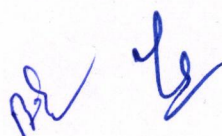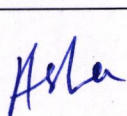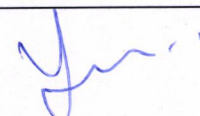
13. Books Recommended

1. Gennaro A R, ed. *Remington's pharmaceutical sciences*. 18th ed. Easton, Pennsylvania: Mack Publishing Company, 1970.
2. Gilbaldi M, Perrier D. Pharmacokinetics, 2nd Ed. New York: Dekker, 1982.
3. Grahame-Smith DG, Aronson JK. *Oxford textbook of clinical pharmacology and drug therapy*. Oxford: Oxford University Press, 1984
4. Katzung BG. *Basic and clinical pharmacology*, 7th ed London: Prentice Hall International, 1998.
5. Skoutakis VA, *Clinical toxicology of drugs; principles and practice*, 1st ed. Philadelphia: Lea and Febiger, 1982.
6. Sprowls JB, ed, *Prescription pharmacy*, 2nd ed. Philadelphia: JB Lippincott Company, 1970.

1. Name of the Department: Forensic Sciences						
2. Course Name	Pharmacokinetics and Pharmacology Lab		**L**	**T**		**P**
3. Course Code	17040610		0	0		4
4. Type of Course (use tick mark)		Core ()	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (If any)		6. Frequency (Use tick marks)	Even(✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This course will provide the practical knowledge for analysing various types of drugs and their mechanism of action. It will also enable students to perform analysis using advanced instrumental techniques.

9. Course Objectives:

1. To gain the fundamental and necessary knowledge of pharmacology through practical exposure for understanding the concepts of forensic toxicology.
2. To develop the understanding of the concepts of Pharmacokinetics and Pharmacodynamics clearly and persuasively.
3. To understand the practical applications of pharmacology to work effectively in any multidisciplinary environment.
4. To develop the understanding of the applications of Pharmacokinetics and Pharmacokinetics in Forensic Science with the most current knowledge and technology.

10. Course Outcomes (COs):

The students will able to –
1. Development of understanding of the analysis of different category of drugs in legal and social context.
2. Development of understanding of the clinical trials to enhance critical thinking and observation skills.
3. Development of understanding of the drug administration in the animal hosts for drug development and discovery for achieving the target without spoiling the societal harmony.
4. Development of understanding of the qualitative and quantitative analysis of different categories of drugs in drug toxicity cases to analyze and interpret experimental and reported data.

11. Practicals

1. To perform the qualitative and quantitative analysis of the given sample of analgesic using TLC and GC-MS.
2. To determine the adulterants present in the multivitamins.
3. To perform the qualitative and quantitative analysis of the given sample of adulterated cosmetics.
4. To analyze the viscera sample claiming toxicity due to antibiotics.
5. To prepare a case report on clinical trials.
6. Study of action of antidepressants on mice.
7. To separate primary components of the drugs using thin layer chromatography.
8. To prepare a case study on placebo effect of a antidepressants.
9. Introduction of animal used for experimental pharmacology.
10. Introduction of administration of drugs in experimental animals

12. Books recommended:

1. Brenner, G. M., Stevens, C. W., & Brenner, G. M. (2018). *Pharmacology*
2. DiPalma, J. R. (1979). *Practical pharmacology for prescribers*. Oradell, N.J: Medical Economics Co., Book Division.

3. Kitchen, I. (1984). *Textbook of in vitro practical pharmacology*. Oxford: Blackwell Scientific Publications.
4. Mahajan, Rajiv, *Practical Manual of Pharmacology for Medical Students*, International Journal of Applied and Basic Medical Research: Oct–Dec 2021 - Volume 11 - Issue 4 - p 280-281
5. Salmon, M. (2014). *Practical pharmacology for the pharmaceutical sciences*.

1. Name of the Department: Forensic Science

2. Course Name	Instrumentation in Chemical Sciences	L	T	P
3. Course Code	17040611	4	0	0

4. Type of Course (use tick mark)		Core ()	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

This core paper in Forensic Science provide students with the knowledge of Molecular Spectroscopy, Chromatographic Techniques and Radiochemical Techniques along with their forensic applications.

9. Course Objectives

1. To impart disciplinary knowledge about the various instrumental techniques.
2. To analyse and interpret the results.
3. To enhance analytical skills.
4. To develop the problem solving attitude related to different techniques.

10. Course Outcomes (COs)

Upon successful completion of this course, the students will be able to:
1. Describe and use various chromatographic techniques for academic, professional and research purpose.
2. Describe and apply various Molecular Spectroscopic techniques for examination of various evidence found at the scene of crime.
3. Explain and use various Chromatographic and spectroscopy techniques
4. Illustrate merits and demerits of all the techniques and choose the most appropriate technique for analysis.

11. Unit wise detailed content

Unit-1	Number of lectures : 13	Title of the unit: Chromatography

Basics of chromatography – Definition, Classification of chromatography

Basic Principle, working, Instrumentation, Development of Chromatograms and Forensic application (Paper Chromatography, Thin Layer Chromatography, HPTLC).

Qualitative and quantitative aspects of chromatographic methods in Forensic.

Unit – 2	Number of lectures : 13	Title of the unit: Column Chromatography Techniques

HPLC - Basic Principle, working, Instrumentation, Analysis and Forensic application.

Gas Chromatography - Basic Principle, working, Instrumentation, Analysis and Forensic application.

Unit – 3	Number of lectures : 13	Title of the unit: Spectroscopy

Electromagnetic Spectrum, interaction of radiation with matter, Types of Spectroscopic Techniques

UV-VIS Spectroscopy – Basic principle of instrumentation, single beam and double beam instrument, Beer Lamber law, Forensic application.

IR Spectroscopy – instrumentation, single beam and double beam, sampling techniques, interpretation of structura data, forensic application

Atomic Absorption and Atomic emission spectroscopy – Basic principle of instrumentation, techniques of atomization Chemical interference and their methods of removal, forensic applications.

Unit -4	Number of lectures : 13	Title of the unit: Mass Spectroscopy

Basic principle, Instrumentation, working, Fragmentation of molecules, Isotopes, Isobars, Molecular ion, Metastable ion, Radicals, Fragment Ions, Ionisation Techniques, Detectors and Forensic applications.

12. Brief Description of self-learning / E-learning component

1. https://soe.unipune.ac.in/studymaterial/ashwiniWadegaonkarSelf/222%20Chapter%204.pdf
2. https://www.whitman.edu/chemistry/edusolns_software/GC_LC_CE_MS_2017/CH%201%202017.pdf
3. https://www.oup.com.au/__data/assets/pdf_file/0019/135073/Chemistry-for-QLD_9780190313395_sample-chapter-13_secure.pdf
4. https://www.osti.gov/includes/opennet/includes/Understanding%20the%20Atom/Spectroscopy.pdf
5. https://www.su.se/polopoly_fs/1.521101.1602178917!/menu/standard/file/Introduction%20to%20Spectroscopy.pdf
6. https://byjus.com/chemistry/principle-of-uv-visible-spectroscopy/
7. https://www.youtube.com/watch?v=cfYp1jPkDVQ
8. https://www.bio-rad.com/en-us/applications-technologies/liquid-chromatography-principles?ID=MWHAS7E8Z

13. Books Recommended

1. Robinson, J.W; Atomic Spectroscopy, 2nd Ed. Revised & Expanded, Marcel Dekkar,Inc,New York, 1996.
2. Workman, J; Art Springsteen; Applied Spectroscopy- A compact reference forPractitioners, Academic Press, London, 1997.
3. Subrahmanyam, N. &Lal B; A text Book of Optics, S. Chand & Company, New Delhi,2004.
4. Willard, H.H. Lynne L. Merrett, J. Dean, A. Frank, A. Settle. J; Instrumental Methods ofAnalysis, 7th Edn.CBS pub.& Distributors, New Delhi, 1986.
5. Khandpur, R.S; Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co.NewDelhi, 2004.
6. Thomson, K.C. &Renolds, R.J; Atomic Absorption Fluorescence & Flame EmissionSpectroscopy, A Practical Approach, 2nd Edn. Charles Griffith & Company, New SouthWales, 1978.
7. Dudley, H. Williams & Fleming, I; Spectroscopic Methods in Organic Chemistry, 4thEdn,Tata McGraw-Hill Publishing Company, New Delhi, 1994.

1. Name of the Department: Forensic Science						
2. Course Name	Instrumentation in Chemical Sciences Lab		L	T		P
3. Course Code	17040612		0	0		4
4. Type of Course (use tick mark)		Core ()	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

This paper in Forensic Science provide students practical exposure of spectroscopic, chromatographic and Radiochemical Techniques along with their forensic applications.

9. Course Objectives

1. To gain practical exposure about the various instrumental techniques.
2. To analyse and interpret the results of toxicological samples
3. To enhance analytical skills through advanced instrumental techniques
4. To develop the problem solving attitude related to different techniques.

10. Course Outcomes (COs)

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

1. Apply practical aspects of chromatographic techniques for academic, professional and research purpose.
2. Utilise Molecular Spectroscopic techniques for examination of various evidence found at the scene of crime.
3. Gain analytical skills for examination of various chemical and toxicological evidence
4. Illustrate merits and demerits of all the techniques and choose the most appropriate technique for analysis.

11. Practicals

1. To analyse and interpret given FTIR Spectrum.
2. To identify different functional group based on given spectroscopy data.
3. To perform the TLC of cosmetic samples.
4. To perform TLC of Ink samples.
5. Chromatographic separation of active ingredients of plant extracts (poisonous plants).
6. To study the mass spectrum of a given compound.
7. To perform paper chromatography of a forensically relevant evidence.
8. To verify lambert beer's law.
9. To analyse the different metallic poisons using reinsch test.
10. To perform colour tests for volatile poisons and non – volatile poisons.
11. Examination of documents under stereo zoom microscope, UV rays, IR rays and obliquelight.
12. Comparison of soil samples using microscopic and density-gradient distribution of particlesmethod.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=XIWc9eT476c
2. https://jascoinc.com/learning-center/theory/spectroscopy/fundamentals-ftir-spectroscopy/
3. https://www.youtube.com/watch?v=U2BKeT8toLQ
4. https://www.youtube.com/watch?v=qozD2XBRF0U
5. https://www.youtube.com/watch?v=J2iTt8P6j6E

13. Books Recommended

1. "Working Procedure Manual on Chemistry", Directorate of Forensic Science MHA Govt.of India, 2005.
2. "Working Procedure Manual- Chemistry, Explosives and Narcotics", BPR&D, 2000.
3. DFS Manual of Forensic Toxicology
4. A C Moffat Clarke's Analysis of Drugs and Poisons, (Formerly Isolation & Identification ofDrugs) 3rd Ed. 2 Vol.
5. Casarett & Doll Toxicology (2003) The Basic Science of poisons.
6. Clark, E.G.C. : Isolation and identification of Drugs, VI and Vol. II, 1966, 1975-1986.
7. Curry A.S (1986) Analytical Methods in Human Toxicology, Part II, CRC Press Ohio

1. Name of the Department: Forensic Sciences						
2. Course Name	**Security Documents and Its Examination**			**L**	**T**	**P**
3. Course Code	17040613			4	0	0
4. Type of Course (use tick mark)		Core ()	DSE(✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science Stream	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = Nil	Practical = Nil

8. Course Description:

In this Domain Specific Elective (DSE) course the student will gain knowledge about different types of security documents, their security features, and their identifiable parameters. The students will learn about the examination of counterfeited security documents like stamp papers, passports, driving licenses, credit cards, bank cheques etc.

9. Course Objectives:

The course focuses on following objectives:

1. Developing an understanding and appreciation for the scope of security documents
2. To understand the significance of security documents as Questioned Documents.
3. Develop an understanding on different types of security documents and their salient features and characteristics.
4. Brief description on Bank notes, bank cheques, Govt. Stamp Duty papers along with their security features and examination.

10. Course Outcomes (COs):

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

1. Apply disciplinary knowledge of forensic examination on Security Documents and their types for Forensic cases.
2. Demonstrate features and characteristics of security documents in a more critical way.
3. Gain analytical skills of features of Bank notes, bank cheques, Govt. Stamp Duty papers along with their security features and examination.
4. Apply the problem solving skills related to the examination and instrumentation used for identification of security documents.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Introduction to Security Documents

Defining security documents. Need of Security Documents. Brief description on of security documents, security features and verification features. Levels of security in a security document. Verification of passports, credit cards, and bank cheques etc.

Unit-2	Number of lectures = 13	Title of the unit: Disputed Security Documents

Describing disputed security documents. Types of disputed security documents. Salient features for their identifications. Instrumentation used for their Examination. Examination of Educational Certificates for tampering or any fraudulent act.

Unit – 3	Number of lectures = 13	Title of the unit: Bank and Govt. Stamp Papers

Introduction to major Currency notes across the globe. Brief description on Governing and Manufacturing bodies in India. Salient features for identification of genuine bank notes of 10, 100, 200,

500, and 2000 rupees. Identification of other currencies like USD, Euro, Malaysian Ringgit etc. Examination of security features of Govt. Stamp Duty Papers. Forensic Cases related to these documents.

Unit – 4	Number of lectures = 13	Title of the unit: Instruments, Analysis, Credit cards

Use of magnifying glass, stereomicroscope, and comparison microscope. Application of UV and IR lights in the examination of security features. Comparison of security features in credit and debit cards. Identifying a counterfeited security document. Case studies and Report Writing.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=7FPrba70r_8
2. https://www.youtube.com/watch?v=gDuiwtRp1m0
3. https://www.youtube.com/watch?v=DkGdAclh214
4. https://www.youtube.com/watch?v=mQxH1EZA7lI
5. https://www.youtube.com/watch?v=i6AVF0GhxNk
6. https://www.youtube.com/watch?v=7aUtNuqek8M

13. Books Recommended

1. Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.
2. Lingaed, J. R., (1985). Bank Security Documents, Butterworths.
3. Budhram, T., (2007). Examining the Unique Security Features of a Credit Card with the Aim of Identifying Possible Fraudulent Use, University of South Africa.
4. Fumy, W. and Paeschke, M. (2011). Handbook of e- ID Security, Publicis Publishing.
5. Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group.

1. Name of the Department: Forensic Sciences						
2. Course Name	Security Documents and Its Examination Lab		L	T		P
3. Course Code	17040614		0	0		4
4. Type of Course (use tick mark)		Core ()	DSE(✔)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science Stream	6. Frequency (use tick marks)	Even(✔)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

In this Domain Specific Elective (DSE) course the student will gain the practical knowledge about different types of security documents, their security features, and their identifiable parameters. The students will be to examine the counterfeited security documents like stamp papers, passports, driving licenses, credit cards, bank cheques etc.

9. Course Objectives:

The course focuses on following objectives:

1. Developing an understanding and appreciation for the scope of security documents
2. To understand the significance of security documents as Questioned Documents.
3. Develop an understanding on different types of security documents and their salient features and characteristics.
4. Brief description on Bank notes, bank cheques, Govt. Stamp Duty papers along with their security features and examination.

10. Course Outcomes (COs):

Upon successful completion of this course, the students will be able to:
1. Apply disciplinary knowledge of forensic examination on Security Documents and their types for Forensic cases.
2. Demonstrate features and characteristics of security documents in a more critical way.
3. Gain analytical skills of features of Bank notes, bank cheques, Govt. Stamp Duty papers along with their security features and examination.
4. Apply the problem solving skills related to the examination and instrumentation used for identification of security documents.

11. List of Experiments

1. To Examine the security features of currency notes of India and studying their security features.
2. To Examine the security features of currency notes of foreign countries and studying their security features.
3. To Study and analysis of security features of Indian Passport.
4. To Study and analysis of security features of any one Foreign Passport.
5. To Study and analysis of security features of Bank Cheques.
6. To Study and analysis of security features of Govt. Stamp Duty Papers.
7. To Study and analysis of security features of Educational Certificates.
8. To Examine the tampered educational certificates.
9. To Examine the counterfeited currencies.
10. To Examine the counterfeited Govt. Stamp Papers

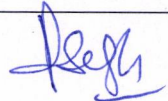## 12. Brief Description of self-learning / E-learning component

1.	https://www.youtube.com/watch?v=7FPrba70r_8
2.	https://www.youtube.com/watch?v=gDuiwtRp1m0
3.	https://www.youtube.com/watch?v=DkGdAclh214
4.	https://www.youtube.com/watch?v=mQxH1EZA7lI
5.	https://www.youtube.com/watch?v=i6AVF0GhxNk
6.	https://www.youtube.com/watch?v=7aUtNuqek8M

13. Books Recommended

1. Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.
2. Lingaed, J. R., (1985). Bank Security Documents, Butterworths.
3. Budhram, T., (2007). Examining the Unique Security Features of a Credit Card with the Aim of Identifying Possible Fraudulent Use, University of South Africa.
4. Fumy, W. and Paeschke, M. (2011). Handbook of e- ID Security, Publicis Publishing.
5. Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group.

1. Name of the Department: Forensic Science							

2. Course Name	Instrumentation in Questioned Documents			L	T		P
3. Course Code	17040615			4	0		0
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()		OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even (✓)	Odd ( )	Either Sem ( )		Every Sem ( )

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course will explain Automatic Fingerprint Identification System (AFIS). Comparison of handwriting and signature specimens will be explained. In addition, Comparison of handwriting and signatures, disguise and forgeries specimens and determination of source of paper and ink samples will be highlighted.

9. Course Objectives

The objectives of this course are to:

1. Learns about comparison of handwriting and signatures, disguise and forgeries through optical and high-end instruments.

2. Explain the relevance and implementation of microscopic examination for questioned document examination.

10. Course Outcomes (COs):

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

1. Research Related Skills for comparing questioned document through instrumentation techniques

2. Disciplinary Knowledge to compare handwriting and signatures, disguise and forgeries through microscopic examination.

3. Analytical / Scientific Reasoning that explains the working and applications of photography of documents.

4. Critical Thinking and Problem Solving of indentation marks on a document by ESDA

11. Unit wise detailed content

Unit-1	Number of lectures 13	Title of the unit: Instrumentation techniques

Basic Principles & Techniques Visible and Florescence (UV and IR), Crossline Examination System,

HPTLC and Raman Spectroscopy in document examination.

Unit – 2	Number of lectures 13	Title of the unit: Microscopic Examination
Photomicrography & Microphotography, Working and application of Stereo-zoom Microscopy		
Unit – 3	Number of lectures 13	Title of the unit: Electrostatic Detection Apparatus (ESDA) and Video Spectral Comparator (VSC)

ESDA: History, principle and components of ESDA, preparation of ESDA, Implementation of ESDA, Factors influencing the quality of final image by ESDA, Application of electrostatic detection device
VSC: Features of VSC, Examination of Document under various light sources, Determination of sequence of intersecting strokes and other applications of VSC.

Unit -4	Number of lectures 13	Title of the unit: Document photography

Basic principles and techniques of black & white and colour photography. Specialized photography - UV, IR, transmitted light and side light photography close-up photography, trick photography, contact photography, Photomicrography & Microphotography. Demonstrative and juxtapose charts. Digital photography, file formats for digital photographs, digital watermarking and digital imaging. Photogrammetry & Radiography.

12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=9RYDhw5yjrM
2. https://www.youtube.com/watch?v=2WPdKbH0xl0
3. https://www.youtube.com/watch?v=yhVFk_uQFxo
4. https://www.youtube.com/watch?v=S3zNABQv270
5. https://www.youtube.com/watch?v=0LI0HXCr5xs
6. https://www.youtube.com/watch?v=S_yrfqMtUBQ
7. https://www.youtube.com/watch?v=6lKM2I_9cnw
8. https://www.youtube.com/watch?v=bYyw6-L2A9c

13. Books Recommended

1. Ordway Hilton; Scientific Examination of Questioned Documents. Revised Edition, Elsevier, NY (1982).
2. Albert S. Osborn; Questioned Documents, 2nd Ed., universal Law Pub., Delhi (1998).
3. Albert S Osborn; The Problem of Proof, 2nd Ed., Universal Law Pub. Delhi (1998)
4. Charles C. Thomas; I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates Springfield, Illinois, USA (1971)
5. Wilson R. Harrison; Suspect Documents Their Scientific Examination, Universal Law Pub. Delhi Indian Reprint (2001)
6. Morris Ron N; Forensic Handwriting Identification, Acad Press, London (2001)
7. Kurtz Sheila; Graphotypes a new Plant on Handwriting Analysis, Crown Pub. Inc., USA (1983)
8. Lerinson Jay; Questioned Documents, Acad Press, London (2001)
9. Mcmenamin Gerald R, Forensic Linguistics-Advances in Forensic Stylistics, CRC Press, Washington Dc

1. Name of the Department: Forensic Science						
2. Course Name	Instrumentation in Questioned Documents Lab		**L**	**T**	**P**	
3. Course Code	17040616		0	0	4	
4. Type of Course (use tick mark)		Core ( )	DSE (✔)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✔)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

The lab work emphasizes learning of basic skills helpful. It includes studying comparison of Handwriting written on different surfaces, Comparison of Inks and Examination of scripts through various tools.

9. Course Objectives

The objectives of this course are to:
1. Compare Handwriting samples written on different surfaces.
2. Photography of questioned documents
3. Explain how to report cases in the court of law.
4. Training for photography and enhancement of questioned document

10. Course Outcomes (COs):

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

1. Disciplinary Knowledge of different types of Inks.
2. Critical Thinking and Problem Solving to compare Handwriting samples written on different surfaces.
3. Analytical / Scientific Reasoning that explains the working and applications of photography of fingerprints.
4. Ethics of report writing

11. List of experiments

1. To study the Comparison of Handwriting written on different surfaces

2. To conduct the Examination of Paper

3. To conduct the Examination of Inks

4. To conduct the Comparison of Inks

5. To study the Examination of scripts
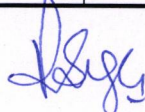
6. To study the different angles of Photography of questioned document
7. To study the Comparison of a questioned document with known sample
8. To study the making of Report writing.
12. Books Recommended
DFSS, CFSL and SFSL Manuals

1. Name of the Department: Forensic Science						
2. Course Name	Network Forensics			**L**	**T**	**P**
3. Course Code	17040617			4	0	0
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical =00

8. Course Description:

This course aims at learning the principles and practices of network forensics. Introduction to network protocols; security and forensic components; and vulnerability and defence

9. Course Objectives

1. To impart fundamental and necessary knowledge essential for examination of network systems.
2. To provide a platform to exchange views and develop the skills to take up
3. entrepreneurships and higher studies in the field of network forensics.
4. To improve student's knowledge on investigating network attacks and present them in the form of reports, case studies and research studies.

10. Course Outcomes (COs):

1. Investigate and explain the real time forensic issues in network system
2. Precisely hypothesize and reconstruct the events surrounding a network security attack based on their critical thinking and observation skills.
3. Analyse and describe theoretical, conceptual and experimental data in network forensic investigation
4. Collate and interpret scientific information for writing review articles, short communications, case reports.

11. Unit wise detailed content

Unit-1	Number of lectures	Title of the unit: Introduction to Network Systems

Introduction. Computer Networking- Digital and Analog Signalling Methods Host security and network security. Various components of computer networks. Significance of computer networks (i.e., internet, LAN, WAN) in an investigation. Different types of IP Addresses and Classes, Subnet Masks, Subnetting and Super -netting, web cache/traffic, Traffic types

Unit – 2	Number of lectures	Title of the unit: Network Attacks

Types of network attacks- eavesdropping, spoofing, modification, Cross-site scripting, DNS Spoofing, Routing Table Poisoning, ARP Poisoning, Web Jacking. Attacks on Wireless Networks. Social Engineering Attacks and its types. Packet Sniffing, Types of authentications, Attacks on WEP, WPA and WPA-2 Encryption, fake hotspots.

Unit – 3	Number of lectures	Title of the unit: Security in Networks

IP security architecture, Security protocols, IP Sec, Web Security – Firewalls, IDS, IDPS. Network Security Applications, Authentication Mechanisms: Passwords, Cryptographic authentication protocol

Unit -4	Number of lectures	Title of the unit: Investigation of Network attacks

Monitoring of computer network and activities, Live Packet Capturing and Analysis. Searching and collection of evidences from the network. Network Intrusion Detection and Analysis. Event Log analysis-tools and techniques. Investigating network attacks. Evidence collection from Routers other networking devices.

12. Brief Description of self-learning / E-learning component
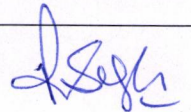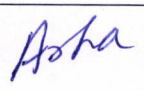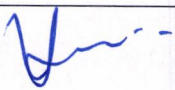
1. https://www.enisa.europa.eu/topics/trainings-for-cybersecurity-specialists/online-training-material/documents/introduction-to-network-forensics-handbook.pdf
2. https://www.bu.edu/csmet/files/2018/05/CS703_EL_Fall-2017.pdf
3. https://www.youtube.com/watch?v=Ryfg4IqWJhg
4. https://www.youtube.com/watch?v=jPQCHZIN88g
5. https://www.youtube.com/watch?v=iVsfG7PAIgg
6. https://www.youtube.com/watch?v=Ryfg4IqWJhg
7. https://www.ijcset.com/docs/IJCSET14-05-02-074.pdf

13. Books Recommended

1. Goyal R.M. and Pawar M.S. (1994), Computer crimes- concept, control and prevention, Sysman Computer Pvt. Ltd.
2. Lee Reiber. Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation, 1st edition, McGraw-Hill 2016
3. Maria P. and Costas P. (2010), Image Processing: The Fundamentals, Wiley.
4. Marie-Helen Maras. Computer Forensics: Cybercriminals, Laws, and Evidence, 2nd edition, Jones & Bartlett Learning 2015
5. NCJRS Library collection, best practices for seizing electronic evidence v.3: A Pocket Guide for First Responders, US department of Homeland Security.
6. Robert Moore. Cybercrime: Investigating High-Technology Computer Crime, 2nd edition, Routledge 2015
7. Special Report (2nd Edition), Electronic Crime Scene Investigation: A Guide for First Responders, NIJ publication.
8. Special Report, Forensic Examination of Digital Evidence: A Guide for Law Enforcement, NIJ Publication.
9. Sridhar S. (2011), Digital Image Processing, Oxford University Press.
10. Stern D.L. (1993), Preventing Computer fraud, Computing Mcgraw-Hill.
11. Tewari R.K., Sastry P.K. and Ravikumar K.V. (2003), Computer Crime & Computer Forensics, Select Publisher, New Delhi.
12. Veerakumar T., Jayaraman S. and Esakkirajan S. (2009), Digital Image Processing, McGraw Hill. 17. Wold G.H. and Shriver R. (1993), Computer Crime techniques Prevention, New Delhi Galgotia Book Source.

1. Name of the Department: Forensic Science						
2. Course Name	Network Forensics Lab		**L**	**T**		**P**
3. Course Code	17040618		0	0		4
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even (✓)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Objectives:

1. To impart fundamental and necessary knowledge essential for examination of wireless networks.
2. To provide a platform to exchange views and develop the skills to take up entrepreneurships and higher studies in the field of network forensics.
3. To improve student's knowledge on investigating network manipulation and present them in the form of reports, case studies and research studies.
4. To develop self-learning and be aware of recent trends and technological advances in network attack investigation

9. Course Outcomes (COs):

1. How to look for evidence in both wired and wireless networks
2. Perform end to end forensic investigations
3. Collect evidence from log files How to use typical forensic investigation tools
4. Follow a scientific approach to investigate network security events and incidents

10. Practical

1. To Study the wireless devices

2. To Study the wireless networks and wireless network analysis.

3. To study and Understanding dynamic and static pages, Viewing HTML Source and HTTP Headers,

4. To study and Understanding Header Information

5. To study and demonstrate URL Manipulation

6. To conduct the Identification and investigation of website spoofing

7. To study the Working with Wire Shark for Network analysis.

8. Studying of packets and packet formats.

9. To study Network evidence collection offline and online.

10.To demonstrate the Recovering of deleted files
11.Retrieving internet activity
12.To study how to Secure a Windows server Network
13.To study the Creating and securing LAN and WAN

11. Books Recommended

1. Lab Manual of DFSS
2. Real Digital Forensics by Keith j.Jones, Richard Bejitlich,Curtis W.Rose ,AddisonWesley Pearson Education
3. Forensic Compiling,A Tractitioneris Guide by Tony Sammes and Brain Jenkinson,Springer International edition.
4. Computer Evidence Collection &Presentation by Chrostopher L.T. Brown,Firewall Media.
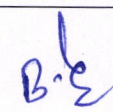5. Homeland Security, Techniques& Technologies by Jesus Mena,Firewall Media.
6. Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M.Slade ,TMH 2005
7. Windows Forensics by chad Steel,Wiley India Edition.
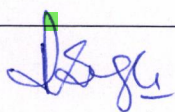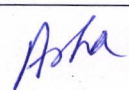
1. Name of the Department: Forensic Science

2. Course Name	Data Acquisition and Cloud Forensics		L	T	P
3. Course Code	17040619		4	0	0

4. Type of Course (use tick mark)		Core ()	DSE (√)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even(√)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This is a Domain Specialization Elective (DSE) course and is ideal for the learners who wants to record a lot of data about the real world from sensors for analyze it later. It will also suitable for the students to learn Data Acquisition form various devices in cases of forensic investigations along with the techniques of data conversions.

9. Course Objectives

1. To introduce students to digital fundamentals.
2. To learn the components of data and programming languages.
3. To learn the basics of data acquisition (DAQ), principles, concepts and methods.
4. To study and apply related software and hardware involved in acquiring data from sensors for measurement purposes.

10. Course Outcomes (COs):

1. Disciplinary knowledge of identity of data, its types and data acquisition system.
2. Critical thinking about the types of techniques and sensor to measure a specific data.
3. Enhancement of Analytical skills of data acquisition in forensic investigations.
4. Becoming familiar data amplification, signal conditioning, and Analog-to-Digital conversion.
5. Becoming familiar with at least one software used to view and analyse data on a PC.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Programming Languages, Data and its Types

Different Types of Programming Languages; Learning Python; Defining Data; Data Types; Raw Data; Data Quality; Data Warehousing; Data Transformations; Metadata and its Significance; Multimodal Data, and Problems related to Data.

Unit – 2	Number of lectures = 13	Title of the unit: Introduction to Data Acquisition (DAQ)

Data Acquisition (DAQ) and Understanding; Data Acquisition Overview; Sensor Types Overview; Application Areas and Trends; Data Acquisition System Feature: System Components, Signal Characteristics, Signal Conditioning, Signal Source and Measurement System Configuration; Voltage resolution; Quantization error; Methods of representation; Shared/Exchanged Data Considerations

Unit – 3	Number of lectures = 13	Title of the unit: Analog to Digital Conversion

Aligning similar Data; Imputing Missing Values; Data Review; Feature selection and extraction; Key analog to digital conversion parameters; Measurement Errors; Triggers; Accuracy requirements; Authoritative Data Source, LabVIEW Introduction; LabVIEW – Sub VIs; Introduction to LabJack, Filters (signal conditioning); Amplification (signal conditioning)

Unit -4	Number of lectures = 13	Title of the unit: Cloud Forensics

Introduction to Cloud Forensics and Incident Response; tools, techniques, and procedures necessary to effectively locate, identify, and collect data; Cloud Infrastructure and IR data sources; Microsoft 365 and Graph API; AWS Incident Response; SOF-ELK(R) Virtual Machine; Cloud Security Attacker Techniques, Monitoring, and Threat Detection; Cloud Security Essentials

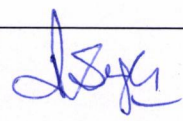## 12. Brief Description of self-learning / E-learning component

1. https://www.mccdaq.com/data-acquisition
2. https://www.omega.com/en-us/resources/daq-systems
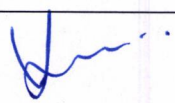3. https://www.electronics-notes.com/articles/test-methods/data-acquisition-daq/understanding-data-acquisition.php
4. https://www.youtube.com/watch?v=TPowbUhf0_Q
5. https://www.youtube.com/watch?v=I_9Pwyxhe40
6. https://www.youtube.com/watch?v=WwQSfk6SSSo

13. Books Recommended

1. Park, J., John Park, A. S. D., & Mackay, S. (2003). *Practical data acquisition for instrumentation and control systems*. Newnes.
2. 1995. *Data acquisition databook*. Santa Clara, CA: National Semiconductor Corporation.
3. Apse-Apsitis, P., 2014. Project Codename — "Sensor Data Remote Acquisition". *Journal of Advances in Computer Networks*, 2(4), pp.237-242.
4. Böðvarsson, R., Rögnvaldsson, S. T., Slunga, R., & Kjartansson, E. (1999). The SIL data acquisition system—at present and beyond year 2000. *Physics of the Earth and Planetary Interiors*, 113(1-4), 89-101.
5. VanRossum, G., & Drake, F. L. (2010). *The python language reference*. Amsterdam, Netherlands: Python Software Foundation.
6. Provost, F., & Fawcett, T. (2013). *Data Science for Business: What you need to know about data mining and data-analytic thinking*. " O'Reilly Media, Inc.".

1. Name of the Department: Forensic Science						
2. Course Name	Data Acquisition and Cloud Forensics Lab	**L**		**T**		**P**
3. Course Code	17040620	0		0		4
4. Type of Course (use tick mark)		Core ( )	DSE (√)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even(√)	Odd()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This is a Domain Specialization Elective (DSE) course and is ideal for the learners who wants to record a lot of data about the real world from sensors for analyze it later. It will also suitable for the students to learn Data Acquisition form various devices in cases of forensic investigations along with the techniques of data conversions.

9. Course Objectives

1. To introduce students to digital fundamentals.
2. To learn the components of data and programming languages.
3. To learn the basics of data acquisition (DAQ), principles, concepts and methods.
4. To study and apply related software and hardware involved in acquiring data from sensors for measurement purposes.

10. Course Outcomes (COs):

1. Disciplinary knowledge of identity of data, its types and data acquisition system.
2. Critical thinking about the types of techniques and sensor to measure a specific data.
3. Enhancement of Analytical skills of data acquisition in forensic investigations.
4. Becoming familiar data amplification, signal conditioning, and Analog-to-Digital conversion.
5. Becoming familiar with at least one software used to view and analyse data on a PC.
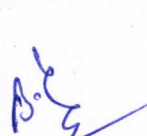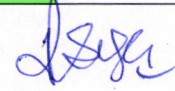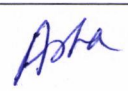
11. List of Experiments

1. To Study the methods of data storing in computer devices including SSD, Flash Drives, Magnetic Data Storage, Digital Audio etc.

2. To study various types of file formats like JPEG, GIF, SVG, PNG, TIF, HTML, PDF, DOCX, TXT, AVI, MP4, AVCHD etc.

3. To Study the case studies related to DAQs

4. To Study the case studies related to Cloud Forensics

5. To Study the methods of data collection from devices

6. Experimenting the converting/transforming of legacy data

7. To Learn about the LabVIEW basics for data acquisition

8. To Learn about different sensors and their significances.

9. To Learn about the working and function of Analog to Digital Converter

10. To Study and experiment signal conditioning.

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12. Brief Description of self-learning / E-learning component

1. https://www.mccdaq.com/data-acquisition
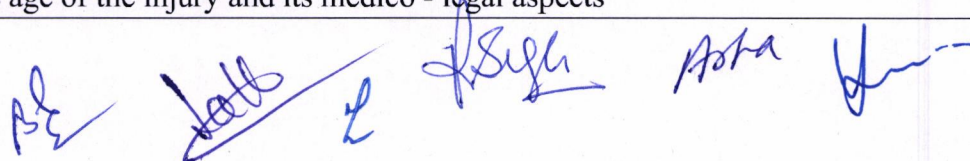2. https://www.omega.com/en-us/resources/daq-systems
3. https://www.electronics-notes.com/articles/test-methods/data-acquisition-daq/understanding-data-acquisition.php
4. https://www.youtube.com/watch?v=TPowbUhf0_Q
5. https://www.youtube.com/watch?v=I_9Pwyxhe40
6. https://www.youtube.com/watch?v=WwQSfk6SSSo

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13. Books Recommended

1. Park, J., John Park, A. S. D., & Mackay, S. (2003). Practical data acquisition for instrumentation and control systems. Newnes.
2. 1995. Data acquisition databook. Santa Clara, CA: National Semiconductor Corporation.
3. Apse-Apsitis, P., 2014. Project Codename — "Sensor Data Remote Acquisition". Journal of Advances in Computer Networks, 2(4), pp.237-242.
4. Böðvarsson, R., Rögnvaldsson, S. T., Slunga, R., & Kjartansson, E. (1999). The SIL data acquisition system—at present and beyond year 2000. Physics of the Earth and Planetary Interiors, 113(1-4), 89-101.
5. VanRossum, G., & Drake, F. L. (2010). The python language reference. Amsterdam, Netherlands: Python Software Foundation.
6. Provost, F., & Fawcett, T. (2013). Data Science for Business: What you need to know about data mining and data-analytic thinking. " O'Reilly Media, Inc.".

1. Name of the Department: Forensic Science					
2. Course Name	Forensic Medicine	L	T	P	
3. Course Code	17040701	4	0	0	

4. Type of Course (use tick mark)		Core ( )	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream.	6. Frequency (use tick marks)	Even ()	Odd(✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description:

This course offers the concepts of forensic medicine to develop the understanding of autopsy procedures, legal aspects, post-mortem changes, forensic entomology, injuries and asphyxial deaths.

9. Course Objectives

1. To understand the fundamental, legal and ethical aspects of forensic medicine to practice forensic principles and procedures in criminal justice system.
2. To develop the understanding of the processes of post-mortem changes for the crime scene assessment and evidence collection.
3. To understand the mechanism of wound production & healing, determining the age of the injury and its medico - legal aspects to analyse and interpret the possible cause of injury.
4. To understand the applications of forensic medicine in legal and social context to express the opinions effectively and clearly.

10. Course Outcomes (COs):

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

1. Develop understanding of the fundamental, legal and ethical aspects of forensic medicine to professional conduct and social issues in the form of report writing and documentation.
2. Develop the understanding of the processes of post-mortem changes to enhance the critical thinking and observation skills.
3. Develop the understanding of the mechanism of wound production & healing, determining the age of the injury and its medico - legal aspects to analyse and interpret the possible cause of injury.
4. Develop the understanding of the applications of forensic medicine in legal and social context.

11. Unit wise detailed content

Unit-1	Number of lectures 13	Title of the unit: Introduction to Forensic Medicine
Fundamental aspects and scope of forensic medicine, Legal aspects and sections, Types of witnesses; dying declaration, Informed consent, ethical aspects of forensic medicine, autopsy procedures.		
Unit – 2	Number of lectures 13	Title of the unit: Thanatology
Post-mortem changes-Algor Mortis, Livor Mortis, Pallor Mortis, Rigor Mortis, Adipocere, Skeletonization, Putrefaction. Estimating time since death using Forensic Entomology.		
Unit – 3	Number of lectures 13	Title of the unit: Mechanical Injuries
Abrasion, Contusion, Laceration, Stab wounds, Incision: Mechanism of wound production & healing, Determining the age of the injury and its medico - legal aspects		

Unit -4	Number of lectures 13	Title of the unit: Miscellaneous Injuries

Injuries due to heat, cold, chemicals and radiation and their medicolegal significance. Asphyxial Deaths: Hanging and Strangulation.

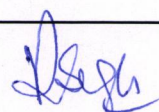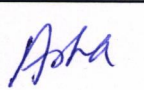## 12. Brief Description of self-learning / E-learning component

1. https://notesmed.com/wp-content/uploads/2021/05/Textbook-of-Forensic-medicine-and-toxicology-5th-edition-by-Krishan-Vij.pdf
2. https://www.youtube.com/watch?v=DWhbUirPFjE
3. https://www.youtube.com/watch?v=atjkuski6D4
4. https://www.pdfdrive.com/the-essentials-of-forensic-medicine-and-toxicology-e176376887.html
5. https://www.pdfdrive.com/the-forensic-laboratory-handbook-procedures-and-practice-forensic-science-and-medicine-d185981349.html

13. Books Recommended

1. J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton (1999).
2. Modi, J. P., & Franklin, C. A. (1988). *Modi's Textbook of medical jurisprudence and toxicology*. Bombay: N.M. Tripathi.
3. Pillay, V.V. (2003) *Handbook of Forensic Medicine and Toxicology*. 13th Edition, Paras Publication, Hyderabad, 24- 25.
4. Reddy, K.S.N. (2013) *The Essentials of Forensic Medicine and Toxicology*. 32nd Edition, Om Sai Graphics, Hyderabad, 56.
5. Vij, K. (2011). *Textbook of forensic medicine and toxicology: Principles and practice.*

1. Name of the Department: Forensic Sciences					
2. Course Name	Forensic Medicine Lab	**L**	**T**	**P**	
3. Course Code	17040702	0	0	4	
4. Type of Course (use tick mark)	Core ()	DSE (✓)	AEC ()	SEC ()	OE ()
5. Pre-requisite (if any)	10+2 with Science stream	6. Frequency (Use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

(Note: table header row "4. Type of Course" row: Core (), DSE (✓), AEC (), SEC (), OE (); row "5. Pre-requisite" contains 10+2 with Science stream, 6. Frequency (Use tick marks), Even (), Odd (✓), Either Sem (), Every Sem ())

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

This course offers the analytical and pathological concepts of forensic medicine to develop the understanding of investigating post-mortem changes, forensic entomology, injuries and asphyxial deaths.

9: Course Objectives:

1. To understand the pathological, analytical and ethical aspects of forensic medicine to practice forensic principles and procedures in criminal justice system.
2. To develop the understanding of the processes of post-mortem changes for the crime scene assessment and evidence collection.
3. To understand and perform the procedures for the determination the age of the injury and its medico - legal aspects to analyze and interpret the possible cause of injury.
4. To understand the applications of forensic medicine in legal and social context to express the opinions effectively and clearly.

10. Course Outcomes (COs):

Upon successful completion of the course, the students will able to:

1. Understand the analysis and interpretation of the injuries.
2. Understand the determination and interpretation of time since death to investigate and explain the real time forensic issues in legal and social context.
3. Understand the forensic and entomological aspects to determine cause of death to describe theoretical, conceptual facts.
4. Understand report writing and dying declaration considering legal and ethical aspects to professional conduct and social issues in the form of technical writing.

11. List of Practicals

1. To study the various tools and instrument used in autopsy.
2. To design a protocol to write and document dying declaration.
3. To study the protocol or legal and ethical clearance for the conduction of autopsy.
4. To understand the aspects of virtual autopsy.
5. To analyze and preserve bite marks.
6. To analyze the skeletal remains found on the crime scene.
7. To analyze the injuries present on the body found on crime scene.
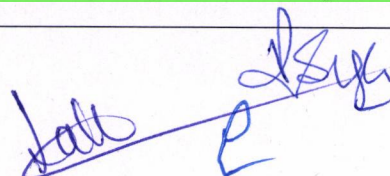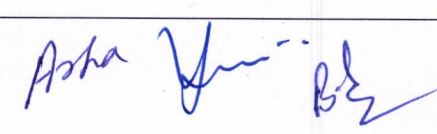8. To analyze and determine the degree of burns on the body.

12. Books recommended:

1. J. Dix, Handbook for Death Scene Investigations, CRC Press, Boca Raton (1999).
2. Modi, J. P., & Franklin, C. A. (1988). Modi's Textbook of medical jurisprudence and toxicology. Bombay: N.M. Tripathi.
3. Pillay, V.V. (2003) Handbook of Forensic Medicine and Toxicology. 13th Edition, Paras Publication, Hyderabad, 24- 25.

1.	Name of the Department: Forensic Science					
2.	Course Name	Research Methodology and Statistics	**L**	**T**	**P**	
3.	Course Code	17040703	4	0	0	
4.	Type of Course (use tick mark)		Core ()	DSE (✓)	AECC()	SEC ()
5.	Pre-requisite (if any)	10+2 with Science stream	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ( ) / Every Sem ( )

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

In this course, the components of research methodology, research design, sampling, hypothesis formulation, scientific research, statistics in scientific research and report writing will be explained.

9. Course Objectives

1. To introduce the understanding of research process, conceiving, designing, conducting and analyzing.
2. To understand the methods of sampling and preparation of reports.
3. To understand the concepts of descriptive statistics and graphical representation of the data.
4. To make students capable of applying statistics in academics and research.

10. Course Outcomes (COs)

Upon successful completion of this course, the students will be able to
1. Understand and apply the knowledge of research methodology in idea formulation, and research designing.
2. Hypothesize research theories, methodologies and processes based on their critical thinking and problem solving skills.
3. Analyze and describe theoretical, conceptual and experimental data.
4. Collect, analyze and interpret the data using statistical techniques .

11. Unit wise detailed content

Unit-1	Number of lectures = 10	Title of the unit: Introduction to Research Methodology

Defining Research Methodology, need and scope of research, concept of research design, independent, dependable & extraneous variables. Research hypothesis, methods of research: case study method, descriptive & diagnostic studies, analytic studies, survey etc. Experimental designs- CRD, RBD, LSD & Factorial designs.

Unit-2	Number of lectures = 13	Title of the unit: Sampling and Components of a Research report

Sampling: Principles, methods, types of sampling. Tools for data collection: Observation, interview schedule, questionnaire, semantic differential. Components of a Research report: Title, Authors and addresses, Abstract, Summary, Synopsis, key words. Introduction, Review of Literature: Research Reading, Critical Reading. Materials and Methods, References: Different types of Citing References.

Unit-3	Number of lectures = 14	Title of the unit: Statistics-I

Introduction, Descriptive Statistics: Frequency distribution, class intervals, graphical presentation: bar diagram, histogram, pie chart; Measures of Central Tendency; measures of dispersion. Definition of correlation, Methods of correlation, skewness and Kurtosis variance, Types of correlation (Pearson r& Rho), correlation coefficient, regression, Rank.

Unit-4	Number of lectures = 15	Title of the unit: Statistics-II

Continuous random variable, discrete random variable, binomial distribution, Poisson distribution, normal distribution and their properties. Hypothesis: Test of hypothesis, Null hypothesis, alternative hypothesis. T-test, chi-square test, F test, ANOVA.

12. Brief Description of self-learning / E-learning component

1.	https://www.youtube.com/watch?v=Pztlk97hf0o
2.	https://www.youtube.com/watch?v=tBXznU_TPJo
3.	https://www.youtube.com/watch?v=xy9_oWpWEGo
4.	https://www.youtube.com/watch?v=dOew5987Gvg
5.	https://www.youtube.com/watch?v=QfVx7AH8rck
6.	https://www.youtube.com/watch?v=L4Z66nTag7w

13. Books Recommended

1. KS Yogesh. Fundamental of Research Methodology and Statistics, 2006.
2. Broota, K.D., Experimental Design in Behavioural Research, Wiley eastern, New York, 1992.
3. Guilford, Statistics in Psychology and Education, McGraw hill, New York, 1986. .
4. Rajamanickam, M., Statistical Methods in Psychological and Educational Research, Concept Publishing Co. New Delhi, India, 1983.
5. S.P. Gupta. Statistical Methods 43rd Edition , Sultan Chand and Sons. New Delhi, India, 2014

1. Name of the Department: Forensic Science					
2. Course Name	Research Methodology and Statistics Lab	L	T	P	
3. Course Code	17040704	0	0	4	
4. Type of Course (use tick mark)	Core ( )	DSE (✓)	AEC ( )	SEC ( )	OE ( )
5. Pre-requisite (if any)	10+2 with Science stream.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

In the course, the students will apply conceptual knowledge of research methodology and statistics for testing hypothesis and formulate results/reports on the basis of obtained experimental data.

9. Course Objectives

1. To understand and apply the concepts of research methodology and research design.
2. To understand and apply the details of descriptive statistics.
3. To acquire the knowledge of different measures of variance.
4. To gain practical knowledge on hypothesis testing and analysis of experimental data

10. Course Outcomes (COs):

Upon successful completion of this course, the students will able to

1. Develop knowledge about various research methodologies, research designs and their application
2. Hypothesize research theories, methodologies and processes based on their critical thinking and problem solving skills.
3. Analyze and describe theoretical, conceptual and experimental data.
4. Collect, analyze and interpret the data using statistical techniques .

11. Unit wise detailed content

Practicals

1. To construct discrete and continuous frequency distribution tables
2. To construct Bar Diagram, Histogram, Pie Diagram, Frequency curve and Frequency polygon from the data
3. To calculate Mean, Median , Mode of grouped and ungrouped data
4. To calculate mean deviation and standard deviation of the given data
5. To calculate the Correlation and regression coefficient along with their test of significance of the given data
6. To definition of Null and Alternative Hypothesis and test it using different tests of significance
7. To apply t test for single mean, t-test for independent samples, paired t test on the given data
8. To apply F-test on the given data
9. To apply Chi-square test on the given data
10. To analyse the given data using one-way or two-way ANOVA
11. To cite the references in APA and Vancouver format.

12. Books Recommended

1. A textbook of Biostatistics, C.R Kothari

1. Name of the Department: Environmental Science						
2. Course Name	Ecology & Biodiversity		**L**	**T**	**P**	**Credits**
3. Course Code	17040705		4	0	0	4
4. Type of Course (use tick mark)		Core ()	DSE (✓)		SEC ()	
5. Pre-requisite (if any)	10+2	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 15 weeks of one semester)

Lectures = 52	Tutorials = Nil	Practical = Nil

8. Course Description:

Ecosystem is the interaction between biotic and abiotic components of ecosystems. This course will cover ecological factors & the interaction, adaptation and functional adjustment of organisms to the changes in physical environment. This course will cover detail understanding of pattern of biodiversity and will help in understanding strategies for conserving ecosystem and biodiversity.

9. Course Objectives:

The objectives of this course are:

1. To introduce the students with factors responsible for evolution of life.
2. To understand biodiversity pattern and human interaction with ecological world.
3. To know about various conventions and treaties for biodiversity conservation.
4. To know about the working of organizations for wildlife conservation.

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able:

1. To understand principles of ecology, population and resource dynamics
2. To understand the relationship of living organisms with their environment.
3. To know the effect of human civilization and industrialization on biodiversity.
4. To know about the sustainable development for protection of ecosystem and conserving biodiversity.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Ecology & Ecosystem

Ecosystem: Definition, structure and function, Evolutionary ecology, Earth's major ecosystems - terrestrial and aquatic ecosystems, Biosphere, Ecosystem productivity, Adaptations to the physical environment, Ecosystem stability, Ecological Succession, Ecades, Ecotypes, Ecotone.

Unit – 2	Number of lectures = 13	Population Ecology

Population: Interaction, distribution, and abundance; Species and communities, Survivorship curves and models, r & k Selection, Concept of carrying capacity, Concept of Habitat and Ecological Niche, Lotka-Voltera Model.

Unit – 3	Number of lectures = 13	Biodiversity

Historical and geographical pattern of biodiversity; Types of biodiversity, levels, and gradients of Biodiversity, Theories of biological classification, IUCN categories, red data book, green data book, Biodiversity in the welfare of mankind.

Unit – 4	Number of lectures = 13	Conservation and Sustaining Strategies

International conventions, treaties and protocols for Biodiversity Conservation, Human impacts: threats to ecosystem and biodiversity, Role of WWF, WCU, CITES, TRAFFIC, Concept of sustainable development

12. Brief Description of self learning / E-learning component

1. https://www.conserve-energy-future.com/what-is-an-ecosystem.php
2. https://www.youtube.com/watch?v=pv-WbXGtkzU
3. https://www.slideshare.net/TalemosSeta/lecture-note-on-biodiversity-conservation
4. https://nptel.ac.in/courses/102104068/2
5. https://www.easybiologyclass.com/biodiversity-introduction-definition-classification-importance-measurement-of-biodiversity

13. Books Recommended

1. Fundamentals of Ecology by Eugene P. Odum, Gary W. Barrett - Publisher : Cengage(5 edition) ISBN: 9780534420666
2. Ecology and Field Biology by R.L Smith , Publisher: Benjamin Cummings ISBN-10 : 0321042905
3. Principles of Environmental Science by William Cunningham and Mary Cunningham Publisher: McGraw-Hill Education; 8th edition ISBN-10 : 0078036070
4. Global Biodiversity: Volume 2: Selected Countries in Europe by Apple Academic Press ISBN: 9781771887175
5. Ecology of Natural Resources by Francois Ramade Publisher : John Wiley & Sons Inc ISBN 9780471901044

1. Name of the Department: Environmental Sciences						

2. Course Name	Ecology and Biodiversity-Lab		L	T	P	Credits
3. Course Code	17040706		0	0	4	2

4. Type of Course (use tick mark)		Core ()	DSE (✓)	SEC ()		
5. Pre-requisite (if any)	10+2	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical.

Lectures = Nil	Tutorials = Nil	Practical = 52

8. Course Description:

This Course will introduce the students to the basic concept of Ecology and Biodiversity. This course will also give a platform to develop different methods to study population size of an individual organism along with biodiversity survey and conservation.

9. Course Objectives:

The objectives of this course are:

1. To study plant community ecology ecosystem.
2. To learn concepts of biodiversity pattern and value of biodiversity.
3. To describe the methods to study population size, frequency and density.
4. To know about the working of organizations for wildlife conservation

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able:

1. To demonstrate fieldwork skills like species identification and ecological survey.
2. To explain the distribution and abundance of different plant species in any region.
3. To evaluate the relationship/interactions among the different species.
4. To know about the role of wildlife and ground problems in the protection of local and national wildlife.

11. List of Experiments

1. Determination of minimum size of quadrat for community study.
2. To determine the frequency and density of species in a given area.
3. Estimation of chlorophyll content in plant samples.
4. Estimation of organic carbon content in plants.
5. Estimation of Protein content in plants.
6. To study the biodiversity present on campus.

7. To determine diversity indices in a given area
8. Study of major National parks, Biosphere reserves and Wildlife Sanctuaries and their Flora and Fauna.
9. Biodiversity Photography: Field work
10.   Case study of the reintroduction of wild animals.
12. Books Recommended
1.   Fundamentals of Ecology by Eugene P. Odum, Gary W. Barrett - Publisher : Cengage (5 edition), ISBN: 9780534420666 2.   Ecology and Field Biology by R.L Smith , Publisher: Benjamin Cummings ISBN-10 : 0321042905 3.   Global Biodiversity: Volume 2: Selected Countries in Europe by Apple Academic Press, ISBN: 9781771887175 4.   Ecology of Natural Resources by Francois Ramade,Publisher : John Wiley & Sons Inc ISBN 9780471901044

1. Name of the Department: Environmental Science						
2. Course Name	Air and Noise Pollution	L	T		P	Credits
3. Course Code	17040707	4	0		0	4
4. Type of Course (use tick mark)		Core ()	DSE (✓)		SEC ()	
5. Pre-requisite (if any)	10+2	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 15 weeks of one semester)

Lectures = 52	Tutorials = Nil	Practical = Nil

8. Course Description:

Atmospheric Pollution and control is based on the information about different processes in Atmospheric chemistry in relation to gases and particulate matter. This course will cover basic concepts in atmospheric chemistry and noise pollution. It also covers the detail knowledge related to effect of human activities on the natural atmospheric properties. Also the health effects and control measures for air and noise pollution are studied.

9. Course Objectives:

1. To describe the structure, photochemistry and chemical processes existing in the atmosphere.

2. To understand the concepts and unifying features of atmospheric chemistry.

3. To know about causes, effects and control measures of gaseous and particulate pollutants.

4. To understand the sources and harmful impacts of noise pollution on humans and other organisms.

10. Course Outcomes (COs):

Upon successful completion of this course the student will be able,
1. To apply the concepts and unifying features of atmospheric chemistry.

2. To understand the interconnections between different layers of atmosphere and their importance.

3. To understand the effect of human activities on the natural atmosphere.

4. To understand estimation methods of different air pollutants.

5. To know about the different sound indices and control measures for noise pollution.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Air Pollution and its effects

Air pollution: composition and structure of atmosphere, global implications of air pollution. Sources and Classification of air pollutants, Indoor air pollution, Effects of air pollutants on humans, animals, property and plants, Case Studies.

Unit – 2	Number of lectures = 13	Dispersion of pollutants

Meteorological aspects of air pollution dispersion; lapse rate, inversion and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

Unit – 3	Number of lectures = 13	Air pollution control devices

Ambient air quality standards, Ambient air sampling: gaseous and particulate pollutants, stack sampling, IOT based monitoring systems, Control devices for particulate and gaseous contaminants: gravitational settling chambers, cyclone separators, wet scrubbers, fabric filters (Bag-house filter), Electrostatic precipitators (ESP), Catalytic converters.

Unit – 4	Number of lectures = 13	Noise pollution

Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; effects of noise on humans, noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

12.	Brief Description of self learning / E-learning component
	1. http://acmg.seas.harvard.edu/people/faculty/djj/book/powerpoints/index.html
	2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-84j-atmospheric-chemistry-fall-2013/lecture-notes/
13.	**Books Recommended**

1. Industrial Noise Control: Fundamentals And Applications, 2Nd Edition by H. Bell; Douglas H. Bell Publisher : T&F India, ISBN : 9781138583191
2. Introduction to Environmental Engineering and Science (3rd Edition) by Gilbert M. Masters; Wendell P. Ela Publication : Pearson, ISBN : 9780131481930
3. Introduction to Atmospheric Chemistry, Daniel J. Jacob, Publisher: Cambridge University Press, ISBN-13: 978-0521778008
4. Air Pollution: Its Origin and Control.3rd Edition, Kenneth Wark and C F Warner, Publisher : Pearson; ISBN-13 : 978-0673994165
5. Air Pollution Control Engineering. Ist Edition by Rao and Rao, Publisher : McGraw Hill Education
6. ISBN-13 : 978-0074518717

1. Name of the Department: Environmental Science						
2.Course Name	Air and Noise Pollution- Lab	L	T	P	Credits	
3.Course Code	17040708	0	0	4	2	
4.Type of Course (use tick mark)		Core ()	DSE (✓)		SEC ()	
5.Pre-requisite (if any)	10+2	6.Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical.

Lectures = Nil	Tutorials = Nil	Practical = 52

8.Course Description:

This Course will introduce the students to understand the principle and working of different instruments used for air quality assessment. To know properties of different pollutants and their sampling methodology. To understand the residence and transport of pollutants in atmosphere.

9.Course Objectives:

The objectives of this course are:

1. To know the concentration of Particulate Matter in air.
2. To acquaint with NO_2 measurement procedure.
3. To acquaint with SO_2 measurement procedure.
4. To get familiar with stack monitoring procedure.
5. To understand procedure of noise measurement using Noise level meter.

10.Course Outcomes (COs):

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

1. Use different instruments for air quality assessment.
2. Analyze various parameters for air quality assessment like concentration of NO_2, SO_2, CO, PM etc.
3. Explain the sources of different types air pollutants.
4. Understand the working and applications of Sound level meter.

11.List of Experiments

1. Determination of respirable suspended particulate matter (RSPM) in ambient air quality.
2. Determination of NO_2 concentration in ambient air quality.
3. Determination of SO_2 concentration in ambient air quality.
4. Study of ambient noise level.
5. Stack monitoring and analysis of different pollutants.
6. Determination of Carbon Monoxide.
7. To compare the pollution level of different location.
8. Indoor air quality monitoring of campus.
9. To study the occupational health effects of air pollution: case study/survey.

10. To study the occupational health effects of noise pollution: case study/survey.
12.Books Recommended
1. Air pollution by Rao & Rao, Publisher : McGraw Hill Education ISBN-13 : 978-0074518717
2. National Ambient Air Quality Series: Central Pollution Control Board

1. Name of the Department: Forensic Science							
2. Course Name	Forensic Engineering		**L**	**T**		**P**	
3. Course Code	17040801		4	0		0	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)			SEC ( )	
5. Pre-requisite (if any)	10+2 with Science stream	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )		Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical							
Lectures = 52		Tutorials = 00			Practical = 00		

8. Course Description

This is a Domain Specialization Elective (DSE) course and deals with the investigation of products, materials, structures and components that either fail or function inappropriately causing huge loss to person(s) and property. This course provides students the knowledge of basic concepts of forensic engineering including analysis of system failure.

9. Course Objectives

The objectives of this course are to:
1. To introduce the students to basic concept of forensic engineering.
2. To learn the process of investigation in system failure.
3. To learn about the type of evidences relevant to the system failure.
4. To learn about the forensic analysis of different material causing system failure.

10. Course Outcomes (COs)

Upon successful completion of this course, the students will able to

1. Gain disciplinary knowledge of different type of system failure analysis
2. Develop critical thinking about the causes of system failure, their types, evidence collection and their analysis
3. Enhance their analytical and investigative skills especially in cases of building collapse, fire, transportation accidents.
4. Become familiar different types of analytical techniques used in forensic examination of building material.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Introduction to forensic engineering

Introduction to Forensic Engineering; Fire investigation; Industrial accidents; Traffic accident reconstruction; Transportation disaster investigation; Civil engineering investigation; Investigation report. Structural failures, static loads, dynamic loads, causes of building collapse

Unit - 2	Number of lectures = 13	Title of the unit: Cement, Glass and paints

Building Materials: Types of cement and their composition, other mixing material, Analysis of Bitumen and road material, Analysis of cement mortar and cement concrete and stones, Glass: 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.

Unit – 3	Number of lectures = 13	Title of the unit: Soil and fabric

Soil: Importance, location, collection and comparison of soil samples, Forensic examination of soil, Interpretation of soil evidence.

Paints: Types of paint and their composition, collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases, Forensic examination of paints Interpretation of paint evidence.

Fiber analysis: Forensic significance, Classification, Fabric characteristics, Microscopy characteristic, Birefringence, Fluorescence Microscopy, Colors in textile, Color Assessment, Chemical properties

Unit – 4	Number of lectures = 13	Title of the unit: Tool Marks and Miscellaneous Clue Materials

Tool Marks: Types of tool marks, Class characteristics and individual characteristics, Lifting of tool marks, Examination, Miscellaneous Clue Materials- Examination of strings/ropes, Wires/cables, Seals, Counterfeit coins

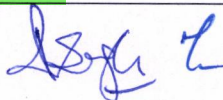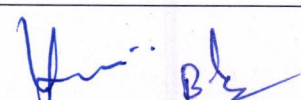## 12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=I0drf6ZGxXQ
2. https://www.youtube.com/watch?v=_6WWV500q9E
3. https://www.youtube.com/watch?v=I0drf6ZGxXQ
4. https://www.youtube.com/watch?v=-TAGgskF-JE
5. https://www.youtube.com/watch?v=lZSbczLjoc8
6. https://www.youtube.com/watch?v=vIKzKuy8Duo
7. https://www.youtube.com/watch?v=AQqo_gpx65c
8. https://www.youtube.com/watch?v=6mrZhEDyys4

13. Books Recommended

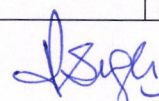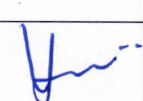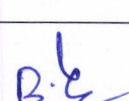1. B.S.Neale, Forensic engineering: the investigation of failures. Thomas Telford, London, 2001.
2. Forensic Paint Analysis and Comparison Guidelines
3. Robertson J, Roux C, Wiggin GK, Grieve M. Forensic Examination of Fibre s(2nd Edn). CRC Press, 1999.
4. Noon RK. Forensic Engineering Investigation (2nd Edn). CRC Press, 2000.
5. Van Kirk DJ. Vehicular Accident investigation and reconstruction. CRC Press, 2000.
6. JA Siegel, P.J Saukko. Encyclopedia of Forensic Sciences (Vol. I, II and III). Academic Press, 2000.
7. Sharma BR. Forensic Science in Criminal Investigation and Trials. Central Law Agency, Allahabad, 1974.
8. Saferstein R. Criminalistics, Prentice Hall Inc. USA, 2000.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Engineering Lab	**L**	**T**	**P**		
3. Course Code	17040802	0	0	4		
4. Type of Course (use tick mark)		Core ()	DSE (✓)		SEC ()	
5. Pre-requisite (if any)	10+2 with Science stream	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practicals

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description

This is a Domain Specialization Elective (DSE) course and provides a practical exposure about the different types of physical evidences occur at the scene of building collapse, accidental sites etc.

9. Course Objectives

The objectives of this course are to:
1. To introduce students about the importance of physical evidences in system failure analysis.
2. To learn the physical examination of paint chips, soil, fabric and Glass.
3. To develop the analytical skills in students
4. To develop critical thinking about the different situation which can lead to a system failure.

10. Course Outcomes (COs)

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

1. Investigate and explain the real time forensic issues in legal and social context.
2. Precisely hypothesize and reconstruct the events surrounding a crime scene
3. Critical thinking and problem solving during investigation of real life cases.
4. Develop analytical and scientific reasoning related to different physical evidences.

11. List of experiments

1. To conduct Visual examination of soil sample
2. To Determination of soil density by density gradient tube techniques.
3. To conduct Comparison of different Soil samples
4. To conduct Macroscopic and microscopic comparison of paint chips.
5. To study Comparison of glass using density gradient method.
6. To Study of different types of fabric material
7. To conduct Analysis of fabric material
8. To study Comparison of Bangle pieces.
9. To compare paint samples by physical matching method.
10. To compare paint samples by thin layer chromatography method.
11. To conduct Analysis of building material by setting time (cement)

12. Books Recommended:

1. DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science				
2. Course Name	Analytical Laboratory Techniques and Quality Management	**L**	**T**	**P**
3. Course Code	17040803	4	0	0
4. Type of Course (use tick mark)	Core ( )	DSE (✓)		SEC ( )
5. Pre-requisite (if any)	10+2 with Science	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical

Lectures = 52	Tutorials = 00	Practical = 00

8. Course Description

This course provides students the knowledge of different Laboratory Analytical Techniques along with their forensic applications. Introduction to Quality Management, Quality Audit will be explained. Organizations involved in setting guidelines and maintaining quality system will be described.

9. Course Objectives

The objectives of this course are to:
1. Analyze theoretical basics of Advanced Analytical Techniques.
2. Describe concepts of different molecular biological techniques.
3. Introduce fundamentals of Quality management.
4. Explain functioning of organizations like NABL, ILAC, APLAC, ASCLD, ISO-IEC, BIS.

10. Course Outcomes (COs)

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

1. Gain disciplinary knowledge of different categories of Analytical Instruments.
2. Develop analytical skills for the different categories of Analytical Instruments.
3. Develop research ethics in interpretation of results obtained from different analytical techniques.
4. Develop ethics in quality managing system.

11. Unit wise detailed content

Unit-1	Number of lectures = 13	Title of the unit: Advanced Analytical Techniques

Principle, Instrumentation and Applications of Raman Spectroscopy, Nuclear Magnetic Resonance (NMR). X-ray Diffraction (XRD) and X-Ray Fluorescence (XRF). Fourier transform infrared spectrometry (FTIR) advantages, instrumentation qualitative and quantitative applications, interpretation of Infrared (IR) spectra.

Unit - 2	Number of lectures = 13	Title of the unit: Molecular Biology Techniques

ELISA, Principle, Instrumentation and Applications: Agarose Gel Electrophoresis, SDS-PAGE, Pulse field gel electrophoresis system. Principle, steps, types, components and application of PCR.

Unit – 3	Number of lectures = 13	Title of the unit: Introduction to Quality Management System

Quality – vision, mission and policy statements, Definition of Accreditation, Benefits of Accreditation, Quality Management System, Quality Manual, Quality Manager. Quality Assurance, Quality Control, Quality Planning. Quality Audit/Internal Audits. Quality Control tools.

Unit – 4	Number of lectures = 13	Title of the unit: Organizations involved in setting guidelines and maintaining quality system

National Accreditation Board for Testing and Calibration Laboratories (NABL), International Laboratory Accreditation Co-operation (ILAC), Asia Pacific Laboratory Accreditation Co-operation (APLAC). American Society of Crime Laboratory Directors (ASCLD), International Organization for Standardization (ISO), Bureau of Indian Standards (BIS).

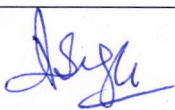## 12. Brief Description of self-learning / E-learning component

1. https://www.youtube.com/watch?v=g5voLRKi4fA
2. https://www.youtube.com/watch?v=PSJTBwh35jk
3. https://www.youtube.com/watch?v=FX-NiPVsYPM
4. https://www.youtube.com/watch?v=45hjG3QwTNQ
5. https://www.youtube.com/watch?v=AWDWamCH_ls
6. https://www.youtube.com/watch?v=wXvET5RTMxQ
7. https://www.youtube.com/watch?v=DVv2F0KiD8w
8. https://www.youtube.com/watch?v=76rLqg9BJro
9. https://www.youtube.com/watch?v=1hGiptAhSr4
10. https://www.youtube.com/watch?v=d5O1Iu1ZINA
11. https://www.youtube.com/watch?v=PnHaca_08vY
12. https://www.youtube.com/watch?v=g-OwCpoGXxg
13. https://www.youtube.com/watch?v=b5ZrDy0l5wk
14. https://www.studocu.com/en-au/document/griffith-university/forensic-lab-accred-qual-sys/lecture-notes/forensic-lab-accred-and-qual-sys-exam-notes/1293870/view
15. https://www.in.gov/isp/labs/files/Lab_QA_Manual_03-16-16.pdf
16. https://epic.org/state-policy/foia/dna-software/18-Quality-Manual-071615-Rev-16.pdf

13. Books Recommended

1. James W. Robinson, Eileen Skelly Frame, George M. Frame II. Undergraduate Instrumental Analysis (7th Edn). CRC Press, 2014.
2. Settle FA. Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.
3. Sue Jickells, Adam Negrusz. Clarke's Analytical Forensic Toxicology. Pharmaceutical Press, 2008.
4. Robinson JW. Atomic Spectroscopy (2nd Edn). Marcel Dekkar, Inc, New York, 1996.
5. Willard HH, Lynne L. Merrett, J. Dean, A. Frank, A. Settle. Instrumental Methods of Analysis (7th Edn). CBS pub. & Distributors, New Delhi, 1988.
6. Khandpur RS. Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co. New Delhi, 2004.
7. Thomson KC, Renolds RJ. Atomic Absorption Fluorescence & Flame Emission Spectroscopy: A Practical Approach (2nd Edn). Charles Griffith & Company, New South Wales, 1978.
8. Hobart Willard. Instrumental Methods of Analysis. Wadsworth Publishing Company, 1988.
9. Douglas Skoog, James Holler, Stanley Crouch. Principles of Instrumental Analysis (7th Edn). Cengage Learning, 2017.
10. Skoog & Lerry, Instrumental Methods of Analysis, Saunders College Publications, New York
11. G.R Chatwal, S.K Anand. Instrumental Methods of Chemical Analysis. Himalaya Publ. House, 2004.
12. G.R Chatwal. Analytical Spectroscopy (2nd Edition). Himalaya Publishing House, 2002.
13. NABL - Guide for Internal audit and Management Review for Laboratories.
14. Manuals of DFSS.

1. Name of the Department: Forensic Science					
2. Course Name	Analytical Laboratory Techniques and Quality Management Lab	**L**	**T**	**P**	
3. Course Code	17040804	0	0	4	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)	SEC ( )	
5. Pre-requisite (if any)	10+2 with Science	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( ) / Every Sem ( )

7. Total Number of Lectures, Tutorials, Practical

Lectures = 00	Tutorials = 00	Practical = 52

8. Course Description:

In this course, theoretical basics of analytical techniques will be explained. Introduction to forensic quality management system, quality audit will also be explained. Organizations involved in setting guidelines and maintaining quality system will be described.

9. Course Objectives

The objectives of this course are to:
1. Analyze theoretical basics of Advanced Analytical Techniques.
2. Describe concepts of different molecular biological techniques.
3. Introduce fundamentals of Quality management.
4. Explain functioning of organizations like NABL, ILAC, APLAC, ASCLD, ISO-IEC and BIS.

10. Course Outcomes (COs)

Upon successful completion of this course, the students will be able to:
1. Gain disciplinary knowledge of different categories of analytical Instruments.
2. Enhance their analytical skills for the different categories of analytical Instruments.
3. Develop and maintain research ethics in interpretation of results obtained from different analytical techniques.
4. Develop ethics with respect to quality management of systems.

11. List of Experiments

1. To perform drug testing by TLC.
2. To compare paint samples by GC.
3. To carry out sample preparation and testing by HPLC
4. To carry out sample preparation and testing by FTIR.
5. To perform Agarose Gel Electrophoresis.
6. To prepare a report on working procedure of National Accreditation Board for Testing and Calibration Laboratories.
7. To prepare a case study on different parameters of certification of International Organization for Standardization (ISO).
8. To study about American Society of Crime Laboratory Directors (ASCLD).

13. Books Recommended

1. NABL - Guide for Internal audit and Management Review for Laboratories.
2. Manuals of DFSS.

1. Name of the Department: Environmental Science						
2. Course Name	Soil and water pollution		L	T	P	Credits
3. Course Code	17040805		4	0	0	4
4. Type of Course (use tick mark)		Core()	DSE(✓)		SEC()	
5. Pre-requisite (if any)	10+2	6.Frequency (use tick marks)	Even (✓)	Odd ()	Either Sem ()	Every Sem()

7. Total Number of Lectures, Tutorials, Practical (assuming 15 weeks of one semester)

Lectures=52	Tutorials=Nil	Practical=Nil

8. Course Description:

The course mainly covers the soil and water pollution problems and solution. This covers the topics like soil profile, physic-chemical properties of soil, soil pollution and remediation of contaminated soil. It also includes solid waste and its management using different methods such sanitary land-filling, recycling, composting, vermin-composting, incineration, energy recovery from organic waste etc. This also aware students about the various factors affecting the physicochemical properties of water and different treatment methods for industrial and domestic waste water.

9. Course Objectives:

The objectives of this course are:

1. To learn the basic concepts of soil formation and important physic-chemical properties.

2. To know about the remedial measures for soil pollution.

3. To provide knowledge about the different methods of solid waste management.

4. To develop understanding of water quality criteria and standard.

5. To describe the waste water treatment processes.

10. Course Outcomes(COs):

Upon successful completion of this course, the student will be able:

1. To know about the various physicochemical properties of soil and major sources of soil pollution.

2. To understand and apply the concept of solid waste management to minimize the adverse effects.

3. To be familiar with relationships between inappropriate waste management practices and their impacts on water and soil.

4. To develop an integrated perspective on water resources and water quality management.

5. To understand the different waste water treatment methodologies.

11. Unitwisedetailedcontent

Unit-1	Number of lectures=13	Soil formation and properties

Soil Formation: Process, Factors, Soil profile, Types of soils, Physicochemical and biological properties of soil, Soil pollution: Types and major sources of soil pollutants, effects of soil pollutants on environment, remedial measures for soil pollution.

Unit– 2	Number of lectures=13	Solid waste and its management

Solid waste: Sources, classification & composition. Solid Waste Management-Sanitary land-filling, Recycling, Composting, Vermi-composting, Incineration, Energy recovery from organic waste-Gasification, Liquification and Pyrolysis, Waste minimization technologies, HazardousWasteand its

Management

Unit– 3	Number of lectures=13	Water properties and resources

Physico-chemical and biological properties of fresh water, Hydrological cycle, Solubility of gases in water, carbonate system, Water management strategies: Rain water harvesting, Recharging of ground water, Water quality standards.

Unit– 4	Number of lectures=13	Water pollution

Water pollution: Sources, causes and effects, Characteristics of domestic, industrial and agricultural waste water, Marine pollution, Thermal pollution. Primary, secondary, tertiary & advance treatment of waste water, Wastewater treatment technologies, Bioremediation, Water borne diseases.

12. Brief Description of self learning/E-learning component

1. https://www.environmentalpollutioncenters.org/soil/
2. https://www.springer.com/journal/11270
3. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000014ER/P000280/M026065/ET/1520505536paper10_module25_etext.pdf

13. Books Suggested:

1. Introduction to Soil Microbiology by. Alexander, M., Publisher: John Wiley & Sons, ISBN-13 : 978-0471021797
2. Fundamentals of Soil Ecology by Coleman and Crossley, Academic Press, ISBN 9780121797263.
3. Soil Ecology, Killham, K.,Cambridge University Press, ISBN: 9780511623363
4. Environmental chemistry by G.S.Sodhi, ISBN-13 : 978-1842650127
5. Introduction to environmental engineering and science - Gilbert Masters, Publisher: Pearson, ISBN-10:0134830660
6. Water supply engineering by S.K. Garg, Publisher: Khanna, ISBN-13 : 978-8174091208

1. Name of the Department: Environmental Science							
2. Course Name	Soil and water pollution -Lab		**L**	**T**		**P**	**Credits**
3. Course Code	17040806		0	0		4	2
4. Type of Course (use tick mark)		Core()	DSE(✓)			SEC()	
5. Pre-requisite(if any)	10+2.	**6.** Frequency(use tick marks)	Even (✓)	Odd()		Either Sem()	Every Sem()

7. TotalNumberofLectures,Tutorials,Practical(assuming15weeksofonesemester)

Lectures=Nil	Tutorials=Nil	Practical=52

8. Course Description:

This Course will introduce the students to the basic concept of water pollution and chemistry. This course will also give a platform to develop different methods to study to various samples of water from various sources. This Course will also introduce the students to understand the basic chemistry of the soil. To know the methodology for analysis of basic physico-chemical properties of soil. To understand the solid waste and its environmental implications.

9. Course Objectives:

The objectives of this course are:

1. To explain the process of composting/ Vermi-composting/landfill.
2. To determine DO, BOD, COD of wastewater.
3. To compare physio-chemical properties of polluted and non-polluted soil.
4. To measure specific gravity and moisture content of soil.

10. Course Outcomes(COs):

Upon successful completion of this course, the student will be able:

1. To understand the physio-chemical properties of soil.
2. To understand the physio-chemical properties of water.
3. To be familiar with composting/vermicomposting/landfill sites.
4. To understand the process of waste water treatment.

11. List of Experiments

1. A visit to composting/vermicomposting/sanitary landfill site and report writing.
2. A visit to nearby STP/ETP to understand operation and report writing on process of water/effluent treatment.
3. To study the Soil profile and determination of moisture content of the soil.
4. Determination of pH and Electrical Conductivity of Soil and Water sample.
5. Determination of hardness of water sample.
6. Determination of the alkalinity of water sample.
7. Estimation of Dissolved Oxygen of water sample.
8. Estimation of Biological oxygen Demand of wastewater.
9. Estimation of Chemical oxygen demand of wastewater.
10. To determine organic carbon content in soil sample.

Brief Description of self learning/E-learning component
1. https://www.environmentalpollutioncenters.org/soil/
2. https://www.springer.com/journal/11270
3. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000014ER/P000280/M026065/ET/1520505536paper10_module25_etext.pdf

Books Suggested:
1. Introduction to Soil Microbiology by.Alexander, M., Publisher: John Wiley & Sons, ISBN-13 : 978-0471021797
2. Fundamentals of Soil Ecology by Coleman and Crossley, Academic Press, ISBN 9780121797263.
3. Soil Ecology, Killham, K.,Cambridge University Press, ISBN: 9780511623363
4. Environmental chemistry by G.S.Sodhi, ISBN-13 : 978-1842650127
5. Introduction to environmental engineering and science - Gilbert Masters, Publisher: Pearson, ISBN-10:0134830660
Water supply engineering by S.K. Garg, Publisher: Khanna, ISBN-13 : 978-8174091208

1. Name of the Department: Environmental Science					
2. Course Name	EIA and Sustainable development	**L**	**T**	**P**	**Credits**
3. Course Code	17040807	4	0	0	4

4. Type of Course (use tick mark)	Core ()	DSE (✓)		SEC ()	

5. Pre-requisite(if any)	10+2	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical (assuming 15 weeks)

Lectures = 52	Tutorials = Nil	Practical = Nil

8. Course Description:

This course will introduce students to the concept of environmental impacts assessment and its importance. It also help students in understanding the various methodologies and guidelines of EIA in details. This course also covers the different stages of EIA, criteria and standards for the environmental impact assessment and provides the alternates and mitigation measures to reduce the adverse impacts of developmental projects on environment. Last two units of this course covers the topics such as Principles and emergence of the concept of Sustainable Development, Resource degradation, social insecurity, and Role of developed countries in the sustainable development of developing countries.

9. Course Objectives:

The objectives of this course are:

1. To acquaint students about the concept and basic process of environmental impact assessment.

2. To develop critical awareness among students about the factors affecting the EIA process.

3. To describe the EIA methodologies and risk assessment process.

4. To know the principle of sustainable development.

5. To understand the future aspect of sustainability.

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able:

1. To identify the environmental attributes to be considered for the EIA study.
2. To formulate objectives of the EIA studies.
3. To identify the methodology to prepare rapid EIA.
4. To prepare EIA reports and environmental management plans.
5. To get basic knowledge about concept of sustainable development.

Unit wise detailed content

Unit-1	Number of lectures = 13	Introduction to EIA Concept

Nature and purpose of Environment impact assessment, Environmental impact statement and Environmental management plan, EIA notification 1994, 2006 & 2020. EIA checklist, ISO14000 and Life cycles Assessment. Environmental clearance, Composition of EAC & SEAC.

Unit – 2	Number of lectures = 13	Process and Methods of EIA:

EIA methodology: Screening, Scoping, Alternatives, Base-line data, Impact Identification, Impact prediction, evaluation and mitigation. Criteria and standards for assessing significant Impact. Cost- Benefit Analysis and evaluation of Environmental Impacts. Public Participation, presentation and review. EIA monitoring and auditing.

Unit – 3	Number of lectures = 13	Concept of Sustainability

Sustainable Development: Concept, principles and indicators, SDGs, Agenda for Future Global Sustainable Development: Role of developed countries in the sustainable development of developing countries, Demographic dynamics and sustainability, Integrated approach for resource protection and management.

Unit – 4	Number of lectures = 13	Approaches for Sustainable Development

Environmental accounting for sustainable development, Clean development mechanism and carbon trading, Green building concept, Linkages between population, poverty and environment, Role of public in sustainable development, National Environment Policy 2006, Recent initiatives of renewable energy by Government of India,

11. Brief Description of self-learning / E-learning component

1. https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/Teachers_Manual/Teacher_manual_master_EIA.pdf
2. https://www.iitr.ac.in
3. https://www.sdgindex.org/reports/sustainable-development-report-2021/
4. https://www.un.org/sustainabledevelopment/progress-report/

12. Books Recommended

1. Environmental Impact Assessment by John Glasson, Publisher: Routledge, ISBN 9781138600744.
2. Methods of Environmental Impact Assessment by Morris and the rivel. Publisher: Routledge, ISBN: 9781134107988
3. Environmental Impact Assessment by L. W. Canter, Publisher: McGraw-Hill Higher Education; 2nd edition, ISBN-13 : 978-0070097674
4. The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., Publishers: New Society, ISBN-13 : 978-0865715318
5. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by TERI for MoEF, 2011.
6. Report of the Department for Policy Coordination and Sustainable Development (DPCSD), United Nations Division for Sustainable Development.

1. Name of the Department: Environmental Sciences						

2. Course Name	EIA and Sustainable Development-Lab	L	T		P	Credits
3. Course Code	17040808	0	0		4	2

4. Type of Course (use tick mark)		Core ()	DSE (✓)	SEC ()		
5. Pre-requisite (if any)	10+2	6. Frequency (use tick marks)	Even (✓)	Odd ()	Either Sem ()	Every Sem ()

7. Total Number of Lectures, Tutorials, Practical.

Lectures = Nil	Tutorials = Nil	Practical = 52

8. Course Description:

This Course will introduce the students to the basic concept of EIA, EIS, regulatory authorities in India related to projects. The part of Sustainable Development will enable students to understand the importance of natural resources and the need for their conservation. This course will also give a platform to develop knowledge about the requirements, check lists, process and time need for decision making in proceedings of any projects.

9. Course Objectives:

The objectives of this course are:

1. To study EIA notifications and amendments time to time.
2. To learn concepts of EIA and the process.
3. To understand the concept of Sustainable Development
4. To acquaint students about the process of EIA through Case studies.

10. Course Outcomes (COs):

Upon successful completion of this course, the student will be able:

1. Identify the factors affecting the EIA Process.

2. Prepare the EIA report of different projects.

3. Demonstrate the methods for carrying out impact assessment method

4. Develop the strategies to conserve natural resources

11. List of Experiments

1. EIA case study of Mining Project
2. EIA case study of Thermal Power Project
3. EIA case study of Township Project
4. Public Hearing of EIA- Documents and Process
5. United Nations and Sustainable Development
6. Sustainable Development- Case Study
7. To study the star rating of electronic appliances and energy conservation.
8. To make the energy audit of a residential building.
9. To determine the carbon footprint of a project.
10. To determine the carbon sequestration by trees.

12. Books Recommended

1. Environmental Impact Assessment by John Glasson, Publisher: Routledge, ISBN 9781138600744.
2. Methods of Environmental Impact Assessment by Morris and the rivel. Publisher: Routledge, ISBN: 9781134107988
3. Environmental Impact Assessment by L. W. Canter, Publisher: McGraw-Hill Higher Education; 2nd edition, ISBN-13 : 978-0070097674
4. The Sustainability Revolution: Portrait of a Paradigm Shift by Edwards, Andres R., Publishers: New Society, ISBN-13 : 978-0865715318