DEPARTMENT OF FORENSIC SCIENCE

About the Department

The Department of Forensic Science was established in 2019 to teach the next generation about forensic science. Our department's vision is achieved through imparting quality education to students. Our faculty puts forth the best possible efforts to ensure that the students gain the proper technical skills along with life skills that help them face the world confidently and with high self-esteem. Because the Institute has been granted autonomous status by the UGC, necessary and required changes to the OBE curriculum have been made after due revisions and monitoring by experts. The department has dedicated, motivated, and devoted faculty with a passion for teaching. The faculty is committed to enriching their skills through continual higher education and research. The department conducts seminars, workshops, conferences, and faculty development programmes for faculty advancement. More innovative methods of teaching and learning have been developed and implemented. The overall strength of the department is 240 students in a three-year pattern with six faculties and well-equipped forensic laboratory equipment.

PRINCIPAL

Dr. P. Balagurusamy, M.A., M.Phil. M.Ed., P.G.D.C.A., Ph.D.,

STAFF

1.	**Mr. Krushna Sharad Sonawane., M.Sc.**	**-**	**Assistant Professor and Head**
2.	**Mr. Sumit Vikram Sarwade., M.Sc.**	**-**	**Assistant Professor**
3.	**Ms. Soumya Abraham., M.Sc.**	**-**	**Assistant Professor**
4.	**Ms. Haneena Haneef., M.Sc.**	**-**	**Assistant Professor**
5.	**Ms. Leena Ramdas Dhakate., M.Sc.**	**-**	**Assistant Professor**
6.	**Mr. Naveenkumar Thatikunta., M.Sc.**	**-**	**Assistant Professor**
7.	**Ms. Emily Shammy., M.Sc.**	**-**	**Assistant Professor**

Under Choice Based Credit System (CBCS)

Under Graduate Courses

Course Pattern for B. Sc Forensic Science

The Under graduate degree course consists of five vital components. They are as follows:

Part I Language (Tamil / French)

Part II English

Part III Core Course (Theory, Practical, Electives, Allied, Project and Internship).

Part IV Skill Based, Non Major Electives, Environmental Studies, Value Education and Self Study

Part V Physical Education (Non Semester) and Extension Activities.

Objectives

The Syllabus for **B. Sc Forensic Science** Programme under semester system has been designed on the basis of Choice Based Credit System (CBCS), which would focus on job oriented programmes and value added education. It will come into effect from June 2020 onwards.

Eligibility

Candidates should have passed the Higher Secondary Examination, Government of Tamil Nadu or any other examination accepted by the syndicate of Madurai Kamaraj University as equivalent there to.

Duration of the Course

The students who join the **B. Sc Forensic Science** Programme shall undergo a study period of three academic years – Six semesters.

SUMMARY OF HOURS AND CREDITS

Part	Semester	Specification	No. of Courses	Hrs	Credits	Total
I	**I - IV**	**Languages (Tamil / French)**	4	24	12	**12**
II	**I - IV**	**English**	4	24	12	**12**
III	**I – VI**	**Core Courses** Theory Practical Allied Electives Project	 18 6 4 2 1	 63 21 16 8 8	 54 18 16 8 6	**102**
IV	**I & II**	**Non Major Elective Courses**	2	4	4	**20**
	I & II	**1. Value Education 2. Environment and Gender Studies**	2	4	4	
	III - VI	**Skill Based Courses**	4	8	8	
	III & IV	**Self Study Courses (Soft Skills I & Soft Skills II)**	2	-	4	
V	**II**	**Physical Education - Practical (Non-Semester Course)**	1	-	2	**4**
	IV	**Extension Activities**	1		2	
		Total	**50**	**180**	**150**	**150**

Programme Specific Outcomes
The students at the completion of the programme will be able to

PSO1: Organize and develop the knowledge about various domains of Forensic Science, importance of allied subjects, various organizations running across the globe in Forensic Science and their key role in Forensic Science.

PSO2: Apply the professional ethics, values, principle; of forensic science to solve the crimes and Develop the new research tools in drawing a solutions and suggestions to the existing problems in the society by the use of Forensic Science.

PSO3: Employ and execute the real time remedial measures to the crime investigation and legal need using forensic science knowledge.

PSO4: Apply the ethical principles and commit to professional ethics through skill in digital literacy, communication and field work.

PSO5: Analyze the current scenario about the crime, lacunas in the investigation and find the remedial measures in order to bring the quality, speed, truthiness, in the investigation process as a trained professional Forensic expert/ scientist. Incorporate the acquired Forensic knowledge and techniques in the field of crime investigation.

PSO6: Gain the knowledge about crime, historical perspective, and its classification, importance of criminology, penal laws and Criminal Justice System from Forensics viewpoint.

PSO7: Apply, develop and demonstrate the competency in the various investigation techniques including recognition, collection, identification, presentation and documentation of physical evidences countered in various crimes.

PSO8: Integrate with new research techniques and methodology through application of statistical package that will enhance the professional knowledge, highest excellence in the field of Forensic Science.

PSO9: Gaining knowledge of grammatical conventions, varieties, formulations, courses and culture. Becoming competent to face competitive examinations through development of language skills.

PSO10: Understand roles and responsibilities in society and apply professional ethics, accountability and equity.

PSO11: Reenact and make use Forensic Protocols or hub within realistic social and environmental aspects with values, ethics and equity to transform the knowledge and skills to the community.

PSO12: Organize and develop enthusiasm for self-improvement through continuous professional development and lifelong learning.

Course Pattern – From 2020-2021 Batch

Sem.	Part	Study Component	Course Code	Course Title	Hrs.	Credit
I	I	Tamil 1	20UTAL11	jw;fhy ftpijAk; rpWfijAk;	6	3
	II	English 1	20UENL11	English Language Through Literature - I	6	3
	III	Core Course I	20UFSC11	Introduction to Forensic Science	4	3
		Core Course II	20UFSC12	Indian Penal Code	3	3
		Core Practical I	20UFSC1P	Elementary Computer Science	3	3
		Allied Course I	20UFSA11	Basic Physics	4	4
	IV	Non Major Elective Course I	20UFSN11	Forensic Science	2	2
		Value Education	20UVEV11	Value Education	2	2
				Total	**30**	**24**
II	I	Tamil II	20UTAL21	gfjp ,yf;fpaKk; GjpdKk;	6	3
	II	English II	20UENL21	English Language Through Literature - II	6	3
	III	Core Course III	20UFSC21	Basics of Forensic Science	4	3
		Core Course IV	20UFSC22	Forensic Psychology	3	3
		Core Course V	20UFSC23	Police Investigation and Administration	3	3
		Allied Course II	20UFSA21	Allied Physical Chemistry	4	4
	IV	Non Major Elective Course II	20UFSN21	Emerging Trends in Forensic Science	2	2
		Environment and Gender Studies	20UEGS21	Environment and GenderStudies	2	2
	V	Physical Education Practical	20UPEV2P	Physical Education Practical (NonSemester Course)	-	2
				Total	**30**	**26**
	I	Tamil III	20UTAL31	fhg;gpa ,yf;fpaKk; ciueilAk;	6	3
	II	English III	20UENL31	English Language Through Literature - II	6	3
		Core Course VI	20UFSC31	Forensic Dermatoglyphics	3	3

III	III	Core Course VII	20UFSC32	Technological Methods in Forensic Science	3	3
		Core Course VIII	20UFSC33	Indian Laws	3	3
		Core Practical II	20UFSC3P	Practical- Forensic Dermatoglyphics and Technological Methods inForensic Science	3	3
		Allied Course III	20UFSA31	Fundamentals of Zoology to Forensic Science	4	4
	IV	Self Study Course I	20USSS31	Soft Skills I	-	2
	IV	Skill Based Course I	20UFSS31	Advanced Forensic Science	2	2
				Total	**30**	**26**
IV	I	Tamil IV	20UTAL41	gz;ila ,yf;fpaKk; ehlfKk;	6	3
	II	English IV	20UENL41	English Language Through Literature - IV	6	3
	III	Core Course IX	20UFSC41	Forensic Chemistry	3	3
		Core Course X	20UFSC42	Questioned Documents and Handwriting Examination	3	3
		Core Course XI	20UFSC43	Forensic Biology	3	3
		Core Practical Course III	20UFSC4P	Practical- Forensic Chemistry and Questioned Documents and Handwriting Examination	3	3
		Allied Course IV	20UFSA41	Introduction to Basic Programming Languages	4	4
	IV	Self Study Course II	20USSS41	Soft Skills II	-	2
	IV	Skill Based Course II	20UFSS41	Forensic Photography andAccident Investigation	2	2
				Total	**30**	**26**
	III	Core Course XII	20UFSC51	Forensic Physics and Ballistics	4	3
		Core Course XIII	20UFSC52	Forensic Toxicology	4	3
		Core Course XIV	20UFSC53	Digital and Cyber Forensics	4	3
		Core Course XV	20UFSC54	Applied Forensic Science	4	3

V		Core Practical IV	20UFSC5P	Practical - Forensic Physics and Ballistics & Forensic Toxicology	4	3
		Core Practical V	20UFSC5Q	Practical - Digital Cyber Forensics & Applied Forensic Science	4	3
		Core Elective Course I	20UFSE51	Multimedia Forensics	4	4
			20UFSE52	Economic Offences	4	4
			20UFSE53	Criminal Psychology and Forensic Related Laws		
	IV	Skill Based CourseIII	20UFSS51	Forensic Research Methodology	2	2
				Total	**30**	**24**
VI	III	Core Course XVI	20UFSC61	Forensic Anthropology and Odontology	4	3
		Core Course XVII	20UFSC62	Forensic Medicine	4	3
		Core Course XVIII	20UFSC63	Forensic DNA Typing andMolecular Techniques	4	3
		Core Practical VI	20UFSC6Q	Practical- Forensic Anthropology and Odontology & Forensic Medicine	4	3
		Core Elective Course II	20UFSE61	Forensic Professional Ethics	4	4
			20UFSE62	Criminology-Victimology and Penology	4	4
			20UFSE63	Security and Vigilance	4	4
		Core Project I	20UFSC6P	Dissertation	8	6
	IV	Skill Based Course IV	20UFSS6P	Demonstrations on CSI, CSM and CSR	2	2
				Total	**30**	**24**
Total For All Semesters					**450**	**150**

Allied Courses

There will be **FOUR** Allied courses to fulfil the **B.Sc., Forensic Science** Programme throughout the THREE Years Course Durations.

Subject	Maximum Marks	Year of Study
Basic Physics	100	I
Allied Physical Chemistry	100	
Fundamentals of Zoology to Forensic Science	100	II
Introduction to Basic Programming Languages	100	

Value Added Courses

The Department of Forensic Science is offering the following Value Added Courses for thirty hours for all the UG students with no prejudice to the Under Graduate programme results.

Sl.No.	Semester	Course Code	Course Title
1.	III	20CFSC31	The Constitution of India
2	IV	20CFSC41	Scientific and Legal Principles of Forensic Evidence
3	V	20CFSC51	New Edge Forensics
4	VI	20CFSC61	Entrepreneurship and Innovation

Extra Credit Self- Paced Courses for Advanced Learners

The **Department of Forensic Science** is offering the Extra Credit Self- Paced Courses to enlighten the Advanced Learners from Semester III onwards. The Department will persuade the Students to take virtual courses on MOOCs, SWAYAM and NPTEL

1. Handwriting Examination and Fingerprint Analysis
2. Cyber Security and Ethical Hacking
3. Crime Scene Management and Crime Scene Investigation
4. Data Science

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSC11	Number of Hours/Cycle	4
Semester	I	Max. Marks	100
Part	III	Credit	4
Core Course I			
Course Title	Introduction to Forensic Science		
Cognitive Level	Up to K4		

Preamble

To facilitate the students to learn the history of Forensic Science, know about the domains in Forensic Science, understand the Organizational setup of FSL in India and Crime detection agencies, learn the Basics of criminology, and apply the knowledge Forensic Science in investigation process.

Unit I History of Development of Forensic Science 12 Hours

Functions of Forensic Science. Specific contribution of scientists in the field of Forensic Science. History and Development of Forensic Science in India and world, Definitions and concepts in Forensic Science. Scope of Forensic Science. Need of Forensic Science. Basic principles of Forensic Science, Ethics in Forensic Science, Frye case and Daubert standard.

Unit II Domains in Forensic Science and Forensic Scientist 12 Hours

Domains in Forensic Science, Forensic Science international perspectives, including Set up of INTERPOL and FBI. Duties of Forensic Scientist. Code of conduct for Forensic scientists. Qualifications of Forensic Scientist. Report Writing.

Unit III Organizational setup of FSL in India and Crime detection agencies 12 Hours

Hierarchical Setup Of Central Forensic Science Laboratories, State Forensic Science Laboratories, Government Examiners Of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police And Detective Training Schools, Bureau Of Police Research And Development, Directorate Of Forensic Science And Mobile Crime Laboratories. Police Academies. Police Dogs. Services of Crime Laboratories. Basic Services and Optimal Services.

Unit IV Basics of criminology 12 Hours

Definition aims and scope. Theories of criminal behavior- classical, positivist, sociological. Criminal anthropology. Criminal profiling. Understanding modus operandi. Investigative strategy. Role of media in crime investigation.

Unit V 12 Hours

1. Identification and morphological examination of Toxic plants.
2. To write report on different type of crime cases.
3. To perform the collection, preservation, and packaging of physical evidences found on the given crime scene.
4. To perform the comparison of given physical evidences.
5. Examination of Accident Scene.
6. To perform the exhumation of given body/ skeleton/ evidence.

Unit V has to be conducted as Practical.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. B S Nabar (2013), "*Forensic Science in Crime Investigation*", Asia Law House, Hyderabad, 3rd edition.
2. B.B. Nanda and R.K. Tiwari (2001), "*Forensic Science in India: A Vision for the Twenty First century"*, Select Publishers, New Delhi.

Reference Books

1. M.K.Bhasin and S. Nath (2002*), "Role of Forensic Science in the New Millennium"*, University of Delhi, Delhi.
2. S.H. James and J.J. Nordby (2005), *"Forensic Science: An Introduction to Scientific and Investigative Techniques"*, CRC Press, Boca Raton, 2nd edition.
3. W.G. Eckert and R.K. Wright (1997), "*Introduction to Forensic Sciences*", CRC Press, Boca Raton , 2nd edition
4. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "*Henry Lee's Crime Scene Handbook*", Academic Press,USA, 1st edition.
5. R. Saferstein (2004), "*Criminalistics*", Prentice Hall, New Jersey, 8th edition.
6. W.J. Tilstone, M.L. Hastrup and C. Hald (2013), *"Fisher's Techniques of Crime Scene Investigation"*, CRC Press, Boca Raton.

E- Resources

- www.fbi.gov.
- www.ojp.usdoj.gov/nij/topics/forensic.
- www.forensicnetbase.com
- www.mobile.ncstl.org.com
- www.youtube.com Forensic channel

Course Outcomes

At the end of the course, students would be able to:

CO1	Infer the concepts of Forensic science and its history.
CO2	Interpret the domains of forensic science, Organizational setup of FSL in India and basics of criminology.
CO3	Articulate and execute the professional code of ethics and execute the skills of Forensic Scientist/ expert.
CO4	Integrate the Forensic Science knowledge in the investigation of various types of crimes.
CO5	Correlate and interprets the technical knowledge by carrying out number of related practicals.

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**	**PSO 9**	**PSO 10**	**PSO 11**	**PSO 12**
CO1	2	2	2	2	2	2	2	2	2	3	2	2
CO2	2	2	2	2	2	2	2	2	2	3	2	2
CO3	2	3	3	3	2	2	3	2	1	1	3	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	16	20	41	41%	41%
K2	5	8	10	23	23%	23%
K3	-	8	10	18	18%	18%
K4	-	8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit	Description	Hours	Mode
I History of Development of Forensic Science	a. Definitions and concepts in Forensic Science b. History & Development of Forensic science in India c. Basic Principles and Ethics of Forensic science d. Frye case and Daubert standard e. Specific Contribution of Scientist in Forensic science	2 3 2 2 3	Descriptive method PPT Presentation
II Tools and Techniques in Forensic Science	a. Domains in Forensic Science b. Forensic Science international perspectives c. Duties of Forensic Scientist d. Qualifications of Forensic Scientist	6 2 2 2	Descriptive method PPT Presentation

III Organizational setup of Forensic Science laboratory in India	a. Hierarchical Setup Of Central Forensic Science Laboratories b. Hierarchical Setup Of State Forensic Science Laboratories c. National Crime Records Bureau d. Bureau Of Police Research And Development	4 4 2 2	Descriptive method PPT Presentation
IV Basics of criminology	a. Definition aims and scope b. Theories of criminal behavior c. Criminal profiling d. Investigative strategy	3 3 3 3	Descriptive method PPT Presentation
V Practicals	a. Identification and morphological examination of Toxic plants b. To write report on different type of crime cases. c. To perform the collection, preservation, and packaging of physical evidences found on the given crime scene d. To perform the comparison of given physical evidences. e. To perform the exhumation of given body/ skeleton/ evidence.	2 2 3 2 3	Descriptive method PPT Presentation Practical Activity Brain storming, Activity

Course Designed By: Mr. Krushna Sonawane.

Programme	B.Sc Forensic Science	Programme Code	UFS
Course Code	20UFSC12	Number of Hours/Cycle	3
Semester	I	Max. Marks	100
Part	III	Credit	3
Core Course II			
Course Title	Indian Penal Code		
Cognitive Level	Up to K4		

Preamble

To learn the basics of Indian Penal Code and elements of nature of the crime, know about the crime against the state and property, understand the fundamentals of Constitutions and rights, learn the offence against human body and learn different crime case studies.

Unit I Crime **9 Hours**

Crime: Basic concepts- Definition of Crime, Nature of Crime, Essentials elements of Crime, effect of crime on the society , crime and its classification , cognizable and non-cognizable offence, bailable and non-bailable offence, compoundable and non-compoundable offences.

Unit II Different types of crime **12 Hours**

Different types of Crime: different types of crime according to Indian Penal Code, Crime against State, Crime against Army, Navy, and Air Force, public servant.Indian Penal Code pertaining to offences against property Sections- 378, 383, 390, 391, 405, 415, 420, 441,463, 489A, 497, 499, 503, 511, Offence relating to Religion, false evidences.

Unit III Constitution of India **6 Hours**

Brief introduction to the constitution of India, Fundamental rights, Articles 14, 15, 21, 22, 51A.

Unit IV Offence affecting human body **9 Hours**

Culpable homicide, Murder, Dowry Death, Attempt to Murder, Causing Miscarriage, ,Hurt, Grievous hurt, Assault, Assault or Criminal force to women with intent to outrage her modesty, Kidnapping , Abduction, Sexual offence, Rape, Unnatural offence.

Unit V **9 Hours**

1. To prepare a schedule of five cognizable and five non-cognizable offences.
2. To study a crime case in which an accused was punish on charge of murder under Section 302.
3. To study a crime case in which accused was punish on charge of rape under Section 375.
4. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
5. To study a crime case in which an accused was punish on charge of Kidnapping.
6. To visit the nearest police station and write a report about the visit.

Unit V has to be conducted as Practical.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Activity, and Case Study.

Text Books

1. K.D. Gaur (2016), "*The Indian Penal Code*", Universal Law Publishing, 6th edition.
2. Universals (2019), "*The Indian Penal Code",* Lexis Nexis, New Delhi.

Reference Books

1. J.N. Pandey (2018), "*The Constitutional Law of India*", Central Law Agency.
2. Ratanlal and Dhirajlal (2017), "*The Indian Penal Code*", LexisNexis, 35th edition.
3. Ratanlal and Dhirajlal (2015), "*The Criminal Procedure Code*", LexisNexis, Student Edition.
4. BatukLal (2015), "*The Law of Evidence*", Central Law Agency

5. N.V. Paranjape (2017), "*Criminology & Penology with Victimology*", Central Law Publications.

E- Resources

- www.gutenberg.org.com
- www.libray.law.uiowa.edu.com
- google play store.app.indian Bare Acts
- www.legalserviceindia.com
- www.delhihighcourt.nic.in.

Course Outcomes

At the end of the course, students would be able to:

CO1	Associate the importance of The Indian Penal Code rules in the investigation of various types of crimes.
CO2	Identify and express the different types of crime according to Indian Penal Code.
CO3	Integrate the fundamental rights in real life society.
CO4	Chart and determine the Indian Penal Code to investigate the offence affecting the human body.
CO5	Correlate legal knowledge by carrying out various practical's and case studies.

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2	3	2	2
CO2	2	2	2	2	2	2	2	2	2	3	2	2
CO3	2	3	3	3	2	2	3	3	2	1	3	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Question
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3		8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Crime	a. Definition of Crime, Nature of Crime b. Essentials elements of Crime c. crime and its classification d. Classification of offences	2 2 2 3	Descriptive method PPT Presentation
II Different types of crime	a. Different types of Crime b. Different types of crime according to Indian Penal Code c. Indian Penal Code pertaining to offences against Property d. Offence relating to Religion, false evidences	3 3 3 3	Descriptive method PPT Presentation
III Constitution of India	a. Preamble b. Fundamental rights c. Directive principles of State Policy	2 2 2	Descriptive method PPT Presentation
IV Offence affecting human body	a. Offence affecting human body b. Criminal force to women with intent to outrage her modesty	5 4	Descriptive method PPT Presentation
V-	a. To study a crime case in which an accused was punish on charge of murder under Section 302 b. To study a crime case in which accused was punish on charge of rape under Section 375 c. To prepare a schedule of five cognizable and five non-cognizable offences d. To visit the nearest police station and write a report about the visit. e. To study a crime case in which an accused was punish on charge of Kidnapping	1 2 2 2 2	Descriptive method PPT Presentation Practical Activity Brain storming, Activity

Course Designed By: Mr. Sumit Sarwade.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSC1P	Number of Hours/Cycle	3
Semester	I	Max. Marks	100
Part	III	Credit	3
Core Practical I			
Course Title	Elementary Computer Science		

Preamble

To learn about the basics of computer and information technology, integration of computer peripherals, understand the function of Windows Command Prompt and Network commands, gain the knowledge about usage of Internet, E-mail and World Wide Web, learn learn about analysis of Digital Evidences and learn about the crime usage of various files and data security.

List of Practical's:

1. Introduction to the Computer Components.
2. Introduction to Computer Software Components.
3. Introduction to Paint relating to image.
4. Working with Ms Office word.
5. Working with Power point Presentation
6. Working with Excel sheet
7. Working with Ms Picture Manager
8. Working with Control panel
9. Introduction to Command Prompt
10. Working with keypad (Shortcut keys)
11. Working with Internet
12. Working with E-mail
13. Introduction to Internet Connections
14. Tracing and analyzing E – mail senders IP Address of received e–mail.
15. Cyber Crime Case Study
16. Seizing electronic evidences.
17. Collecting Electronic evidences
18. Creating Offline Signature in M.S. Office File
19. Creating Online Signature in M.S. Office File
20. Hash Calculator

Pedagogy

Computers and projector, Class Room Lectures, Power point presentation, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

E- Resources

- www.Youtube.com. nptelhrd channel
- www.tutorialspoint.com
- www.Javatpoint.com
- www.edu.gcfglobal.org
- www.edx.org.com

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**20UFSA11**	**Number of Hours**	**4**
Semester	**I**	**Max. Marks**	**100**
Part	**III**	**Credit**	**4**
Allied Course I			
Course Title	**Basic Physics**		
Cognitive Level	**Up to K4**		

Preamble

To facilitate the student to learn the elastic properties of the materials, able to explain the fundamentals of thermodynamics, acquire the basic ideas of the electromagnetic and get the conceptual understanding on the propagation of sound waves and its applications, get insight on the atoms and its functions and learn the Basic Physics knowledge by carrying out various practicals.

Unit I Properties of matter **12 Hours**

Introduction to elasticity – Stress & Strain – Hooke's law – types of moduli – twisting couple of a wire (derivation) – tensile strength – torsional pendulum – rigidity modulus of the material (derivation & experiment) – bending of beams – bending moment (derivation) – uniform and non-uniform bending (experimental procedure only).

Unit II Thermal Physics **12 Hours**

Concept of temperature–Conduction, convection & radiation - determination of specific heat capacity of solid (method of mixtures) Lees Disc– Newton's law of cooling - ideal gas equation and its law - Vander Waal's equation, reversible and irreversible process, Zeroth law, first, second and third law of thermodynamics - Carnot's cycle.

Unit III Electromagnetism, Waves and Oscillations **14 Hours**

Coulomb's law - Electric field - Magnetic field due to current - Gauss's theorem and its application - Ampere's law - Kirchhoff's law and their application - Wheat-stone bridge and its sensitivity - Rectifiers, amplifiers, semi-conductor and its type of junction- Dia, para and ferromagnetic materials and their properties, Introduction to Digital Electronics- Logic gates- AND, OR, NOT.

Waves and Oscillations

Simple harmonic motion – free oscillations – damped oscillations (Derivation) – force d oscillations (Derivation) - Resonance and its application – interference & beats of waves – transverse & longitudinal oscillations – experimental verification of laws of vibrating strings – Melde's experiment - Doppler effect of sound

Unit IV Atomic Physics **10 Hours**

Black body radiation - Planck's theory (Derivation) - De Broglie waves - Heisenberg's uncertainty principle - Rutherford's atomic model - Bohr's atomic model - Bohr's theory for Hydrogen atom - Atomic radii, velocity, frequency and energy of orbital electron – Schrodinger's time independent and time dependant wave equations (Derivation). X-rays: Discovery, Coolidge tube - Properties, Moseley's law & its importance – applications of X-rays.

Unit V **12 Hours**

1. Determination of rigidity modulus & moment of inertia of a given wire using torsional pendulum.
2. Determination of specific heat capacity of solid lees disk method.
3. Verification of logic tables of basic gates.
4. Construction of voltage regulation using bridge rectifier.
5. Experimental verification of laws of vibrating strings.

Unit V has to be conducted as Practical.

Pedagogy

Class Room Lectures, Power point presentation, Seminar, Quiz, Assignments, Brain storming.

Text Books

1. R K Gaur and S L Gupta (2018), *"Engineering Physics*", Dhanpat Rai Publications, New Delhi.
2. Carl F Kauhn (2018), *"Basic Physics: A Self Teaching Guide"*Noah Books, 2nd Edition.

Reference Books

1. R Murugesan and KeerthigaSivaprasath (2019), "*Modern Physics*", S. Chand Publishing, chennai.
2. D.K. Bhattacharya and PoonamTandon (2015) *"Engineering Physics"*Oxford University Press, Delhi.

E- Resources

- YoutubeChannel :eink education
- (https://www.youtube.com/channel/UCMi2MUM8nt9HfKgBaIHW5RQ)
- NPTEL Courses on Basic Physics
- www.physics4kids.com
- www.aip.org.com
- www.faraday.physics.utoronto.ca
- www.academicearth.org.com

Course Outcomes

At the end of the course, students would be able to:

CO1	Annotate the elastic properties of materials
CO2	Articulate the basic thermodynamic laws
CO3	Associate electromagnetic concepts and Application of basics of sound waves
CO4	Determine the overview of atomic structures
CO5	Correlate the Basic Physics knowledge by carrying out various practical's

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2	3	2	2
CO2	2	3	3	3	2	2	3	3	2	1	3	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K1)
2	CO2	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K2 & K2)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	-	10	15	15	15%
K2	5	24	10	39	39	39%
K3		8	20	28	28	28%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Properties of matter	a. Introduction to elasticity b. Types of module c. Modulus of the material d. Bending moment	3 3 3 3	Descriptive method PPT Presentation
II Thermal Physics	a. Concept of temperature b. Determination of specific heat capacity of solids c. Vander Waal's equation d. Laws of thermodynamics e. Carnot's cycle.	2 3 2 3 2	Descriptive method PPT Presentation
III Electromagnetism	a. Coulomb's law - Electric field b. Gauss's theorem and its application c. Ampere's law - Kirchhoff's law and their application d. Semi-conductor and its type of junction	3 4 4 3	Descriptive method PPT Presentation
IV Waves and Oscillations	a. Simple harmonic motion b. Resonance and its application c. Interference & beats of waves d. Experimental verification of laws of vibrating strings e. Doppler effect of sound	2 2 2 2 2	Descriptive method PPT Presentation
V Atomic Physics	a. Determination of rigidity modulus & moment of inertia of a given wire using torsion pendulum. b. Determination of specific heat capacity of solid lees disk method. c. Verification of logic tables of basic gates. d. Construction of voltage regulation using bridge rectifier. e. Experimental verification of laws of vibrating strings.	2 2 3 2 3	Descriptive method PPT Presentation Practical Activity Brain storming, Activity

Course Designed By: Dr. R. Jothimurugan.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSN11	Number of Hours/Cycle	2
Semester	I	Max. Marks	50
Part	IV	Credit	2
Non Major Elective Course I			
Course Title	Forensic Science		
Cognitive Level	Up to K4		

Preamble

To learn the branches of Forensic Science, understand the basics of the crime, global scenario of Forensic Science, learn about the Physical evidences and their significances in Forensic Science and understand the crime scene documentation.

Unit I Basic of Forensic Science 6 Hours

Introduction, Definition, need, scope of Forensic Science. Various Principles of Forensic Science, branches of Forensic Science: Forensic Medicine, Forensic Toxicology, Forensic accounting, Forensic Biology, Forensic Physics, Forensic Photography, Ballistics, Questioned document and Fingerprint, Forensic Psychology, Forensic Anthropology, Wild life Forensics, DNA fingerprinting , Cyber Forensics etc.,

Unit II Crime 6 Hours

Definition of crime, history and development, victimology, criminological perspective, characteristics of crime, classification of crimes: atrocity, seriousness, motive, statistical, situational & systematic. White collar crime, professional crime, organized crime, present scenario of crime in India.

Unit III History and development of Forensic Science 6 Hours

Development of Forensic Science in the world and India. National and international scenario in Forensic Science. Various scientists and their contribution in the field Forensic Science.

Unit IV Physical evidences and their significances in Forensic Science 6 Hours

Various types of physical evidences found on the crime scene, searching, collection, packaging, and handling of the physical evidences found on the crime scene

Unit V Crime scene documentation 6 Hours

Crime scene documentation- sketching, note making, photography and videography.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. B S Nabar (2013*), "Forensic Science in Crime Investigation*", Asia Law House, Hyderabad, 3rd edition.
2. B.B. Nanda and R.K. Tiwari (2001), "*Forensic Science in India: A Vision for the Twenty First century"*, Select Publishers, New Delhi

Reference Books

1. S.H. James and J.J. Nordby (2005*), "Forensic Science: An Introduction to Scientific and Investigative Techniques*", CRC Press, Boca Raton, 2nd edition.
2. Henry C. Lee;Timothy M. Palmbach and Marilyn T. Miller (2001), "*Henry Lee's Crime Scene Handbook",* Academic Press,USA, 1st edition.
3. R. Saferstein (2004), *"Criminalistics*", Prentice Hall, New Jersey, 8th edition.

e- Resources

- www.fbi.gov.
- www.ojp.usdoj.gov/nij/topics/forensic.
- www.forensicnetbase.com
- www.mobile.ncstl.org.com
- www.youtube.com Forensic channel

Course Outcomes

At the end of the course, students would be able to:

CO1	Categories the crime and associate its essential elements, history and concepts
CO2	Determine the different types of crime, history and development of Forensic Science
CO3	Integrate the knowledge about global scenario of Forensic Science.
CO4	Interprets and examine the physical evidences in the investigation of various types of crimes.
CO5	Explain and correlate the knowledge about crime scene documentation

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2`	3	2	2
CO2	2	3	3	3	2	2	3	3	2	1	3	2
CO3	2	3	3	3	2	2	3	3	2	1	3	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes

Units	COs	K – Level	Section A	Section B
			Either/or Choice	Open Choice
			No. of Questions	No. of Questions
1	CO1	Up to K1	2 (K1 & K1)	1 (K1)
2	CO2	Up to K1	2 (K1 & K1)	1 (K1)
3	CO3	Up to K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total Marks for each Section			15	15

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	12	10	22	40	40%
K2	6	5	11	20	20%
K3	6	5	11	20	20%
K4	6	5	11	20	20%
Total Marks	30	25	55	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I **Basic of Forensic Science**	a. Introduction, Definition, need b. Scope of Forensic Science c. Various Principles of Forensic Science d. Branches of Forensic Science	1 1 2 2	Descriptive method PPT Presentation
II **Crime**	a. Definition of crime, history and development b. Victimology c. Characteristics of crime, classification of crimes d. Present scenario of crime in India.	2 1 2 1	Descriptive method PPT Presentation
III **History and development of Forensic Science**	a. Development of Forensic Science in the world and India b. National and international scenario in Forensic Science c. Various scientists and their contribution in the field Forensic Science	2 2 2	Descriptive method PPT Presentation
IV **Physical evidences and their significances in Forensic Science**	a. Various types of physical evidences found on the crime scene b. Collection, packaging of physical evidences c. Handling of the physical evidences found on the crime scene	2 2 2	Descriptive method PPT Presentation
V **Crime scene documentation**	a. Crime scene documentation b. Crime Scene Sketching, Note Making c. Photography and Videography	2 2 2	Practical Activity Brain storming Activity

Course Designed By: Mr. Krushna Sonawane.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSC21	Number of Hours/Cycle	4
Semester	II	Max. Marks	100
Part	III	Credit	4
Core Course III			
Course Title	Basics of Forensic Science		
Cognitive Level	Up to K4		

Preamble

To learn the scenario of Forensic Science in India, understand the basics of crime scene investigation, learn the crime scene management, understand the different forms of crime and gain the knowledge by carrying out various practical's regarding processing of physical evidences.

Unit I Introduction to Crime **12 Hours**

Crime- Elements, nature, causes and consequences of crime, Hate crimes, organized crimes and public disorder, domestic violence and workplace violence. White collar crimes, Social change and crime.

Sociological aspect of crime in society, Criminal behaviour, Types of crime, Crime scenario in India. Detection of Crime, Police, Medico-legal expert, judicial officers Scope and development of Forensic Science, Facilities provided in Forensic Science Laboratories for chemical, physical, biological, psychological, digital and cyber crime detection and analysis.

Unit II Crime Scene Investigation **12 Hours**

Definition of crime scene, crimes without scene. Classification of crime scene: indoor & outdoor, primary & secondary, macroscopic & microscopic crime scene. Crime scene and its significances, argument and ethics of crime scene. What is physical evidence, classification, types of physical evidences, sources of physical evidence, signification and value of physicalevidence, victim and accused, suspect, witness. Special crime scene - mass disaster, terror attack, geological scene and explosive etc.

Unit III Crime Scene Management **12 Hours**

Introduction to crime scene management, first responding officer and his duties. Crime scene investigator and duties, specialized personnel at the crime scene, processing of scene of crime: plan of action, protection of scene of crime.

Crime scene documentation- sketching, note making, photography and videography. Searching, collection, preservation, packing of physical evidence, forwarding or dispatch of exhibit in to the laboratory, chain of custody, collection of standard/reference samples.

Unit IV Emerging Trends in Forensic Science **12 Hours**

Introduction, Scope and Importance of emerging Forensic Disciplines: Forensic Engineering, Forensic Accounting, Forensic Archaeology, Nuclear forensics, Forensic Journalism, Environmental Forensics, Forensic Nursing, Forensic Intelligence, Forensic Dentistry.

Unit V **12 Hours**

1. To compare and calculate diameter of given bangle piece.
2. To collect and compare physical evidence of Hit and run crime scene Samples.
3. Collection and Handling of arson scene Samples.
4. Packaging and forwarding of physical evidences.
5. Collection of special evidences.

Unit V has to be conducted as Practical.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. B. R. Sharma (2014), "*Forensic Science in Criminal Investigation and Trials*", Universal Law Publishing, 5th edition.
2. M. S. Rao and B. P. Maithil (2013*),"Crime Scene Managemnet: A Forensic Approach, Selective and Scientific Books",* New Delhi, 2nd edition.
3. E.W. Killam (1990),"*TheDetection of Human Remains*", C.C. Thomas, Springfield.
4. O. Ribaux and P. Margot (2000),"*EncyclopaediaofForensicSciences*", Volume 1, J.A. Siegel, P. J. Saukko and G. C. Knupfer (Ed.), Academic Press, London.

Reference Books

1. A K Gupta (2014), "*Essentials of forensic medicine and toxicology*", Current Books International, 5th edition.
2. Mark M. Okuda and Frank H. Stephenson (2019), "*A Hands- on Introduction to Forensic Science Cracking the Case*", CRC Press, 2nd edition.
3. Timothy M. Palmbach and Marilyn T. Miller (2001), "*Henry Lee's Crime Scene Handbook*", Academic Press, USA, 1st edition.
4. S.H. James and J.J. Nordby (2005), *"Forensic Science: An Introduction to Scientific and Investigative Techniques",* CRC Press, Boca Raton, 2nd edition.
5. R.K. Noon (1992), "*Introduction to Forensic Engineering",* CRC Press, Boca Raton.
6. J.F. Brown and K.S. Obenski (1990), "*Forensic Engineering- Reconstruction of Accidents*", C.C. Thomas, Springfield.

E- Resources

- www.fbi.gov.
- www.ojp.usdoj.gov/nij/topics/forensic.
- www.forensicnetbase.com
- www.mobile.ncstl.org.com
- www.youtube.com Forensic channel

Course Outcomes

At the end of the course, students would be able to:

CO1	Categories the various forms of crimes & the identify the Forensics scenario in India
CO2	Execute and apply the knowledge of Forensic Science in crime scene investigation
CO3	Interpret and implement the crime scene management strategies
CO4	Associate the importance of the various emerging trends in Forensic Science
CO5	Explain and Correlate the various practical's on physical evidences

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2	3	2	2
CO2	2	3	3	3	2	2	3	3	2	1	3	2
CO3	2	3	3	3	2	2	3	3	2	1	3	2
CO4	2	2	2	2	2	2	2	2	2	3	2	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3		8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Introduction to Crime	a. Crime- Elements, nature, causes and consequences of crime b. Sociological aspect of crime in society Types of crime c. Sociological aspect of crime in society d. Facilities provided in Forensic Science Laboratories	3 3 3 3	Descriptive method PPT Presentation
II Crime Scene Investigation	a. Definition of crime scene b. Classification of crime scene c. Crime scene and its significances, argument and ethics of crime scene d. Physical evidence, classification, types of physical evidences e. Physical evidence signification and value of physical evidence, f. Special crime scene	2 2 2 2 2 2	Descriptive method PPT Presentation
III Crime Scene Management	a. Introduction to crime scene management b. First responding officer and his duties c. Processing of scene of crime d. Crime scene documentation e. Searching, collection, preservation, packing of physical evidence f. chain of custody	2 2 2 2 2 2	Descriptive method PPT Presentation
IV Emerging Trends in Forensic Science	a. Introduction, Scope and Importance b. Emerging Forensic Disciplines	6 6	Descriptive method PPT Presentation
V Practicals	a. To compare and calculate diameter of given bangle piece. b. To collect and compare physical evidence of Hit and run crime scene Samples. c. Collection and Handling of arson scene Samples. d. Packaging and forwarding of physical evidences. e. Collection of special evidences	2 2 3 2 3	Descriptive method PPT Presentation Practical Activity Brain storming, Activity

Course Designed By: Mr. Krushna Sonawane.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSC22	Number of Hours/Cycle	3
Semester	II	Max. Marks	100
Part	III	Credit	3
Core Course IV			
Course Title	Forensic Psychology		
Cognitive Level	Up to K4		

Preamble

To facilitate the students to learn the science of Psychology, know about the various cognitive processes; learn the basics of Forensic Psychology, understand the about psychopathology, the criminal behavior and tools for detection of deception, and study the various case reports on psychological assessments.

Unit I The Science of Psychology 9 Hours

Concepts of psychology, History of psychology, modern perspectives, types of psychological professional psychology, The science and research methods, professional and ethical issues in psychology.

Biological Perspective : Nerves Neurons: Building the network, central nervous system, peripheral nervous system, Human brain structure and function; sensory systems, endocrine system.

Consciousness of Perception: Consciousness, Altered states of consciousness, attention and awareness, sensation and perception, problems in Attention and perception, assessment attention and perception.

Unit II Cognitive Processes 9 Hours

Learning process: Types of learning, models of memory, stages of memory, encoding, retention and retrieval, forgetting, brain and memory, problem in learning and memory, intelligence- Concepts and theories.

Cognition, Motivation and Emotion: Thinking, decision making and problem solving, intelligence and language, motivation: Types of approaches Emotion, stress and coping

Unit III Basics of Forensic Psychology 9 Hours

Definitions and fundamentals 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 IPC, psychological autopsy.

Unit IV Psychology and Criminal Behaviour 9 Hours

Psychopathology and personality disorder, Psychological assessment and its importance, Serial Killers, psychology of terrorism, biological factors and crime- social learning theories, psycho-social factors, abuse, Juvenile delinquency- theories of offending (Social cognition, moral reasoning), Child abuse (Physical, sexual, emotional), juvenile sex offenders, legal controversies.

Detection of Deception:

Tools for detection of deception- interviews, non-verbal detection, statement analysis, voice stress analyzer, 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.

Unit V 9 Hours

1. To prepare a case report on thematic appreciation test.
2. To prepare a case report on Bhatia's battery of performance test of intelligence.
3. To cite a criminal case in which Narco analysis was used as a means to detect deception.
4. Question formulation in Polygraph.
5. To review a crime case involving serial murders. Comment on the psychological traits of the accused.

6. To study a criminal case in which hypnosis was used as a means to detect deception.

Unit V has to be conducted as Practical.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. S. K. & Meyer G. E, (2006*), "Psychology"*, Ciccarelli, Pearson Education, New Delhi.
2. Vimla Veeraghawan (2009), "*Handbook of Forensic Psychology*", Selective and Scientific Books.
3. Edward E. Smith and Stephen M. Kosslyn (2015), "*Cognitive Psychology: Mind and Brain",* Pearson Education, New Delhi, 1st edition.

Reference Books

1. Daniel (2011), "*Thinking, fast and slow*", Penguin.
2. Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw (1986*), "Introduction to Psychology"*, Hill Book Co.
3. Baran R.A (2001), "*Psychology",* Pearson Education Pvt.Ltd, New Delhi.
4. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau (1995), "*Scientific Evidence in Civil and Criminal Cases"*, The Foundation Press, Inc., New York, 4th Edition.
5. R. Saferstein (2004), "*Criminalistics"*, Prentice Hall, New Jersey, 8th edition.
6. J.C. DeLadurantey and D.R. Sullivan (1980), "*Criminal Investigation Standards*", Harper & Row, New York.
7. J. Niehaus (1999), "*Investigative Forensic Hypnosis*", CRC Press, Boca Raton.

E- Resources

- www.simplypsychology.org.com
- www.psychologytoday.com
- www.psychcentral.com
- www.sciencedirect.com
- www.dictionary.apa.org.com

Course Outcomes

At the end of the course, students would be able to:

CO1	Articulate the various fields and application of psychology
CO2	Identify and Examine the various cognitive processes of real life situation
CO3	Interpret the knowledge about basics of Forensic Psychology
CO4	Implement the knowledge about various psychological disorders and tools for detection of deception
CO5	Distinguish the various case reports regarding psychological assessments

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	3	3	3	2	2	3	3	2	1	3	2
CO2	2	3	3	3	2	2	3	3	2	1	3	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	1	3	3	1	1	3	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3		8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I The Science of Psychology	a. Concepts of psychology b. History of psychology c. The science and research methods d. Biological Perspective e. Consciousness of Perception	1 1 2 3 2	Descriptive method PPT Presentation
II Cognitive Processes	a. Learning process: b. Cognition, c. Motivation d. Emotion	3 2 2 2	Descriptive method PPT Presentation
III Basics of Forensic Psychology	a. Definitions and fundamentals concepts of Forensic psychology and Forensic psychiatry. b. Mental disorders and Forensic Psychology. c. Psychology of Evidence	3 4 2	Descriptive method PPT Presentation

IV Psychology and Criminal Behaviour	a. Psychopathology and personality disorder b. Serial Killers c. Juvenile delinquency d. Tools for detection of deception e. Polygraphy f. Narco Analysis and Brain Electrical Oscillation Signature	2 2 1 1 1 2	Descriptive method PPT Presentation
V Practicals	a. To prepare a case report on thematic appreciation test. b. To prepare a case report on Bhatia's battery of performance test of intelligence. c. To cite a criminal case in which Narco analysis was used as a means to detect deception. d. Question formulation in Polygraph. e. To review a crime case involving serial murders. Comment on the psychological traits of the accused. f. To study a criminal case in which hypnosis was used as a means to detect deception.	1 1 1 2 2 2	Descriptive method Practical Activity Brain storming Activity

Course Designed By: Mr. Krushna Sonawane.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSC23	Number of Hours/Cycle	3
Semester	II	Max. Marks	100
Part	III	Credit	3
Core Course V			
Course Title	Police Investigation And Administration		
Cognitive Level	Up to K4		

Preamble

To facilitate the students to know about the fundamentals of policing, learn about judicial working agencies, understand the methods of police investigation, learn the police duties, powers, and offences against women's and children's.

Unit I Fundamentals of Policing 9 Hours

History of Indian Police, Police Administration Concepts: Hierarchy, Rank, Organizational Structure of Indian Police, Power & Authority, Superintendence, Police Act of 1861, Police reforms, National Police Commission Recommendations (NPC) 1979, Model Police Act of NPC.

Unit II Organization and structure of Indian Police 9 Hours

Structure of State Police- District Police- City Police- Special Police Battalions; Intelligence Branch, Crime Branch (CID) - Directorate of Vigilance and Anti-Corruption. Central Police Organizations- IB, CBI, CISF, CRPF, RPF, RPF, RAW, NCRB, NIA, NSG etc. Police Research and Crime Statistics Organizations- BPR & D, Organizational set- up of Police Stations, Working System of Town & City Police Stations, Village Police, Railway and Armed Police. International Criminal Police Organization (INTERPOL).

Unit III Police Investigation, Procedures and functions 9 Hours

First Information Report, Investigation of Scene of Crimes, Charge Sheet, Investigation of Cognizable and Non-Cognizable Offences, Investigation of Robbery, Dacoity, Theft, House Breaking.

Unit IV Police Duties and Powers 9Hours

Arrest, search, locking up and remand of suspected and accused persons. Conducting various types of raids – Prohibition, gambling, Narcotics and PITA (Prevention of Illicit Traffic in Narcotics)

Unit V Investigation of sexual offenses and crime against women
9 Hours

Sexual assault against children (POCSO act), Domestic violence, Dowry death, trafficking. Unnatural death.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. Misra K.K. (1987), "*Police Administration in Ancient India*", K.K. Publications.
2. Guharoy J. T. (1999)*, "Policing in the 21st Century Indian Institute of Public Administration*".

Reference Books

1. Srivastava Aparna (1999), "*Role of Police in Changing Society*", APH Publishing House.
2. Gupta, Anandswarup (2007), "*Crime and Police in India",* Agra: Sahitya Bhavan.
3. Banerjee D (2005), "*Central Police Organization, Part I & Part II"*, Allied Publishers Pvt. Ltd., New Delhi.

e- Resources

- www.cbi.com
- www.nia.com
- www.svpnpa.gov.in

- www.bprd.in
- www.interpol.in

Course Outcomes –

At the end of the course, students would be able to:

CO1	Interpret the fundamentals of police organization
CO2	Chart out and develop the knowledge about various judicial agencies
CO3	Integrate and apply the various methods and procedures of police investigation.
CO4	Implement the knowledge about police duties
CO5	Correlate and solve the various sexual offences against women and children

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2	3	2	2
CO2	2	3	3	3	2	2	3	3	2	1	3	2
CO3	2	2	2	2	2	2	2	2	2	3	2	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Either/or)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3		8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Fundamentals of Policing	a. History of Indian Police, Police Administration Concepts b. Hierarchy, Rank, Organizational Structure of Indian Police c. Power & Authority d. Police Act of 1861 e. National Police Commission Recommendations (NPC) 1979	2 2 1 2 2	Descriptive method PPT Presentation
II Organization and structure of Indian Police	a. Structure of State Police b. Central Police Organizations c. Police Research and Crime Statistics Organizations d. Organizational set- up of Police Stations e. International Criminal Police Organization (INTERPOL).	2 1 2 2 2	Descriptive method PPT Presentation
III Police Investigation, Procedures and functions	a. First Information Report b. Investigation of Scene of Crimes c. Charge Sheet d. Investigation of Cognizable and Non-Cognizable Offences	2 2 2 3	Descriptive method PPT Presentation
IV Police Duties and Powers	a. Arrest, search b. Locking up and remand of suspected and accused persons c. Conducting various types of raids d. Narcotics and PITA (Prevention of Illicit Traffic in Narcotics)	2 2 2 3	Descriptive method PPT Presentation
V Investigation of sexual offenses and crime against women	a. Sexual assault against children POCSO act b. Domestic violence c. Trafficking d. Unnatural death	3 2 2 2	Descriptive method PPT Presentation

Course Designed By: Mr. Sumit Sarwade.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSA21	Number of Hours/Cycle	4
Semester	II	Max. Marks	100
Part	III	Credit	4
Allied Course II			
Course Title	Allied Physical Chemistry		
Cognitive Level	Up to K4		

Preamble

To learn about liquid state, understand the chemical thermodynamics and kinetics, study the modern periodic table and periodic properties and to understand the various methods of analysis, study the empirical and molecular formulae and apply Allied Physical Chemistry knowledge by carrying out various practical's

Unit I Liquid State **12 Hours**

Liquid State - Free volume of liquid and density measurement, physical properties of liquid, Vapour pressure, surface tension surfactants, viscosity, molar refraction, optical activity structure of liquids, Solutions: Method of exploring concentration of solutions, binary liquids, vapour pressure, composite diagram of binary liquids and solutions, distillation, fractional distillations, vacuum distillations, conductance, conductometry, electro motive force, potentiometery

Unit II Chemical Thermodynamics and Kinetics **12 Hours**

Chemical Thermodynamics and Kinetics -First law of thermodynamics, Internal energy, enthalpy second law of thermodynamics, entropy and its significance, free energy and work function, Rate of reaction, order of molecularity reaction, slow reaction and fast reaction, first order reaction, half life period of first order reaction, Activation energy, temperature dependence of activation energy, explosive reactions, Oscillatory reactions.

Unit III Study of Modern Periodic Table **12 Hours**

Study of Modern Periodic Table - Long form of periodic table, periodic properties, atomic radii, ionization potential, electron affinity electro negativity, metallic characters, non- metallic characters and magnetic properties, comparative study of S and P block elements.

Gravimetric Analysis, volumetric analysis, chromatographic separation, the liquid chromatography, Electrophoresis, Thermal methods.

Unit IV Empirical and Molecular Formulae **12 Hours**

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

Unit V **12 Hours**

Demonstrations':

Potentiometric Titrations

1. Potentiometric Redox Titration ($KMnO_4$-Kl).
2. Determination of pH of the Buffer Solution.

Conductometric Titrations

1. Estimation of Lead Nitrate.
2. Estimation of Barium Chloride.
3. Estimation of Mixtures of Acids (NH_4Cl + HCl).

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. R P Singh (2015), "*Handbook of Chemistry*", Arihant Publications
2. Pegasus Encyclopaedia Library (2011), *"Basic concept of chemistry*", Pegasus

Reference Books

1. B D Gupta & A J Elias (2013), "*Basic Organometallic Chemistry,"* Universities Press, 2nd Edition.
2. S M Khopkar (2020), *"Basic concepts of Analytical Chemistry*", New Age International Pvt. Ltd.
3. Arun Bahl, B S Bahl & G D Tuli (2020), "*Essentials of Physical Chemistry",* S Chand Publishing, 28th Edition.

E- Resources

- www.youtube.com. nptelhrd/channel
- www.chemeddl.org.com
- www.chemistryguide.com
- www.chem4kids.com
- www.youtube.com. Allery Chemistry channel

Course Outcomes

At the end of the course, students would be able to:

CO1	Infer the and associate the knowledge about liquid state
CO2	Associate the importance of the chemical thermodynamics and kinetics
CO3	Articulate and determine the knowledge about modern periodic table, understand and apply the methods of analysis
CO4	Integrate the knowledge about IUPAC nomenclature
CO5	Correlate Allied Physical Chemistry knowledge by carrying out various practical's

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	2	2	2	2	2	2	2	2	3	2	2
CO2	2	2	2	2	2	2	2	2	2	3	2	2
CO3	2	3	3	3	2	2	3	3	2	1	3	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes (COs)

Units	COs	K – Level	Section A		Section B	Section C
			MCQs		Either/or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total Marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3		8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Liquid State	a. Free volume of liquid and density measurement b. Physical properties of liquid c. Solutions: Method of exploring concentration of solutions d. Composite diagram of binary liquids and solutions e. Potentiometery	3 2 3 2 2	Descriptive method PPT Presentation
II Chemical Thermodynamics and Kinetics	a. First law of thermodynamics b. Second law of thermodynamics c. Rate of reaction, order of molecularity reaction d. Activation energy, temperature dependence of activation energy e. Oscillatory reactions	2 3 2 3 2	Descriptive method PPT Presentation
III Study of Modern Periodic Table	a. Long form of periodic table, periodic properties b. Comparative study of S and P block elements c. Gravimetric Analysis d. Volumetric analysis e. Chromatographic separation	2 2 3 3 2	Descriptive method PPT Presentation
IV Nomenclature	a. Empirical and molecular formulae b. Hybridization c. Nature of chemical bonding d. IUPAC nomenclatures e. Reactive intermediates and related reactions.	2 3 2 3 2	Descriptive method PPT Presentation
V-	Potentiometric Titrations a. Potentiometric Redox Titration (KMnO4-Kl). b. Determination of pH of the Buffer Solution. Conductometric Titrations c. Estimation of Lead Nitrate. d. Estimation of Barium Chloride. e. Estimation of Mixtures of Acids (NH4Cl + HCl)	2 2 2 3 3	Practical Activity Brain storming, A3ctivity

Course Designed By: Mrs. A. Mariammal.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	20UFSN21	Number of Hours/Cycle	2
Semester	II	Max. Marks	100
Part	IV	Credit	2
Non- Major Elective Course II			
Course Title	Emerging Trends in Forensic Science		
Cognitive Level	Up to K4		

Preamble

To learn the role of Forensic Science in archaeology, to know about the applications of Forensic Science in engineering field, acquire the knowledge about Forensic Intelligence, understand about the development of Forensic Nursing and gain the knowledge about Forensic Pathology.

Unit I Forensic Engineering 6 Hours

Role of mechanical, electronics and computer engineers in Forensic Science. Accident investigations. Failure of signalling and control systems. Ergonomics. Applications of animations, simulations and digital imaging in solving crime cases. Episodes involving fire engineering.

Unit II Forensic Archaeology

6 Hours

Role of forensic archaeology. Searching the archaeological site. Methods of digging the burial site. Recovery of remains. Documenting the recovered material. Preservation of remains.

Unit – III Forensic Intelligence 6 Hours

Role of Forensic Intelligence in crime analysis. Methods of crime analysis. Databases in Forensic intelligence. Management of serial crimes by application of Forensic intelligence.

Unit – IV Forensic Nursing 6 Hours

Forensic nursing development, definition, Role and responsibilities of Forensic Nurses, present and future trends, Forensic case management with the help of Forensic nursing.

Unit – V Forensic Pathology 6 Hours

Definition, Goals and unique aspects in Forensic pathology, objectives, Roles and responsibilities of Forensic pathologists, Significances of Forensic pathology.

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study

Text Books

1. R.K. Noon (1992), "*Introduction to Forensic Engineering",* CRC Press, Boca Raton.
2. J.F. Brown and K.S. Obenski (1990), "*Forensic Engineering- Reconstruction of Accidents*", C.C. Thomas, Springfield.

Reference Books

1. E.W. Killam (1990), "*TheDetection of Human Remains*", C.C. Thomas, Springfield.
2. O. Ribaux and P. Margot (2000), "*EncyclopaediaofForensicSciences*", Volume 1, J.A. Siegel, P. J. Saukko and G. C. Knupfer (Ed.), Academic Press, London.

E- Resources

- www.fbi.gov.
- www.ojp.usdoj.gov/nij/topics/forensic.
- www.forensicnetbase.com
- www.mobile.ncstl.org.com
- www.youtube.com Forensic channel

Course Outcomes

At the end of the course, students would be able to:

CO1	Determine and develop the knowledge about Forensic Engineering.
CO2	Execute and apply the techniques of Forensic Archaeology
CO3	Examine and apply the Forensic Intelligence in real life investigation
CO4	Identify and implement the importance of various techniques' of Forensic Nursing
CO5	Integrate and understand the roles, responsibilities and develop the significances of Forensic Pathology.

Mapping Course Outcomes with Program Specific Outcomes

Cos/ PSOs	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9	PSO 10	PSO 11	PSO 12
CO1	2	3	3	3	2	2	3	3	2	1	3	2
CO2	2	3	3	3	2	2	3	3	2	1	3	2
CO3	2	3	3	3	2	2	3	3	2	1	3	2
CO4	2	3	3	3	2	2	3	3	2	1	3	2
CO5	3	1	1	1	3	3	1	1	3	1	1	3

1-Low 2-Moderate 3-High

Articulation Mapping - K Levels with Course Outcomes

Units	COs	K – Level	Section A	Section B
			Either/or Choice	Open Choice
			No. of Questions	No. of Questions
1	CO1	Up to K1	2 (K1 & K1)	1 (K1)
2	CO2	Up to K1	2 (K1 & K1)	1 (K1)
3	CO3	Up to K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total Marks for each Section			15	15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section –wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without choice	Consolidated (Rounded off)
K1	12	10	22	40	40%
K2	6	5	11	20	20%
K3	6	5	11	20	20%
K4	6	5	11	20	20%
Total Marks	30	25	55	100	100%

Lesson Plan

Unit	Description	Hours	Mode
I Forensic Engineering	a. Role of mechanical, electronics and computer engineers in Forensic Science. b. Accident investigations. c. Ergonomics.	2 2 2	Descriptive method PPT Presentation
II Forensic Archaeology	a. Role of forensic archaeology. b. Searching the archaeological site. c. Methods of digging the burial site. d. Recovery of remains. e. Documenting the recovered material. f. Preservation of remains.	1 1 1 1 1 1	Descriptive method PPT Presentation
III Forensic Intelligence	a. Role of Forensic Intelligence in crime analysis. Methods of crime analysis. b. Databases in Forensic intelligence. c. Management of serial crimes by application of Forensic intelligence.	2 2 2	Descriptive method PPT Presentation
IV Forensic Nursing	a. Forensic nursing development, definition, b. Role and responsibilities of Forensic Nurses, present and future trends, c. Forensic case management with the help of Forensic nursing.	2 2 2	Descriptive method PPT Presentation
V Forensic Pathology	a. Definition, Goals and unique aspects in Forensic pathology, objectives. b. Roles and responsibilities of Forensic pathologists, c. Significances of Forensic pathology.	2 2 2	Descriptive method Descriptive method PPT Presentation

Course Designed By: Mr. Krushna Sonawane.

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSC31**	Number of Hours/Cycle	**3**
Semester	**III**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Course VI			
Course Title	**Forensic Dermatoglyphics**		
Cognitive Level		**Up to K4**	

Preamble

To make the students to understand the fundamental principles on which the science of fingerprinting is based, Fingerprints are the most infallible means of identification, The physical and chemical techniques of developing fingerprints on crime scene evidence, The Fingerprint recording, lifting, identification and individualization. The method of classifying criminal record by fingerprints was worked out in India, and by Indians, The significance of foot, palm, ear and lip prints.

Unit I	**Basics of fingerprinting**	**9 Hours**
	Introduction to Fingerprint: Definition, History and development, Dermatoglyphics, Theory, Fundamental principles of fingerprinting. Significance, Biological basis of fingerprints-embryology (primary and secondary ridge formation) morphology and anatomy of dermal skin, Friction Skin, Theory of pattern formation, Morphology and anatomy of sweat gland: Eccrine gland, Sebaceous gland, Apocrine gland, Chemical constituent of sweat gland (Water, Inorganic, Organic, Metallic and Drugs. Legal aspects of fingerprint and Court testimony.	
Unit II	**Development of Fingerprints**	**9 Hours**
	Fingerprint Development: Fingerprint at crime scene (Chance, Patent, Plastic and Latent) Formation of latent Fingerprint, Constituents of sweat residue. Fingerprint Development- Physical (Traditional fingerprint Powders), Luminescent (Fluorescent and Phosphorescent) Fingerprint powders metallic (Magnetic, Fine Lead, and Metal Evaporation) Chemical fuming and Enhancement (Iodine Fuming, Iodine Solution method, Cyanoacrylate, Super glue, Ninhydrin method, DFO Method, Silver nitrate method) Instrumental (Laser). Application of light sources in fingerprint detection. Preservation of developed fingerprints. Collection of Fingerprints at Scene of crime.	
Unit III	**Fingerprint recording, lifting, identification and individualization**	**9 Hours**
	Recording & lifting of Fingerprints: Taking of fingerprint: requirements, procedure, precautions, purpose, plain print, rolled print and palm print. Post-mortem fingerprinting: Fresh corpus, Rigor mortis, Mutilated, Decomposed, Drowned, Burn. Photography with various light sources, unknown fingerprint, condition affecting latent print, Identification and individualization methods for Fingerprints: Osborn Grid, Seymour Trace, Photographic Strip, Polygon, Overlay, Osterburg Grid, Microscopic triangulation and conventional method.	
Unit IV	**Fingerprint Classification**	**9 Hours**

	Basic fingerprint patterns (Arch, loop, whorl and composite), pattern area, delta and core (ridge characters) Ridge counting, Ridge tracing, Various Classification system in fingerprints: Ivan Vucetich, Purkinje, Francis Galton, Henry (10 digit and FBI extension), single digit (battle), damage fingers. AFIS- Automated Fingerprint Identification System, FACTS- Fingerprint Analysis and Criminal Tracing System.	
Unit V	**Other Impressions**	**9 Hours**
	Sole prints, Palm prints and their historical importance. Edgeoscopy & Poroscopy: Significance in personal identification. Lip Prints-Introduction- Nature, collection and examination of lip prints, Application in crime detection. Ear Prints- Introduction- History- Morphology of ear – Ear prints location- Producing standards from suspects- Identification and comparison. Foot prints- Gait pattern analysis, Determination of personality by gait analysis.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Lee and Gaensleen's and R.S. Ramotowski (2013), "Advances in Fingerprint Technology" (Ed.), CRC Press, Boca Raton, 3rd Edition
2. Surinder Nath (2010), "Fingerprint Identification", Shiv Shakti Book Traders.
3. David R. Ashbaugh (1999), "Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology", CRC Press, Boca Raton, 1st Edition.

Reference Books

1. Christophe Champod, Chris Lennard, Pierre Margot, And Milutin Stoilovic (2004), "Fingerprints and Other Ridge Skin Impressions", CRC Press, Boca Raton London New York Washington, D.C.
2. C. Champod, C. Lennard, P. Margot an M. Stoilovic (2004), "Fingerprints and other Ridge Skin Impressions", CRC Press, Boca Raton
3. William J Bodziak (1999), "Footwear impression evidence, detection, recovery and examination", CRC Press, Boca Raton, 2nd Edition.
4. S.H. James and J.J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
5. W.G. Eckert and R.K. Wright (1997), "Introduction to Forensic Sciences", CRC Press, Boca Raton, 2nd edition.
6. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "Henry Lee's Crime Scene Handbook", Academic Press, USA, 1st edition.
7. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th edition.
8. W.J. Tilstone, M.L. Hastrup and C. Hald (2013), "Fisher's Techniques of Crime Scene Investigation", CRC Press, Boca Raton.

E-Resources

1. https://www.crime-scene-investigator.net/fingerprintsourcebookchp3.pdf
2. https://gctjaipur.files.wordpress.com/2015/08/advances-in-fingerprint-technology-second-edition-ebook-een.pdf
3. https://www.jstor.org/stable/43953516
4. https://www.google.com/search?q=Fingerprint+identification+by+SurinderNath&oq=Fingerprint
5. +identification+by+SurinderNath&aqs=chrome..69i57j33l2.2579j0j15&sourceid=chrome&ie=UTF-8

Course Outcomes

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

CO1	Explain the basic of fingerprinting
CO2	Explain the formation and preservation of developed fingerprints
CO3	Apply the examination methods for fingerprints
CO4	Identify the various classification system in fingerprints
CO5	Analyze the various impression evidences

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23%	23%
K2	5	16	20	41	41%	41%
K3	-	8	10	18	18%	18%
K4		8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Basics of fingerprinting**	**9 Hours**	**Mode**
	a. Introduction to Fingerprint: Definition, History and development	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Dermatoglyphics, Theory, Fundamental principles of fingerprinting	2	
	c. Biological basis of fingerprints-embryology, morphology and anatomy of dermal skin, friction Skin, Theory of pattern formation	2	
	d. Morphology and anatomy of sweat gland	2	
	e. Chemical constituent of sweat gland	1	
Unit II	**Development of Fingerprints**	**9 Hours**	**Mode**
	a. Fingerprint Development at crime scene	2	PPT, Descriptive Methods, Group discussion
	b. Formation of latent Fingerprint, Constituents of sweat residue.	2	
	c. Development of Fingerprints	2	
	d. Application of light sources in fingerprint detection.	2	
	e. Collection of Fingerprints and Preservation of developed fingerprints.	1	
Unit III	**Fingerprint recording, lifting, identification and individualization**	**9 Hours**	**Mode**
	a. Recording & lifting of Fingerprints	2	PPT, Descriptive Methods, Group discussion
	b. Post-mortem fingerprinting	2	
	c. Conditions affecting the latent prints	2	
	d. Photography of fingerprints with various light sources	2	
	e. Identification and individualization methods for Fingerprints	1	
Unit IV	**Fingerprint Classification**	**9 Hours**	**Mode**
	a. Basic fingerprint patterns and ridge characters	2	PPT, Descriptive Methods, Group discussion
	b. Ridge counting and Ridge tracing	2	
	c. Various Classification system in fingerprints	2	
	d. AFIS- Automated Fingerprint Identification System	2	
	e. FACTS- Fingerprint Analysis and Criminal Tracing System	1	
Unit V	**Other Impressions**	**9 Hours**	**Mode**
	a. Sole prints, Palm prints and their historical importance	2	PPT, Descriptive Methods,
	b. Edgeoscopy & Poroscopy	2	

	c. Lip Prints: Introduction- Nature, collection and examination of lip prints, Application in crime detection	2	Group discussion Brain Storming Activity
	d. Ear Prints: Introduction- History, Morphology of ear, location, Producing standards from suspects, Identification and comparison	2	
	e. Foot prints: Gait pattern analysis, Determination of personality by gait analysis	1	

Course designed by –Mr. Krushna S. Sonawane

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**20UFSC32**	Number of Hours/Cycle	**3**
Semester	**III**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Course VII			
Course Title	**Technological Methods in Forensic Science**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the significance of microscopy in visualizing trace evidence and comparing it with control samples, The importance of chromatographic and spectroscopic techniques in processing crime scene evidence, Advanced Separation and detection techniques in Forensic Science, The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biological materials and UV, IR, NMR and AAS importance and utilization in Forensics.

Unit I	**Microscopic Techniques**	**9 Hours**
	Fundamental principles, Different types of microscopes. Principle, working, mechanism, construction, ray Diagram, application and forensic significance (biological comparison microscope) phase contrast, fluorescent, dark field, polarizing microscope, scanning electron tunnelling microscope, atomic force microscope, Forensic applications of microscopy.	
Unit II	**Basic Separation techniques**	**8 Hours**
	Introduction, types of separation, Paper chromatography- introduction, principle, migration parameters, types of paper chromatography, procedure and applications. Column chromatography- Introduction, principle, working, adsorbents, solvents, factors affects on column efficiency. TLC (Thin Layer Chromatography)-Introduction, principle, stationary phase, mobile phase, solvent system, procedure of development, Rf value, Applications of TLC and HPTLC.	
Unit III	**Advanced Separation and detection technique**	**10 Hours**
	Gas chromatography: principles, instrumentations and working technique, columns, stationary phases, detectors, Forensic applications and limitations. HPLC: Introduction, principle, Instrumentation, working, types of column, detectors, Forensic applications and limitations. Thermal methods- TGA, DTA, DSC- introduction, instrumentation, working, Forensic applications and limitations	
Unit IV	**UV & IR Spectroscopy**	**8 Hours**
	Ultra Violet Spectroscopy- Introduction, working, principle, instrumentation, Lamberts Beer's law, absorption of U.V radiation, Electronic transition. Applications of U.V. Spectroscopy. Infra-Red Spectroscopy: Introduction, Principle of I.R. Spectroscopy, Fundamental modes of vibrations Types of vibrations, Application of I.R. Spectroscopy.	
Unit V	**NMR & AAS Spectroscopy**	**10 Hours**
	NMR- Spectroscopy: Introduction, Theory of NMR, instrumentation, working, principle, Applications and Numerical problems based on NMR. Atomic Absorption and Emission Spectroscopy- Introduction, principles, Instrumentation and working, Forensic applications and limitations.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Willard (1986), "Instrumental Methods of Analysis", CBS Publishers & Distributors, 7th Edition.
2. Douglas A. Skoog /F. James Holler/Stanley R. Crouch (2017), "Principles of Instrumental Analysis", Cengage Learning, USA, 7th Edition

Reference Books

1. D.A. Skoog, D.M. West and F.J. Holler (1992), "Fundamentals of Analytical Chemistry", Saunders College Publishing, Fort Worth, 6th Edition,
2. W. Kemp (1991), "Organic Spectroscopy", Macmillan, Hampshire, 3rdEdition,
3. J.W. Robinson (1995), "Undergraduate Instrumental Analysis", Marcel Dekker, Inc., New York, 5th Edition

E-Resources

1. https://www.sciencedirect.com/science/article/pii/B9780123705198000092?via%3Dihub
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7182842/
3. https://research-repository.griffith.edu.au/
4. https://www.jeol.co.jp/en/products/nmr/basics.html
5. https://books.google.co.in/books?id=D13EDQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Course Outcomes

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

CO1	Infer the difference types and Techniques of microscope
CO2	Interpret the basic Separation Techniques
CO3	Make use of advance instrumentation and working technique for Separation and detection
CO4	Identify the principals of U.V and I.R .Spectroscopy
CO5	Examine the application of atomic absorption and Emission spectroscopy

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Questions	No. of Questionss
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	16	10	31	31%	31%
K2	5	8	20	33	33%	33%
K3	-	8	10	18	18%	18%
K4		8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Microscopic Techniques**	**Hours**	**Mode**
	a. Fundamental principles, Different types of microscopes	2	PPT, Descriptive Methods, Group discussion
	b. Principle, working, mechanism, construction,	2	
	c. Ray Diagram, application and forensic significance	2	
	d. Different types of microscopes	2	
	e. Forensic applications of microscopy	1	
Unit II	**Basic Separation techniques**	**Hours**	**Mode**
	a. Introduction, types of separation,	2	PPT, Descriptive Methods, Group discussion
	b. Paper chromatography	1	
	c. Column chromatography	2	
	d. TLC (Thin Layer Chromatography	2	
	e. Applications of TLC and HPTLC.	1	
Unit III	**Advanced Separation and detection technique**	**Hours**	**Mode**
	a. Gas chromatography	2	PPT, Descriptive Methods, Group discussion
	b. HPLC	2	
	c. Thermal methods- TGA	2	
	d. DTA	2	
	e. DSC	2	
Unit IV	**UV & IR Spectroscopy**	**Hours**	**Mode**
	a. Ultra Violet Spectroscopy- Introduction, working, principle, instrumentation	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Lamberts Beer's law, absorption of U.V radiation, Electronic transition	1	
	c. Applications of U.V. Spectroscopy.	2	
	d. Infra-Red Spectroscopy: Introduction, Principle of I.R. Spectroscopy	2	
	e. Fundamental modes of vibrations Types of vibrations, Application of I.R. Spectroscopy.	1	
Unit V	**NMR & AAS Spectroscopy**	**Hours**	**Mode**
	a. NMR- Spectroscopy: Introduction, Theory of NMR, Principle and working,	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Applications and Numerical problems based NMR	2	
	c. Atomic Absorption and Emission Spectroscopy- Introduction, principles	2	
	d. Instrumentation and working of Atomic Absorption and Emission Spectroscopy	2	
	e. Forensic applications and limitations	2	

Course designed by –Mr. Krushna S. Sonawane

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSC33**	Number of Hours/Cycle	**3**
Semester	**III**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Course VIII			
Course Title	**Indian Laws**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the significance of The code of criminal procedure, 1973, The fundamental principles and functions of the code of criminal procedure, 1973, The significance of The Indian Evidence Act, 1872, The fundamental principles and functions of The Indian Evidence Act, 1872, Demonstration activities on Indian Laws.

Unit I	**The Code of Criminal procedure, 1973**	**9 Hours**
	Criminal justice system: The basic principles of criminal justice system; Constitutional perspectives - Articles 14, 20, 21 and 22; The rationale of criminal procedure; Salient features of the Criminal Procedure Code, 1973, Constitution of criminal courts and the significance of the segregation of magistrates into judicial and executive magistrates categories under the code, Important definitions: Investigation, first information, complaint, inquiry, charge, trial, summons and warrant cases, discharge and acquittal, appeal, revision and reference.	
Unit II	**Investigation proceedings**	**9 Hours**
	Initiation of investigation proceedings (Secs. 154-157), Interrogation powers of police officer (Secs.160and 161), Evidentiary value of FIR and statements made to police officer (Sec. 162 of cr.p.c) Recording of confessions and statements (Sec. 164), Inquest proceedings (Secs. 174-176).General principle of jurisdiction of criminal courts (Sec. 177), Exceptions to the principle (Secs. 178-188), The Charge, Bail provisions (Secs. 436-450). Trial before a court of session (Secs. 225-237) Provisions as to accused persons of unsound mind (Secs. 328-339).	
Unit III	**The Indian Evidence Act, 1872**	**9 Hours**
	The Introduction and The main features of the Indian Evidence Act, 1872.Central conceptions in law of evidence: Facts: Sec. 3, Presumption (Sec. 4),The Doctrine of res gestae (Secs. 6,7,8), Test identification parade(Sec. 9), Evidence of common intention (Sec. 10), The problems of relevancy of "Otherwise" irrelevant facts (Sec. 11), Proof of custom (Sec. 13), confessions caused by , "any inducement, threat or promises" (Sec. 24), Inadmissibility of confession made before a police officer, (Sec. 25),Dying declarations: The justification for reliance on dying declarations (Sec. 32),Expert testimony:45, Oral evidence: general principles concerning Oral evidence (Secs. 59-60)	
Unit IV	**Credibility of Evidence**	**9 Hours**
	General principles concerning documentary evidence, primary and secondary evidence, (Secs. 61-66) Public document and private document (Secs. 74-78). Examination of witnesses, Competency to testify (Secs. 118-122), Leading Questions (Secs 141-143), Lawful Questions in Cross-Examination (Sec. 146), Hostile witness (Sec.154), Impeaching of the standing the credit of witnesses (Sec. 155), refreshing the memory (Sec. 164), The	

	general conception of burden of proof (Secs. 101-104).	
Unit V	**Practicals**	**9 Hours**
	7. To write report on Current Judicial System 8. To visit the regional forensic laboratories 9. To perform the comparison of given physical evidences. 10. To study the Historical case sessions that change overview of judicial system 11. To Visit District/ Session court **Unit V has to be conducted as practical.**	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Ratanlal & Dhirajlal (2019), "The code of criminal procedure", Lexis Nexis publisher, New Delhi, 22nd Edition.
2. The Code of Criminal procedure (1973), "Bare Act", Universal Law Publishing, New Delhi.
3. The Evidence Act (1872), "Bare Act", Universal Law Publishing, New Delhi.

References Books

1. K.D. Gaur (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi, 7th Edition.
2. Ratanlal and Dhirajlal (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi, 36th Edition.
3. R.V.Kelkar's (2016), "The Criminal Procedure Code", Eastern Book Company, Delhi, 6th Edition.
4. M.C.Thakker and C.K.Thakker (2014), "Criminal Procedure", LexisNexis Publisher, New Delhi, 4th Edition.
5. BatukLal (2017), "The Law of Evidence", Thomson Reuter's publishers, 7th Edition.

E-Resources

1. www.gutenberg.org.com
2. www.libray.law.uiowa.edu.com
3. google play store.app.indian Bare Acts
4. www.legalserviceindia.com
5. www.delhihighcourt.nic.in.

Course Outcomes

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

CO1	Interpret the silent features of The Criminal Procedure Code
CO2	Outline the Initiation of Investigation proceeding
CO3	Identify the features of The Indian Evidence Act 1872
CO4	List out the admissible evidences in courts
CO5	Analyse the historical case session that change overview of judicial system

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	8	10	23	23%	23%
K2	5	16	20	41	41%	41%
K3	-	8	10	18	18%	18%
K4		8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**The Code of Criminal procedure, 1973**	**9 Hours**	**Mode**
	a. Criminal justice system: The basic principles of criminal justice system	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Constitutional perspectives - Articles 14, 20, 21 and 22	2	
	c. Salient features of the Criminal Procedure Code 1973	2	
	d. Constitution of criminal courts and the significance of the segregation of magistrates into judicial and executive magistrates	2	
	e. Important definitions: Investigation, first information, complaint	1	
Unit II	**Investigation proceedings**	**9 Hours**	**Mode**
	a. Initiation of investigation proceedings	2	PPT, Descriptive Methods, Group discussion
	b. Interrogation powers of police officer	2	
	c. Evidentiary value of FIR and statements made to police officer	2	
	d. General principle of jurisdiction of criminal courts	2	
	e. Exceptions to the principle	1	
Unit III	**The Indian Evidence Act, 1872**	**9 Hours**	**Mode**
	a. The Introduction and The main features of the Indian Evidence Act, 1872	2	PPT, Descriptive Methods, Group discussion
	b. Central conceptions in law of evidence	2	
	c. Inadmissibility of confession made before a police officer	2	
	d. Dying declarations: The justification for reliance on dying declarations	2	
	e. Oral evidence: general principles	1	
Unit IV	**Credibility of Evidence**	**9 Hours**	**Mode**
	a. General principles concerning	2	PPT, Descriptive Methods, Group discussion
	b. Public document and private document	2	
	c. Examination of witnesses, Competency to testify	2	
	d. Impeaching of the standing the credit of witnesses	2	
	e. The general conception of burden of proof	1	
Unit V	**Practicals**	**9 Hours**	**Mode**
	a. To write report on Current Judicial System	2	PPT, Brain Storming Activity Group discussion
	b. To visit the Regional Forensic Science Laboratories	2	
	c. To perform the comparison of given physical evidences.	2	
	d. To study the Historical case sessions that change overview of judicial system	2	
	e. To Visit District/ Session court	1	

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSC3P**	Number of Hours/Cycle	**3**
Semester	**III**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Practical II			
Course Title	**Forensic Dermatoglyphics and Technological Methods in Forensic Science**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to gain the Practical knowledge about Fingerprint examination, Hands-on about Fingerprint Examinations, Physical, Chemical methods of Development of Fingerprints, Fingerprint identification, individualization and classifications, Application of TLC in various Forensic Science related cases.

List of the Practicals

Forensic Dermatoglyphics:

1. Recording of plain Fingerprint.
2. Recording of rolled Fingerprint.
3. Identification of various Fingerprint patterns.
4. Analysis of palm prints.
5. Classification of Fingerprint according to Henry's Classification.
6. Ridge counting of Fingerprint.
7. Ridge tracing of Fingerprint.
8. Ridge density of Fingerprint.
9. Development of fingerprint on glass surfaces by using powder method.
10. Development of fingerprint on plastic surfaces by using powder method.
11. Development of fingerprint by using Ninhydrin, Iodine Fuming.
12. Development of fingerprint by using SPR method, Silver Nitrate Solution.
13. Examination and comparison of Fingerprints by using different types of comparison methods.
14. Study of lip prints.

Technological Methods in Forensic Science:

15. Examination of fire arson cases by TLC.
16. Verification of Lamberts Beer's law.
17. Examination of hair, cloth, threads Sample by using Comparison Microscope.
18. Examination of various samples countered in various cases by using TLC.
19. (5 Practicals).

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**20UFSA31**	Number of Hours/Cycle	**4**
Semester	**III**	Max. Marks	**100**
Part	**III**	**Credit**	**4**
Allied Course- III			
Course Title	**Fundamentals of Zoology to Forensic Science**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the knowledge on taxonomy of animals, Structure and function of prokaryotic cell, morphology of bacteria, Structure and functions of the cell organelles, Immunology, Genetics laws and hereditary disorders, Structure and function of genetic materials and its biotechnological applications, Developmental biology and Biotechnology.

Unit I	**Taxonomy**	**12 Hours**
	Definition, Principles of classification, Grades of Organization, Symmetry and Coelom, Binomial nomenclature - Outline classification of Animal kingdom up to class level with example - Flow chart only. **General characters** of the following phyla: i) Protozoa, ii) Porifera, iii) Coelenterata, iv) Platyhelminthes, v) Nematoda, vi) Annelida, vii) insects viii) Mollusca, ix) Echinodermata, x) Prochordata, xi) Pisces and Amphibia, xii) Reptilia, xiii) Aves, xiv) Mammalia.	
Unit II	**Cell biology and Immunology**	**12 Hours**
	Structure of a prokaryotic cell (*E. coli*) - Structure of T_4 Phage - Structure and functions of the following cell organelles: Cell membrane – Mitochondria – Nucleus – Ribosome. Lymphoid organs Primary (Thymus, Bone marrow) and secondary (Spleen, lymph nodes) - Immunoglobulin: IgG – structure & functions - Antigen – antibody reaction.	
Unit III	**Biochemistry and Physiology**	**12 Hours**
	Classification and structure of Carbohydrates.(Mono, Di, Polysaccharides with one example each) - Classification and structure of proteins with examples (primary, secondary, tertiary, and quaternary structure) - Classification and Structure of Lipids with examples; Digestion of Carbohydrates, Protein, and Lipids - Mechanism of respiration and Transport of gases - Structure of Nephron and Formation of urine.	
Unit IV	**Genetics and Molecular biology**	**12 Hours**
	Mendel's Laws – Mono and Dihybrid crosses - Multiple Allele (ABO & Rh blood grouping) - Sex linked inheritance in Man. Structure and functions of DNA - Structure and functions of RNAs (t RNA, m RNA, and r RNA) - DNA replication, Protein synthesis.	
Unit V	**Developmental biology and Biotechnology**	**12 Hours**
	Structure of sperm and ovum in Human – Fertilization; Assisted Reproductive Technology – IVF, IUF, AI, Sperm Bank, Test tube baby methods. Enzymes and Vectors - Recombinant DNA - Construction and applications - Transgenic animals – Dolly – Methods and Applications DNA finger printing – Methods and Applications – Ethical issues.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Jason H. Byrd and James L. Castner (2001), "Forensic Entomology", CRC Press, Boca Raton.
2. Benjamin Lewin (2017), "Lewin's XII Genes", Pearsons Prentice hall, Pearson Education, Inc., 12th Edition.
3. Keith Wilson and John Walker (2002), "Principales and Techniques of biochemistry and Molecular biology", Cambridge University press, U.K, 7th Edition.
4. Jenni Punt, Sharon Stranford, Patricia Jones and Judith A Owen (2018), "Kuby Immunology", WH Freeman, 8th Edition.
5. Dr. R C Dubey (2014), "A Textbook of Biotechnology", S. Chand Company & Pvt. Ltd, 5th Edition.

Reference Books

1. L. Stryer (1988), "Biochemistry", W.H. Freeman and Company, New York, 3rd Edition.
2. Richard Li (2015), "Forensic Biology", CRC Press, Boca Raton, 2nd Edition.
3. Avinash Upadhyay, Kakoli Upadhyay (2005), "Basic Molecular Biology", Himalaya Publishing House, 1st Edition.
4. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell (1993), "Harper's Biochemistry", APPLETON & Lange, Norwalk.
5. S. Chowdhuri (1971), "Forensic Biology", BPRD, New Delhi.
6. M.K. Bhasin and S.M.S Chahal (1996), "A Laboratory Manual for Human Blood Analysis", New Delhi house press, Delhi.
7. William Goodwin, Adrian Linacre, Sibte Hadi (2010), "An Introduction to Forensic Genetics", Wiley, 2nd Edition.
8. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th Edition.

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2. https://www.youtube.com/nptel.biology
3. https://www.youtube.com/nptelhrd.immonology
4. https://www.youtube.com/nptelhrd.biochemistry
5. https://www.youtube.com/nptelhrd.genetics
6. https://www.youtube.com/nptelhrd.biotechnology

Course Outcomes

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

CO1	Explain the principals of classification to animal kingdom
CO2	Infer the structure and function of cell organelle
CO3	Identify the classification and structure of Carbohydrates, protein, and lipids
CO4	Analyze the structure and function of DNA
CO5	Examine the methods and application in DNA fingerprinting

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2(K1&K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2(K1&K1)	1(K2)
3	CO3	Up to K2	2	K1&K2	2(K2&K2)	1(K1)
4	CO4	Up to K3	2	K1&K2	2(K3&K3)	1(K3)
5	CO5	Up to K4	2	K1&K2	2(K4&K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	16	20	41	41%	41%
K2	5	8	10	23	23%	23%
K3	-	8	10	18	18%	18%
K4		8	10	18	18%	18%
Total Marks	10	40	50	100	100%	100%

Lesson Plan

Unit I	**Taxonomy**	**Hours**	**Mode**
	a. Definition, Principles of classification, Grades of Organization, Symmetry and Coelom	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Binomial nomenclature - Outline classification of Animal General Characters of the following phyla: i) Protozoa, ii) Porifera, iii) Coelenterata.	3	
	c. General characters of the following phyla: Platyhelminthes, v) Nematoda, vi) Annelida.	3	
	d. General characters of the following phyla: vii) Arthropoda viii) Mollusca, ix) Echinodermata, x) Prochordata.	2	
	e. General characters of the following phyla: xi) Pisces and Amphibia, xii) Reptilia, xiii) Aves, xiv) Mammalia.	1	
Unit II	**Cell Biology and Immunology**	**Hours**	**Mode**
	a. Structure- prokaryotic cell (*E. coli*) and T_4 Phage	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Structure and functions: Cell membrane, Mitochondria, Nucleus, Ribosome. and secondary (Spleen, lymph nodes) - Immunoglobulin: IgG – structure & functions - Antigen – antibody reaction.	3	
	c. Primary and secondary lymphoid organs	3	
	d. Immunoglobulin: Structure & function	2	
	e. Antigen-Antibody reaction	1	
Unit III	**Biochemistry and Physiology**	**Hours**	**Mode**
	a. Classification, structure and digestion of Carbohydrates with examples	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Classification, structure and digestion of proteins with examples	3	
	c. Classification, structure and digestion of Lipids with examples	3	
	d. Mechanism of respiration and Transport of gases	2	
	e. Structure of Nephron and Formation of urine	1	
Unit IV	**Genetics and Molecular Biology**	**Hours**	**Mode**
	a. Mendel's Laws, Mono and Dihybrid crosses	3	PPT, Descriptive Methods, Group discussion
	b. Multiple Allele and Sex linked inheritance in Man.	3	
	c. Structure and functions of DNA	3	
	d. Structure, types and functions of RNA	2	
	e. DNA replication and Protein synthesis	1	
Unit V	**Developmental Biology and Biotechnology**	**Hours**	**Mode**
	a. Structure of sperm and ovum in Human and fertilization process.	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Assisted Reproductive Technology – IVF, IUF, AI, Sperm Bank, Test tube baby methods.	3	
	c. Recombinant DNA Technology- Enzymes and vectors	3	
	d. Recombinant DNA Technology- Construction and applications of transgenic animals.	2	
	e. Methods and Applications and ethical issues concerning DNA finger printing	1	

Course designed by Ms. Aswetha Iyer

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**20UFSS31**	Number of Hours/Cycle	**2**
Semester	**III**	Max. Marks	**50**
Part	**IV**	**Credit**	**2**
Skill Based Course I			
Course Title	**Advanced Forensic Science**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the fundamental principles on which the science of Crime Scene, Crime Reconstructions is based, Importance of Crime Scene Reconstruction in Forensics, Techniques and methods of Crime Scene Reconstruction. Blood Stain Pattern Analysis, The Forensic Significances of Blood Stain Pattern Analysis, Demonstration of Crime Scene Reconstruction and Blood Stain Pattern Analysis.

Unit I	**Crime Reconstruction (CR)**	**6 Hours**
	A history of crime reconstruction , Ethics in CR, Observer effects and examiner bias, Psychological influence on the forensic examiner, Recommendation to blunt observer effects, Standards for the reconstruction of crime, Science of crime reconstruction, Methods of crime reconstruction, Evidence role in reconstruction, Creation of timelines, Mind mapping, Part charting (flow diagram) the crime scene, The nature of reconstruction, Evidence dynamics, Pre-discovery(offender action, victim actions, witness weather/climate, decomposition, insect activity, animal predation, fire) Post-discovery (failure to search recovery, evidence technicians, medical examiner, premature scene cleanup, packaging, transportation, storage and chain of custody).	
Unit II	**Crime Scene Reconstruction (CSR)**	**6 Hours**
	Theoretical and practical concept of crime scene analysis: Fundamental beliefs, theories, principles of CSR, scientific method, facts at scene of crime and relation with evidences. Practical methodology for crime scene reconstruction. Resolving significant investigative questions in CSR. Protocols role in reconstruction.	
Unit III	**Bloodstain Pattern Analysis**	**6 Hours**
	Introduction, Terminologies and classification, Biological and physical properties of human blood, Reconstruction using bloodstains, Droplet Dynamics in Flight and on Impact, Droplet Directionality from bloodstain patterns, Determination of Point of Convergence and Point of Origin. Impact spatter and mechanisms. Altered bloodstain Documentation and Evaluation of bloodstain evidence. Importance and Legal aspects of BPA. Bloodstain Pattern Analysis to crime scene reconstruction. Manual and Computer-assisted reconstruction of BPA	
Unit IV	**Reconstruction of motor accident, firing, post blast cases, fire**	**6 Hours**
	Reconstruction of motor accident, firing, post blast cases, fire. Collection of data (videography photography, measurements, analysis of data) Writing of CSR reports, court room testimony.	

Unit V	Practicals	6 Hours
	1. Reconstruction and evaluation of various scenes of crime. 2. To study crime scene reconstruction methods. 3. To perform rough/ final sketching of crime scene 4. Reconstruction of an old crime scene. 5. Collection and examination blood stain. 6. Analysis of blood stains patterns. **Unit V has to be conducted as practical.**	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. S.H. James and J. J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
2. K.S. Narayan Reddy and O. P. Murty (2017), "The Essentials of Forensic Medicine and Toxicology", Jaypee Brothers Medical Publishers, 34th Edition.
3. Ross M. Gadner and tom Bevel (2009), "Practical Crime Scene Analysis and Reconstruction", CRC Press, Boca Raton.

Reference Books

1. W.G. Eckert and R. K. Wright (1997), "Introduction to Forensic Sciences", CRC Press, Boca Raton, 2nd edition.
2. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "Henry Lee's Crime Scene Handbook", Academic Press, USA, 1st edition.
3. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th edition.
4. W.J. Tilstone, M. L. Hastrup and C. Hald (2013), "Fisher's Techniques of Crime Scene Investigation", CRC Press, Boca Raton.
5. Ross M.Gardner & Donna Krouskup (2018), "Practical Crime Scene Processing and Investigation", CRC Press, Boca Raton**,** 3rd Edition.
6. Barry A J Fisher and David R. Fisher (2012), "Technique of crime scene investigation", CRC Press, Boca Raton, 8th Edition.

E-Resources

1. https://stidhamreconstruction.com/wp-content/uploads/2014/03/Crime-Scene-Reconstruction.pdf
2. https://www.google.com/search?q=Fingerprint+identification+by+SurinderNath&oq=Fingerprint
3. identification+by+SurinderNath&aqs=chrome..69i57j33l2.2579j0j15&sourceid=chrom
4. http://www.istl.org/03-spring/internet.html
5. https://www.nist.gov/system/files/documents/forensics/Crime-Scene-Investigation.pdf

Course Outcomes

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

CO1	Infer the ethics of Crime Reconstruction
CO2	Interpret the practical concept of Crime Scene Analysis
CO3	Make use of Terminologies and classification Bloodstain pattern Analysis
CO4	Examine the Forensic case studies related to Accident
CO5	Take part in collecting and examining various crime scene

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**	**Section B**
			Either/ or Choice	**Open Choice**
			No. of Question	**No. of Questions**
1	CO1	Up to K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2(K1&K1)	1(K2)
3	CO3	Up to K2	2(K2&K2)	1(K1)
4	CO4	Up to K3	2(K3&K3)	1(K3)
5	CO5	Up to K4	2(K4&K4)	1(K4)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total marks for each Section			15	15

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (Either/or)	Section B (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	12	10	22	40%	40%
K2	6	5	11	20%	20%
K3	6	5	11	20%	20%
K4	6	5	11	20%	20%
Total Marks	30	25	55	100%	100%

Lesson Plan

Unit I	**Crime Reconstruction (CR)**	**6 Hours**	**Mode**
	a. Crime reconstruction- History and Ethics	1	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Crime reconstruction- Standards, Science, Nature and Methods	1	
	c. Crime reconstruction- Evidence, timelines, Mind mapping, part charting	1	
	d. Psychological influence on the forensic examiner- Observer effects, examiner bias and recommendation to blunt observer effects	2	
	e. Pre-discovery and Post-discovery	1	
Unit II	**Crime Scene Reconstruction (CSR)**	**6 Hours**	**Mode**
	a. Theoretical and practical concept of crime scene analysis	1	PPT, Descriptive Methods, Group discussion
	b. Principles and Protocols of CSR	1	
	c. Facts at scene of crime and relation with evidences	1	
	d. Practical methodology for crime scene reconstruction. Resolving significant investigative questions in CSR	2	
	e. Protocols role in reconstruction.	1	
Unit III	**Bloodstain Pattern Analysis**	**6 Hours**	**Mode**
	a. Human Reconstruction-Introduction, Terminologies and classification	1	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Human Reconstruction- Biological and physical properties	1	
	c. Impact spatter and mechanisms	1	
	d. Altered bloodstain Documentation and Evaluation of bloodstain evidence	2	
	e. Importance, legal aspects and Manual and Computer-assisted reconstruction	1	
Unit IV	**Reconstruction of motor accident, firing, post blast cases, fire**	**6 Hours**	**Mode**
	a. Reconstruction of motor accident.	1	PPT, Descriptive Methods, Group discussion
	b. Reconstruction of firing.	1	
	c. Reconstruction of post-blast cases and fire.	1	
	d. Collection and analysis of data	2	
	e. Writing of CSR reports and court room testimony.	1	
Unit V	**Practicals**	**6 Hours**	**Mode**
	a. Reconstruction and evaluation of various scenes of crime.	1	PPT, Descriptive Methods, Group discussion
	b. To study crime scene reconstruction methods.	1	
	c. To perform rough/ final sketching of crime scene	1	
	d. Reconstruction of an old crime scene.	2	
	e. Analysis of blood stains patterns	1	

Course designed by –Mr. Krushna S. Sonawane

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSC41**	Number of Hours/Cycle	**3**
Semester	**IV**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Course IX			
Course Title	**Forensic Chemistry**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the methods of analyzing trace amounts of petroleum products in crime scene evidence, The methods of analyzing contaminants in petroleum products, Beverages, The method of searching, collecting, preserving and analyzing arson evidence, The techniques of locating hidden explosives, Provisions related to Petroleum Act, Explosive Substances, Food Adulterations, Narcotic Drugs & Psychotropic Substances Act, Drug and Cosmetics Act.

Unit I	**Introduction to Forensic Chemistry, Arson and Pesticides**	**9 Hours**
	Introduction to Forensic Chemistry – Types of cases – Preliminary Screening – Presumptive Tests (color/spot tests) Examination procedure by Standard methods- Significance of Forensic Chemistry. Chemistry of fire – Fire triangle- Definition Arson – Nature of Fire – Collection and preservation of fire/ arson Evidences – Evaluation of Evidences – Causes of Fire – Chemical analysis of Arson residues – Analysis of fire debris- Information from smoke staining. Instrumental methods of analysis. Pesticides: Introduction, Classification, synthesis of DDT, Malathion, BHC, Parathion, applications. Analysis of soil.	
Unit II	**Examination of Petroleum products & Food adulteration**	**9 Hours**
	Examination of Petroleum products – Distillation and fractionation – Standard methods of analysis of petroleum products – Adulteration of petrol – Various fractions and their commercial use. Food adulteration: Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material cases. Sampling of food, Determination of moisture, ash, pH and Sodium chloride, Butter-water, salt, curd, lactose, fat, ash.	
Unit III	**Explosives**	**9 Hours**
	Introduction to Explosives – Definition of explosives- Classification- Low explosives and high explosives. Military explosives. Blasting agents. Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Blast waves. Bomb scene management. – Composition of explosive components– Explosive Devices – Improvised Explosive devices – Country made explosive and material used - Investigation of explosives - Identification of hidden explosives – Approach to SOC – Post blast Residues Collection – Systematic Analysis of Explosive – Profiling & evaluation of explosives – Disposal of IEDs.	
Unit IV	**Beverages**	**9 Hours**
	Beverages: Composition and analysis of alcoholic and non alcoholic beverages – country made liquor – illicit liquor – classification of alcoholic beverages – Toxic kinetics of alcohol –	

	Effects of alcohol – Collection of samples for identification of alcohols – Chemical & physical tests and evaluation – common adulterants and toxic substances in alcoholic beverages – Breath analysers – Blood alcohol content (BAC).	
Unit V	**Legal Provisions related to Forensic Chemistry**	**9 Hours**
	Petroleum act – BIS - Central excise act. Explosives act & Explosive substances act. Prevention of Food Adulteration Act 1954 (Definition, Power of Food Inspector, Offences and Penalties). Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation, Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties). Drugs & Cosmetics Act 1945 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics, Offenses and Penalties), Arson cases.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. J.D. DeHaan (1991), "Kirk's Fire Investigation", Prentice Hall, New Jersey, 3rd Edition
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau (1995), "Scientific Evidence in Civil and Criminal Cases", The Foundation Press, Inc., New York, 4th Edition.
3. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th Edition
4. Parikh C.K (1999), "Text Book of Medical Jurisprudence Forensic Medicines and Toxicology", CBS Pub. New Delhi.
5. Balraj S. Parmar et.al (2004), "Pesticide Formulation", CBS Publishers, New Delhi.
6. Settle F. A (1997), "Handbook of Instrumental Technique for Analytical Chemistry", Prentice Hall.

Reference Books

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's (2013), "Techniques of Crime Scene Investigation", CRC Press, Boca Raton.
2. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik (2013), "Forensic Science", D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester.
3. Willard (1986), "Instrumental Methods of Analysis", CBS Publishers & Distributors, 7th Edition.
4. K.D. Gaur, (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi, 7th Edition.
5. Ratanlal and Dhirajlal (2020), "The Indian Penal Code", LexisNexis Publisher, New Delhi,36th Edition
6. R.V.Kelkar's (2016), "The Criminal Procedure Code", Eastern Book Company, Delhi, 6th Edition.
7. The Code of Criminal procedure (1973), "Bare Act", Universal Law Publishing, New Delhi.
8. The Evidence Act (1872), "Bare Act", Universal Law Publishing, New Delhi.

E-Resources

1. www.sciencedirect.com
2. www.onlinelibrary.wiley.com
3. www.nicfs.gov.in
4. www.chem.libretexts.org
5. www.britannica.com

Course Outcomes

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

CO1	Explain the significances of forensic chemistry
CO2	Illustrate the standard methods of analysis of petroleum products and commercial products
CO3	Identify the Classification of Explosives
CO4	Categories the types of beverages
CO5	List out the legislative provision related to forensic chemistry

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Questions**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1(K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1(K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1(K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Introduction to Forensic Chemistry, Arson and Pesticides**	**Hours**	**Mode**
	a. Introduction to Forensic Chemistry – Types of cases – Preliminary Screening, Presumptive Tests (color/spot tests)	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Examination procedure by Standard methods, Significance of Forensic Chemistry	2	
	c. Chemistry of fire – Fire triangle- Definition Arson – Nature of Fire	2	
	d. Chemical analysis of Arson residues – Analysis of fire debris	2	
	e. Pesticides: Introduction, Classification, synthesis, applications. Analysis of soil.	1	
Unit II	**Examination of Petroleum products & Food adulteration**	**Hours**	**Mode**
	a. Distillation and fractionation – Standard methods of analysis of petroleum products	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Adulteration of petrol – Various fractions and their commercial use	2	
	c. Introduction, Prevention of food adulteration, Analytical techniques for analysis	2	
	d. Sampling of food, Determination of moisture, ash, pH	2	
	e. Sodium chloride, Butter- water, salt, curd, lactose, fat, ash	1	
Unit III	**Explosives**	**Hours**	**Mode**
	a. Definition of explosives- Classification	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Synthesis and characteristics of TNT, PETN and RDX. Explosion process.	2	
	c. Bomb scene management. – Composition of explosive components– Explosive Devices	2	
	d. Investigation of explosives - Identification of hidden explosives – Approach to SOC	2	
	e. Residues Collection – Systematic Analysis of Explosive	1	
Unit IV	**Beverages**	**Hours**	**Mode**
	a. Composition and analysis of alcoholic and non alcoholic beverages	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. classification of alcoholic beverages	2	
	c. Effects of alcohol – Collection of samples for identification of alcohols	2	
	d. Chemical & physical tests and evaluation – common adulterants and toxic substances in alcoholic beverages	2	
	e. Breath analysers – Blood alcohol content (BAC)	1	
Unit V	**Relevant provision**	**Hours**	**Mode**
	a. Petroleum act – BIS - Central excise act.	2	PPT, Descriptive Methods, Group discussion
	b. Explosives act & Explosive substances act.	2	
	c. Prevention of Food Adulteration Act 1954	2	
	d. Narcotic Drugs & Psychotropic Substances Act 1985	2	
	e. Drugs & Cosmetics Act 1945	1	

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSC42**	Number of Hours/Cycle	**3**
Semester	**IV**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Course X			
Course Title	**Questioned Documents and Handwriting Examination**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the importance of examining questioned documents in crime cases, the tools required for examination of questioned documents, the significance of comparing hand writing samples, the importance of detecting frauds and forgeries by analyzing questioned documents and important features in handwriting identification, Significance of forensic documentation.

Unit I	**Nature and Scope of Questioned Documents**	**9 Hours**
	Definition of questioned documents, Terminology of documents, History of forensic document examination. Classification of documents-procurement of standard admitted/specimen writings-handling and marking of documents-preliminary examination of documents – Types of crimes related to documents – criminal investigation.	
Unit II	**Handwriting Basics**	**10 Hours**
	Handwriting analysis –Definition of Graphology- Basics of Handwriting Identification - Individuality of handwriting - General characteristics of handwriting- Analysis of hand writing-Natural variations and fundamental divergences in handwritings, Tools for Forensic document examination- Basic tools needed for forensic documents' examination: Instrumentation and Principles of Video Spectral Comparator (VSC), Stereoscopic microscopes, ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, electrostatic detection apparatus (ESDA), Simulation and Comparison of Handwriting-Collection of proper standards.	
Unit III	**Disguised writing**	**8 Hours**
	Disguised writing and anonymous letters-Identification of writer-Examination of signatures. Characteristics of forged and genuine signatures. Examination of alterations, erasures, over writings, additions and obliterations. Decipherment of secret writings indented and charred documents. Examination of seal impressions and mechanical impressions.	
Unit IV	**Forgeries and their detection**	**10 Hours**
	Forgeries and their detection. Definition of Forgery, Types of forgeries. Examination of built up documents. Determination of sequence of strokes, physical matching of documents. Examination of black and white, color Xerox copies, carbon copies and fax messages- Identification of type writer writings-identification of type writer, identification of printed matter, various types of printing of security documents, printing of currency notes. Examination of counterfeit currency notes, passports, visa, stamp papers, postal stamps etc.	

Unit V	Document Examination	8 Hours
	Determining the age and relative age of documents. Determination of age of documents by examination of signatures, paper, ink writing/signatures etc. Examination of computer printouts- dot matrix, ink jet and laser printers, electronic type writers, credit cards, E-documents, digital signatures. Opinion writing, Questioned Document and Handwriting Expert, Reasons for opinion and court testimony.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Wilson R. Harrison (1981), "Suspect Documents: Their Scientific Examination", Nelson-Hall.
2. Albert S. Osborn (1974), "Questioned document", Nelson-Hall, Inc, 2nd Edition.
3. R.N. Morris (2000), "Forensic Handwriting Identification: Fundamental Concepts and Principles", Academic Press, London.
4. E. David Hants (1997), "The Scientific Examination of Documents – Methods and Techniques", Taylor & Francis, 2nd Edition.
5. B. R. Sharma (2014), "Forensic Science in Criminal Investigation and Trials", Universal Law Publishing, 5th edition.

Reference Books

1. Jan Seaman Kelly and Brian S. Lindblom (2006), "Scientific Examination of Questioned Documents", CRC Press, Boca Raton, 2nd edition.
2. Katherine M. Koppenhaver (2007), "Forensic Document Examination: Principles and Practice", Humana Press, Kindle Edition.
3. Dr. B. R. Sharma (2016), "Handwriting Forensic", Universal Law Publishing - An imprint of Lexis Nexis, 2nd Edition.
4. O. Hilton (1982), "Scientific Examination of Questioned Documents", CRC Press, Boca Raton.
5. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau (1995), "Scientific Evidence in Civil and Criminal Cases", Foundation Press, New York, 4th Edition.
6. Z. Liu, J.H. Cai and R. Buse (2003), "Handwriting Recognition: Soft Computing and Probabilistic Approach (Volume 133)", Springer Science and Business Media.
7. B S Nabar (2013), "Forensic Science in Crime Investigation", Asia Law House, Hyderabad, 3rd edition.
8. S.H. James and J.J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
9. M.K.Bhasin and S. Nath (2002), "Role of Forensic Science in the New Millennium", University of Delhi, Delhi.
10. M. S. Rao and B. P. Maithil (2013), "Crime Scene Managemnet: A Forensic Approach, Selective and Scientific Books", New Delhi, 2nd edition.

E-Resources

1. https://nha-handwriting.org.uk/handwriting/providing-help/
2. https://www.slideshare.net/eresources
3. http://www.forensicsciencesimplified.org/docs/how.html
4. https://archives.fbi.gov/archives/about-us/lab/forensic-science
5. www.e-pathashala.com

Course Outcomes

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

CO1	Outline the preliminary examinations of documents
CO2	Explain the natural variations and fundamental divergent in hand witting
CO3	Identify the disguised writing
CO4	Classified and identification various types of forgeries
CO5	Analysis and examine the documents

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K1 & K1)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	16	10	31	31	31%
K2	5	8	20	33	33	33%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Nature and Scope of Questioned Documents**	**9 Hours**	**Mode**
	a. Definition of questioned documents, Terminology of documents	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. History of forensic document examination	2	
	c. Classification of documents-procurement of standard admitted/specimen writings	2	
	d. Handling and marking of documents-preliminary examination of documents	2	
	e. Types of crimes related to documents – criminal investigation	1	
Unit II	**Handwriting Basics**	**10 Hours**	**Mode**
	a. Definition of Graphology- Basics of Handwriting Identification	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Individuality of handwriting - General characteristics of handwriting	2	
	c. Analysis of hand writing- Natural variations and fundamental divergences in handwritings,	2	
	d. Tools for Forensic document examination- Basic tools needed for forensic documents' examination	2	
	e. Simulation and Comparison of Handwriting- Collection of proper standards.	2	
Unit III	**Disguised writing**	**8 Hours**	**Mode**
	a. Disguised writing and anonymous letters- Identification of writer-Examination of signatures	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Characteristics of forged and genuine signatures	1	
	c. Examination of alterations	2	
	d. Decipherment of secret writings indented and charred documents	2	
	e. Examination of seal impressions and mechanical impressions	1	
Unit IV	**Forgeries and their detection**	**10 Hours**	**Mode**
	a. Forgeries and their detection. Definition of Forgery, Types of forgeries	2	PPT, Descriptive Methods, Brain Storming Activity Group
	b. Examination of built up documents	2	
	c. Examination of black and white, color Xerox copies, carbon copies and fax messages		
	d. Identification of type writer writings- identification of type writer, identification of	2	

	printed matter		discussion
	e. Examination of counterfeit	2	
Unit V	**Document Examination**	**8 Hours**	**Mode**
	a. Determining the age and relative age of documents	2	PPT, Brain Storming Activity Group discussion
	b. Determination of age of documents by examination of signatures, paper, ink writing/signatures.	1	
	c. Examination of computer printouts	2	
	d. Questioned Document and Handwriting Expert.	2	
	e. Reasons for opinion and court testimony.	1	

Course designed by –Mr. Krushna S. Sonawane

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSC43**	Number of Hours/Cycle	**3**
Semester	**IV**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Course XI			
Course Title	**Forensic Biology**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to understand the significance of biological and serological evidence, The forensic importance of hair evidence, How wildlife forensics aid in conserving natural resources, How forensic entomology assists in death investigations and Demonstration on various biological evidences handling and processing.

Unit I	**Forensic Biology**	**9 Hours**
	Introduction to Forensic Biology, Developmental History of Modern Forensic Biology, Importance and significances of Forensic Biology, Blood evidences. Forensic Botany: (Introduction history and development) botanical evidence encounter in forensic investigation. Identification and examination of plant derivative (leaves, flower, branches, stem, root, wood, grasses, fruits and seeds) classification of plant specimens and examination. Forensic Palynology: Forensic analysis of pollen grains, algae. Investigation of ornamental, imported, stolen, endangered plants. Dendrography (sandal, teak, red sandal wood). Forensic Limnology (collection of diatoms from drowned body, collection of control sample, extraction, digestion, examination, comparison and identification. Dendrochronology, Application of plant ecology, drugs of abuse Opium, Cannabis, from plants, their illegal farming and trading. Practical- To carry out microscopic examination of diatoms.	
Unit II	**Forensic Microbiology**	**10 Hours**
	Forensic Microbiology: Concept of forensic microbiology, history, introduction to epidemiology, microbial forensic programs (SWGMGF), CDC, case studies, microbes of forensic significance. Types of media: selective, differential, special. Isolation of bacteria of forensic significance, sample collection, growth conditions, and identification, Preservation methods (serial transfer, liquid nitrogen, lyophilization). Biochemical methods for identification of bacteria. Fungi: isolation and identification. Virology: Classification, Structure and cultivation of Animal, plant and human viruses.	
Unit III	**Wildlife Forensics**	**8 Hours**
	Fundamentals of Wildlife Forensic. Significance of wildlife Forensic. Protected and endangered species of animals and plants, Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of pug marks of various animals. Criminal investigation, identification of animals by teeth, claws, ivory, antlers, furs, skins, bitemarks, pugmarks, Identification of blood, excreta, and other visceral samples. Wildlife protection act, endangered species, CITES, Census of wild life population, Smuggling and poaching, crime	

	scene search. Forensic Ornithology: Introduction and overview, Forensic Significances and cases.	
Unit IV	**Forensic Entomology**	**10 Hours**
	Basics of Forensic Entomology, Insects of Forensic importance, Collection of entomological evidence during death investigations. Post Mortem Interval: role of entomology in determination of PMI, Introduction to insects of forensic importance, Determination of PMI, Determining the age of blow fly life cycle stages by ADH/ADD/ isomegalen diagram method. Forensic zoology: (Introduction history and development), Investigation of cases where animals are used in commission of crime. Examine marks on the bodies of victims and identification, examination of animal bite marks.	
Unit V	**Biological Evidences Practicals**	**8 Hours**
	1. Study the Nature and importance and Forensic Significances' of various biological evidences. 2. Comparison and examination of human and animal hair 3. Identification of wood, leaves, pollens and juices as botanical evidence. 4. Study the Diatoms and their forensic significance. 5. To carry out microscopic examination of diatoms and Pollen Grains. **Unit V has to be conducted as practical.**	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. K R Kirtikar B D Basu (2006), "Indian Medicinal Plants - 4 Vols. in 8", M/s Bishen Singh Mahendra Pal Singh.
2. Reba Kanungo (2017), "Ananthanarayan and Paniker's Textbook of Microbiology", Universities Press, 10th Edition.
3. Heather Miller Coyle (2004), "Forensic Botany: Principles and Applications to Criminal Casework", CRC Press, Boca Raton.
4. Jason H. Byrd, James L. Castner (2009), "Forensic Entomology**:** The Utility of Arthropods in Legal Investigations", CRC Press, Boca Raton, 2nd Edition.

Reference Books

1. L. Stryer (1988), "Biochemistry", W.H. Freeman and Company, New York , 3rd Edition.
2. Richard Li (2015), "Forensic Biology", CRC Press, Boca Raton, 2nd Edition.
3. Avinash Upadhyay, Kakoli Upadhyay (2005), "Basic Molecular Biology", Himalaya Publishing House, 1st Edition.
4. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell (1993), "Harper's Biochemistry", APPLETON & Lange, Norwalk.
5. S. Chowdhuri (1971), "Forensic Biology", BPRD, New Delhi.
6. M.K. Bhasin and S.M.S Chahal (1996), "A Laboratory Manual for Human Blood Analysis".
7. William Goodwin, Adrian Linacre, Sibte Hadi (2010), "An Introduction to Forensic Genetics", Wiley, 2nd Edition.
8. M. S. Rao and B. P. Maithil (2013), "Crime Scene Managemnet: A Forensic Approach, Selective and Scientific Books", New Delhi, 2nd edition.

9. B S Nabar (2013), "Forensic Science in Crime Investigation", Asia Law House, Hyderabad, 3rd edition.
10. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th Edition
11. Parikh C.K (1999), "Text Book of Medical Jurisprudence Forensic Medicines and Toxicology" CBS Pub. New Delhi.

E-Resources

1. www.youtube.nptel.channel
2. www.shodhganga.inflibnet.ac.in
3. www.sciencedirect.com
4. www.epgp.inflibnet.ac.in
5. www.traffic.org
6. www.online.forensics.med.ufl.edu

Course Outcomes

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

CO1	Interpret the significances of forensic biology
CO2	Summarized the concept of forensic microbiology
CO3	Identify the fundaments of wildlife forensic
CO4	Examine the forensic Entomology
CO5	Conclude the importance of various entomological Evidences

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up toK2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3

Marks for each Question	1		4	10
Total marks for each Section	10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Forensic Biology**	**Hours**	**Mode**
	a. Forensic Biology: Introduction, Developmental History, Importance, Significances of Forensic Biology and Blood evidences.	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Forensic Botany: Introduction, History and Development.	2	
	c. Botanical evidences: Types, Identification, Examination and Forensic palynology	2	
	d. Forensic Limnology, Dendrography, Dendrochronology	2	
	e. Application of plant ecology, drugs of abuse from plants their illegal farming and trading	1	
Unit II	**Forensic Microbiology**	**Hours**	**Mode**
	a. Forensic Microbiology: Concept of Forensic Microbiology, History, Introduction to epidemiology	2	PPT, Descriptive Methods, Brain Storming Activity
	b. Microbial forensic programs, case studies, microbes of forensic significance	2	
	c. Bacteria and Fungi of Forensic Significance	2	
	d. Virology	2	
	e. Types of media and preservation methods	2	
Unit III	**Wildlife Forensics**	**Hours**	**Mode**
	a. Wildlife Forensics: Fundamentals and Significance.	2	PPT, Descriptive Methods, Brain Storming Activity
	b. Wildlife protection act: Protected and endangered species of animals and plants.	1	
	c. Census of wild life population and CITES	2	
	d. Illegal trading of wildlife: Evidences, Identification of origin, Criminal Investigation, and case studies.	2	
	e. Forensic Ornithology	1	

Unit IV	Forensic Entomology	Hours	Mode
	a. Forensic Entomology: Basics, Insects of Forensic importance and Collection of entomological evidences	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Role of entomology in determination of PMI	2	
	c. Determining the age of blow fly life cycle stages by various methods		
	d. Forensic Zoology: Investigation of cases where animals are used in commission of crime.	2	
	e. Examine marks on the bodies of victims and identification, examination of animal bite marks.	2	
Unit V	**Biological Evidences Practicals**	**Hours**	**Mode**
	a. Study the Nature and importance and Forensic Significances' of various biological evidences.	2	PPT, Brain Storming Activity Group discussion
	b. Comparison and examination of human and animal hair	1	
	c. Identification of wood, leaves, pollens and juices as botanical evidence.	2	
	d. Study the Diatoms and their forensic significance.	2	
	e. To carry out microscopic examination of diatoms and Pollen Grains.	1	

Course designed by –Ms. Aswetha Iyer

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**20UFSC4P**	Number of Hours/Cycle	**3**
Semester	**IV**	Max. Marks	**100**
Part	**III**	**Credit**	**3**
Core Practical III			
Course Title	**Forensic Chemistry and Questioned Documents and Handwriting Examination**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to gain the Practical knowledge about Handwriting examination, Hands-on about Handwriting Examinations, Techniques for forgery detection and identification, Basic tools needed for forensic documents' examination, Application of TLC in various Forensic Science related cases, Bribe trap cases detection, Examination of security features of various documents.

List of the Practical's:

Forensic Chemistry:

1. Separation of Components of ink by using TLC.
2. Separation of Components of Yellow Oleander by using TLC.
3. Detection of contamination of petrol with kerosene by using Filter paper Test.
4. Identification of pesticides by TLC.
5. Detection of Methanol.
6. Phenolphthalein test for Bribe Trap cases.
7. Preliminary examination of Explosives (tests for nitrite, nitrate, thiocynate, chlorate, Thiosulphate, per chlorate, Sulphite and Phosphate etc).

Questioned Document and Handwriting Examination:

8. Study of Handwriting characteristics.
9. Examination of Typewritten documents.
10. Detection of Types of Forgery- Simulation forgery.
11. Detection of Types of Forgery- Traced forgery.
12. Detection of Types of Forgery- Blind Forgery.
13. Examination of security features of Currency Notes.
14. Examination of security features of Plastic Money.
15. Examination of security features of Passports.
16. Examination of Rubber stamps.
17. Examination of secret writing.
18. To study alterations, obliterations and erasures in handwriting samples.

Programme	**B. Sc Forensic Science**	**Programme Code**	**UFS**
Course Code	**20UFSA41**	Number of Hours/Cycle	**4**
Semester	**IV**	Max. Marks	**100**
Part	**III**	**Credit**	**4**
Allied Course IV			
Course Title	**Introduction to Basic Programming Languages**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to learn and understand the concepts of basic Programming Language, Design principles along with understanding of c language, Over view of java Script, HTML, CSS and PHP, Programming language skills in various applications, Demonstration of C, java Script, HTML, CSS and PHP.

Unit I	**C Overview**	**12 Hours**
	History of C Languages , Basics of Programming, Importance of C – Basic structure of C – Programming style – Constants, variables and Data types – Declaration of variables – storage class – defining symbolic constants – declaring a variable as constants – Volatile – overflow and underflow of data. Interpreter and Compiler.	
Unit II	**Overview of Java Script**	**8 Hours**
	Introduction, Syntax, statements, comments, variables, Operators, Data types, Control structure, Function, Array, Errors.	
Unit III	**HTML Overview & CSS Overview**	**12 Hours**
	HTML Basics: Understanding HTML – Setting up the Document Structure – Formatting Text by using Tags. -Using Lists and Backgrounds – Creating hyperlinks and Anchors Style Sheets and Graphics: Introduction to Style sheets. Controlling Image Size and Padding. Layouts: Creating Division Based Layouts – Creating User Forms– Using Frames for Layout – Incorporating Audio and Video.	
Unit IV	**PHP Overview**	**12 Hours**
	Introduction, Environment, Syntax, Variable Types, Constants, Operator Types, Decision Making, Loop, Arrays, String, Web Concepts, Methods, File System, Functions, Cookies, Sessions, Sending Emails, File Uploading.	
Unit V	**Practicals**	**16 Hours**
	1. Write C program to evaluate expressions. 2. Write C program to implement various operators. 3. Write a program in C to Calculate Addition of Three Numbers. 4. Create a Simple web page using HTML basic Tags. 5. Develop an HTML document for a web page of about your Department. Design the page with an attractive background color, text color and background image. 6. Write an example of Style Sheet. 7. Write an HTML document with an example of Ordered List and Unordered List. 8. Write an example of Style Sheet using text, color, and border. 9. Write PHP program to print sum of digits.	

	10. Write PHP program to print factorial of a number.	
Unit V	**Unit V has to be conducted as practical.**	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Balagurusamy E. (2019), "Programming in ANSI C", Tata McGraw Hill Publishing Company, New Delhi, 8th Edition.
2. Rob Larsen (2013), "Beginning HTML and CSS", John Wiley & Sons, U.S.
3. Vikram vaswani (2017), "PHP: A Beginners Guide", Tata McGraw Hill Publishing Company, New Delhi.
4. John Pollock (2013), "JAVA Script, A Beginner's Guide", Tata McGraw Hill Publishing Company, New Delhi.4th Edition.

Reference Books

1. Yashvant Kanetkar (2017), "Let Us C", BPB Publications, New Delhi, 17th Edition.
2. Gottfried, (2006), "Programming with C", Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi.
3. Herbert Schildt (2000), "C: The Complete Reference", THM Edition, New Delhi, 4th Edition.
4. Xavier .C (2007), "World Wide Web Design with HTML", Tata McGraw Hill Publishing Company, New Delhi.
5. Jon Duckett (2011), "HTML and CSS: Design and Build Websites", Wileybpublications, 1st Edition.
6. Jon Duckett (2013), "Web Design with HTML, CSS, JavaScript and jQuery set", Wileybpublications, 1st Edition.
7. Marjin Haverbeke (2011), "Eloquent Javascript", No Starch Press, 4th Edition
8. William McCarty (2001), "PHP 4: A Beginers Guide", Tata McGraw Hill Publishing Company, New Delhi.
9. Steven Holzner (2007), "PHP: The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi.

E- Resources

1. www.Youtube.com. Nptelhrd Channel
2. www.tutorialspoint.com
3. www.Javatpoint.com
4. www.ocw.mit.edu.com
5. www.edx.org.com

Course Outcomes

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

CO1	Infer the importance of C language
CO2	Explain the Functions of Java script
CO3	Identify the Basic of HTML and CSS
CO4	Analysis the types and functions of PHP
CO5	Conclude the importance of various Programming languages

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up toK2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**C Overview**	**12 Hours**	**Mode**
	a. History of C Languages , Basics of Programming, Importance of C	3	PPT, Descriptive Methods, Brain Storming Activity
	b. Basic structure of C – Programming style	3	
	c. Constants, variables and Data types – Declaration of variables	3	
	d. Storage class – defining symbolic constants	2	
	e. Volatile – overflow and underflow of data, Interpreter and Compiler	1	
Unit II	**Overview of Java Script**	**8 Hours**	**Mode**
	a. Introduction, Syntax	2	PPT, Descriptive Methods, Group discussion
	b. Statements, comments, variables	1	
	c. Operators, Data types, Control structure,	2	
	d. Function, Array	2	
	e. Errors	1	
Unit III	**HTML Overview & CSS Overview:**	**12 Hours**	**Mode**
	a. HTML Basics: Understanding HTML	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Setting up the Document Structure – Formatting Text by using Tags	2	
	c. Creating hyperlinks and Anchors Style Sheets and Graphic	2	
	d. Introduction to Style sheets. Controlling Image Size and Padding	3	
	e. Layouts: Creating Division Based Layouts – Creating User Forms– Using Frames for Layout	3	
Unit IV	**PHP Overview**	**12 Hours**	**Mode**
	a. Introduction, Environment, Syntax, Variable Types	3	Descriptive Methods, Brain Storming Activity
	b. Constants, Operator Types, Decision Making	3	
	c. Loop, Arrays, String, Web Concepts	3	
	d. File System, Functions	2	
	e. Cookies, Sessions, Sending Emails, File Uploading.	1	
Unit V	**Practicals**	**16 Hours**	**Mode**
	1. Write C program to evaluate expressions. 2. Write C program to implement various operators. 3. Write a program in C to Calculate Addition of Three Numbers. 4. Create a Simple web page using HTML basic Tags. 5. Develop an HTML document for a web page of about your Department. Design the page with an attractive background color, text color and background image. 6. Write an example of Style Sheet. 7. Write an HTML document with an example of Ordered List and Unordered List. 8. Write an example of Style Sheet using text, colour, and border.	16	PPT, Descriptive Methods, Brain Storming Activity Group discussion

	9. Write PHP program to print sum of digits. 10. Write PHP program to print factorial of a number.		

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code	UFS
Course Code	**20UFSS41**	Number of Hours/Cycle	**2**
Semester	**IV**	Max. Marks	**50**
Part	**IV**	**Credit**	**2**
Skill Based Course Ii			
Course Title	**Forensic Photography and Accident Investigation**		
Cognitive Level		**Up to K4**	

Preamble

To facilitate the students to learn and understand the Basics of Photography and its importance in Forensic Science, Various types of camera, Working of SLR & DSLR Cameras, Scope and significances of photography in various disciplines of forensic science, Basics of Automobiles, Road Terminologies, The Theoretical and Practical Knowledge about Investigation of Motor, Railway and Air Accidents, Demonstrations of Forensic Photography and Accident Investigation.

Unit I	**Photography**	**6 Hours**
	History and development of photography, Definition and basic principles, Camera and its Essential parts, Types of camera, Features of camera ,Working of SLR & DSLR Cameras, Optics and Lenses, Zoom and various types of Photography, Effect of aperture, Shutter speed and ISO on photograph, Manual mode & Auto mode.	
Unit II	**Forensic Photography**	**6 Hours**
	Introduction, Types of Forensic photography, Scope and significances of photography in various disciplines of forensic science- finger prints, foot prints, physics, chemistry, biology, ballistics, computer forensics etc. Crime scene photography, Bloodstain Photography, Photography of Shooting Incidents, Special Photography Scenes, photogrammetry, Digital Imaging , Legal Issues Related to Photographs and Digital Images.	
Unit III	**Basics of Automobiles and Road Terminologies**	**6 Hours**
	Automobiles- Vehicles manufactured in India, Components of automobile, Chassis, body, chassis frame, general assemblies of chassis and their functions, Various identification numbers, Head lights, Tail lights and Indicators, Types of automobiles, Technical terms- wheel base, thread width, turning radius, ground clearance, variants. Safety standards for cars, Suspension system, Steering system, Brake system and testing of brakes, Tire and rims, two stroke and four stroke engines and their comparison. Road Terminologies: Cut, Final Grade, Surface, Existing Grade, Fill, Sub grade, Base, Traffic lane, travelled way, Shoulders, Roadbed, ditch, Ditch slope, Back slope, Fill slope, Interceptor ditch, Slope ratio, Central line, Crown, Super elevation, Road dividers. Road signs, symbols and traffic control mechanisms.	
Unit IV	**Motor, Railway and Air Accidents**	**6 Hours**
	Vehicular accidents: Primary causes of road accident, Types of road accident, Sources of information, eye witnesses, Tire and other marks, Causes and Injuries, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, types of skid marks, Motor vehicle examination, Hit & Run cases, Motor Vehicles Crimes	

	Investigation of rail crash: Introduction, Investigation principles, Best Practices: rail company tests, inspection of driving Cab, examination of electrical/electronic/technological system and their failure, causes of failures, Necessary equipments required for forensic examination. Air Accidents- Introduction, classifications, sources of information, Types of failure, primary steps to investigation, eye witnesses.	
Unit V	**Practicals**	**6 Hours**
	1. To demonstrate Photography with Camera and its Components. 2. To perform Photography using Auto Mode of camera. 3. To perform Photography using Aperture as main component. 4. To perform Photography using Shatter speed as main component. 5. To perform Photography using ISO as main component. 6. To Perform Crime Scene Photography. 7. To examine the road accident cases. 8. Comparative study of technical specifications of various vehicles. 9. To examine skid mark of Vehicles. 10. To perform Physical examination on accidental vehicle. **Unit V has to be conducted as practical.**	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Edward M. Robinson (2010), "Crime Scene Photography", Academic Press is an imprint of Elsevier (AP), London, 2nd Edition.
2. C. P. Nakra (2016), "Basic of Automobile Engineering", Dhapat Rai Publishing Company, New Delhi, 20th Edition.
3. Michel P. Burke (2006), "Forensic Medical Investigation of Motor Vehicle Incidence", Taylor & Francis Inc CRC Press Publishers, 1st Edition.

Reference Books

1. Harold Franck and Darren Frank (2015), "Forensic Engineering Fundamentals", Taylor & Francis Inc CRC Press Publishers, 1st Edition.
2. K. M. Gupta (2002), "Automobile Engineering Vol- I and II, Umesh publications", New Delhi.
3. John Freeman (2010), "Photography The New Complete Guide to Taking photographs", Collins and Brown publisher, London.
4. Helmut Gernsheim (1986), "A concise history of photography", Dove publications, New York, 3rd Edition.
5. Michael Langford (2015), "Basic Photography", Focal Press, Routledge publisher, 10th Edition.

E-Resources

1. www.slideshare.net
2. www.ncbi.nim.nih.gov
3. www.l-tron.com
4. www.allcriminaljusticeschools.com
5. www.shodhganga.inflibnet.ac.in

Course Outcomes

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

CO1	Explain the features of Photography
CO2	Demonstrated the Forensic Photography
CO3	Identify the basic of automobiles
CO4	Analysis the various types of Accidents
CO5	Conclude the importance of Forensic Photography

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	1	1	2	3	3	1	3	1	1	2	1	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High 2. Moderate 3. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**	**Section B**
			Either/ or Choice	**Open Choice**
			No. of Question	**No. of Questions**
1	CO1	Up to K1	2(K1&K1)	1(K1)
2	CO2	Up to K2	2(K2&K2)	1(K2)
3	CO3	Up to K2	2(K2&K2)	1(K1)
4	CO4	Up to K3	2(K3&K3)	1(K3)
5	CO5	Up to K4	2(K4&K4)	1(K4)
No of Questions to be asked			10	5
No of Questions to be answered			5	3
Marks for each Question			3	5
Total marks for each Section			15	15

K1 – Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving problems

K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	6	10	16	29.1	29%
K2	12	5	17	30.9	31%
K3	6	5	11	20	20%
K4	6	5	11	20	20%
Total Marks	30	25	55	100	100%

Lesson Plan

Unit I	**Photography**	**6 Hours**	**Mode**
	a. Photography: History, Development, Definitions, and Basic Principles and types	1	PPT, Descriptive Methods, Brain Storming Activity
	b. Camera: Essential parts, Types, Features	1	
	c. Optics and Lenses	1	
	d. Working of SLR & DSLR Cameras	2	
	e. Effect of aperture, Shutter speed and ISO on photograph, Manual mode & Auto mode.	1	
Unit II	**Forensic Photography**	**6 Hours**	**Mode**
	a. Forensic photography: Introduction, Scope and Significance	1	PPT, Descriptive Methods, Group discussion
	b. Types of Forensic Photography in various disciplines of Forensic Science	1	
	c. Photogrammetry	1	
	d. Digital Imaging	2	
	e. Legal Issues Related to Photographs and Digital Images	1	
Unit III	**Basics of Automobiles**	**6 Hours**	**Mode**
	a. Automobiles: Components, Types and Technical terms	1	PPT, Descriptive Methods, Brain Storming Activity
	b. Chassis: General assemblies and functions	1	
	c. Various identification numbers, Head lights, Tail lights and Indicators	1	
	d. Safety standards for cars	2	
	e. Road Terminologies	1	
Unit IV	**Motor, Railway and Air accidents**	**6 Hours**	**Mode**
	a. Vehicular accidents: Types and Primary causes	1	PPT, Descriptive Methods, Group discussion
	b. Vehicular accidents: Sources of Information and Evidences	1	
	c. Vehicular Accidents: Examination of injuries, Pedestrian impacts, and motor vehicle conditions	1	
	d. Rail accidents	2	
	e. Air accidents	1	
Unit V	**Practicals**	**6 Hours**	**Mode**
	1. To demonstrate Photography with Camera and its Components. 2. To perform Photography using Auto Mode of camera. 3. To perform Photography using Aperture as main component. 4. To perform Photography using Shatter speed as main component. 5. To perform Photography using ISO as main component. 6. To Perform Crime Scene Photography. 7. To examine the road accident cases. 8. Comparative study of technical specifications of various vehicles. 9. To examine skid mark of Vehicles. 10. To perform Physical examination on accidental vehicle.	6	PPT, Descriptive Methods, Group discussion Brain Storming Activity

Course designed by –Mr. Krushna S. Sonawane

Value Added Courses

Programme	**B. Sc., Forensic Science**		**Programme Code**		**UFS**
Course Code	**20CFSC31**	**Number of Hours/Cycle**			**2**
Semester	**III**	**Max. Marks**			**100**
Part	**IV**	**Credit**			**2**
Value added courses					
Course Title	**The Constitution of India**		**L**	**T**	**P**
Cognitive Level		**Up to K2**	**30**	**-**	**-**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

Students completing this course will gain a better understanding of the fundamental concepts of The Indian Constitution, Structure of Constitution, Principals of constitution, Fundamentals Rights, Fundamental duties. The Constitution contains the fundamental law of the land. It is the source of all powers of, and limitations on, the three organs of State, viz. the executive, legislature and judiciary

Unit I	**History of The Indian Constitution**	**6 Hours**
	Brief History of constitution, Constitution – Fundamental Law of the Land: Making of the Indian Constitution, Aims and Objectives; Essential Features of Constitution	
Unit II	**Structure of The Indian Constitution**	**6 Hours**
	Theory of Basic Structure; Principles of Federalism; Nature of the Indian Constitution – Federal, Unitary, Quasi-federal, Body of Constitution	
Unit III	**Fundamental Rights (General) -I**	**6 Hours**
	State' under Article 12, 'Law' under Article 13; Also Articles 31A, 31B, 31C, 368, Doctrine of Eclipse, Waiver of Fundamental Rights, Severability, Power of Parliament to modify the fundamental rights (Article 33) Martial Law (Article 34)	
Unit IV	**Fundamental Rights (General) -II**	**6 Hours**
	Right to Equality – Articles 14,15,16,17, Right to Freedom – 19,20,21,21A,22, Right against Exploitation – 23,24, Right to Freedom of Religion – 25,26,27,28 Cultural and Educational Rights – 29,30	
Unit V	**Global Scenario of various Constitution**	**6 Hours**
	Introduction ,Political Systems around the world, silent features of constitution of various democratic countries, borrowed features of Indian Constitution ,comparison of Indian Constitution with that of others	

Pedagogy

Lecture classes, Power point presentation, Group Discussions, Role- play, Case Discussions, Group activities.

Text Book

1. J.N. Pandey (2018), "The Constitutional Law of India", Central Law Agency, New Delhi.

Reference Books

1. M.P. Jain 2018, "Indian Constitutional Law" Lexis Nexis, New Delhi 8th Edition.
2. D.D. Basu 2018, "Shorter Constitution of India", Lexis Nexis, New Delhi 15th Edition.
3. Mahendra P. Singh 2008, "V. N. Shula's Constitution of India" Eastern Book company, Lucknow 11th Edition.

Programme	B. Sc., Forensic Science		Programme Code		UFS
Course Code	20CFSC41	Number of Hours/Cycle			2
Semester	IV	Max. Marks			100
Part	IV	Credit			2
Value added courses					
Course Title	Scientific and Legal Principles of Forensic Evidence		L	T	P
Cognitive Level		Up to K4	30	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

Students completing this course will gain a better understanding of the fundamental concepts of evidence, burden and standard of proof, judge and jury, types of evidence, witnesses, degrees of certainty, and other relevant aspects of the principles of evidence in a legal investigation.

Unit I	**Evidence Basics**	6 Hours
	What is Evidence? Types of evidence: eyewitness, expert, physical, direct, circumstantial, demonstrative. Evidence Identification, Collection and Preservation; Crime Scene to Courtroom; physical forensic evidence.	
Unit II	**Fundamental Concepts**	**6 Hours**
	Fundamental Concepts: Relevance, Admissibility, Weight of Evidence, Unreliable evidence, confessions, eyewitness identifications, latent print evidence, accomplice testimony.	
Unit III	**Witnesses**	**6 Hours**
	Witnesses: competence and compellability (subpoena), due process, confrontation clause/ Documentation, Report Writing, degrees of scientific certainty, chain of custody Locating, Evaluating and Selecting Experts; qualifying the expert, battle of the experts, discrediting experts, lawsuits against experts, who is an expert, role of the expert.	
Unit IV	**Pre-trial proceedings**	**6 Hours**
	Pre-trial proceedings and other types of sworn testimony: admissibility hearings, depositions, affidavits, meeting with opposing counsel, discovery. The course of evidence: burden and standard of proof, ultimate issue, trial chronology.	
Unit V	**Testimony**	**6 Hours**
	Testimony: direct and cross-examination of a witness (hostile witness), hearsay (common law and statutory exceptions), impeachment (prior inconsistent statements), juror comprehension, testimony tips Post Trial proceedings: appeals, mistrials, retrials, bifurcated trials (penalty phase) post-conviction litigation, ethics.	

Pedagogy

Lecture classes, Power point presentation, Group Discussions, Role- play, Case Discussions, Group activities.

Text Book

1. B S Nabar (2013), "Forensic Science in Crime Investigation", Asia Law House, Hyderabad, 3rd edition.
2. Batuk Lal (2015), "The Law of Evidence", Central Law Agency.

Reference Books

1. S.H. James and J.J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
2. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "Henry Lee's Crime Scene Handbook", Academic Press, USA, 1st edition.
3. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th edition.
4. K.D. Gaur (2016), "The Indian Penal Code", Universal Law Publishing, 6th edition.
5. J.N. Pandey (2018), "The Constitutional Law of India", Central Law Agency.
6. Ratanlal and Dhirajlal (2017), "The Indian Penal Code", LexisNexis, 35th edition.
7. Ratanlal and Dhirajlal (2015), "The Criminal Procedure Code", LexisNexis, Student Edition.
8. N.V. Paranjape (2017), "Criminology & Penology with Victimology", Central Law Publications.

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSC51	Number of Hours/Cycle		4
Semester	V	Max. Marks		100
Part	III	Credit		3
Core Course XII				
Course Title	Forensic Physics and Ballistics	L	T	P
Cognitive Level	Up to K4	60		

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students to understand to know Various types of Tool Marks and Trace Evidences, Footwear Impressions and their Forensic Examinations, Fire Arms and Ammunition and their Forensic Examinations, Internal Ballistics, External Ballistics and various factors affecting on the same, The nature, types and formation of wounds/injuries due to projectiles in shooting and bomb blast cases.

Unit I	Tool Marks and Trace Evidences	12 Hours
	Tools: Common Hand Tools-Levers, Hand saw, Striking Tools, Grasping Tools, Cutting Tools, Crimping Tools, Knives, Scissors and shears, Chisels and punches, Drill bits. Tool Marks: tool mark types, compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks, Collection and documentation of tool marks. Trace Evidences: Soil, Glass, Paint, and Fiber: Introduction, Nature, Composition, types, forensic significance and forensic analysis Gun Shot Residues (GSR): Mechanism of formation of GSR, modern methods of analysis of GSR from the shooting hand & target with special reference to clothing's. Bullet and Cartridges matching: Class and individual characteristics on bullet and cartridge case for comparing and matching with suspected firearm. Briefs of NIBIN and IBIS.	
Unit II	**Footwear Impressions**	**12 Hours**
	Casting 3-D Footwear Impressions: Introduction to casting, Importance of casting, Benefits of casts over photographs, casting materials, Methods of casting with dental stone, plaster of paris, casting footwear impressions in various geographical locations. Treatment of 2-D Footwear Impressions: Lifting 2-D footwear impressions, Lifting impressions electro statically and electrostatic lifting devices, Gelatin and adhesive lifting, other lifting materials and choices, Powdering impressions, Deformable impressions, Impressions on carpets, cushions, grass and skin. Enhancement of Footwear Impressions: Specialized lighting and photographic methods, Chemical enhancement, other enhancement techniques.	
Unit III	**Fire Arms and Ammunition**	**12 Hours**
	Fire arms - Early hand cannons, The matchlock, The wheel lock, The shaphaunce, The flintlock, The percussion system, The pin fire system, The rim fire system, centre fire system,	

	Needle fire system, Rifling, revolver, Pistols, Bolt action rifle, Shotgun, Sub machine gun, Machine gun, zip guns (Improvised Firearms). Ammunitions - Rim fire, centre fire, Case less, Blank ammunition, Tear gas, Grenade launcher, Dummy, Primer cap types, Berdan primer, Boxer primer, Cartridge cases - Rimless, semi-rimmed, rimmed, belted. Bullet and its types, Shotgun ammunition- shotgun slugs.	
Unit IV	**Internal Ballistics & External Ballistics**	**12 Hours**
	Internal Ballistics: Definition, ignition of propellants, shape and size of propellants, manner of burning, various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting. Muzzle velocity; Barrel length and velocity, effect of quantity of gun powder, effect of bullet weight, twist versus muzzle, velocity. Strength of barrel and other parts, Recoil, jump and vibration. External Ballistics: Trajectory formation, Vacuum trajectories, Range, Experimental determination and shape of trajectory, Spin, Drift, Angle of fire, Structure of the projectile, Sectional density, Influence of earth and escape Velocity, Air resistance, Retardation, Wind deflection, firing guns in the air, Ricochet.	
Unit V	**Terminal & Wound Ballistics**	**12 Hours**
	Terminal Ballistics: Effect of projectile on hitting the target, Function of bullet shape, Striking velocity, Striking angle, Tumbling of bullets, Cavitations, Ricochet and its effects. Wound Ballistics: Understanding the nature, types and formation of wounds/injuries due to projectiles in shooting and bomb blast cases, determination of range of fire- burning, scorching, blackening, tattooing and metal fouling, shots dispersion, Injuries by shotgun, revolver, pistol, rifles, etc., Wounding power of bullets, Interpretation of medico legal report. Ricochet, yawing, cavity formation inside the body (temporary & permanent). Differences in Entry and Exit Wounds, etc. Contact wounds, near contact wound, close range, abrasion collar.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Houck. Max M.(2003) "Trace Evidence Analysis" ,Academic press,2nd Edition
2. Heard. Brian J. (2008) "Handbook of Fire arm and ballistics- Examining and Interpreting Forensic Evidence", Wiley-Blackwell, 2nd Edition.
3. "Laboratory Procedural manual," Physics Section, DFSL, Mumbai

Reference Books

1. Hatcher Jury & Weller (2006) "Firearm Investigation Identification and Evidence", Ray Riling Arms Books Co. Philadelphia, PA.
2. Gunther & Gunther, (2015) "The Identification of Firearms", Skyhorse, New York.
3. Jauhri, M.(1980) "Monograph on Forensic Ballistics", Govt. of India Publication, New Delhi.

4. Sharma B.R.(2017) “Firearms in Criminal Investigation and Trails”, Universal law publishing,5th Edition
5. Warlow Tom (2021), “Firearm, the law, and Forensic Ballistics”, CRC Press Routledge, 3rd Edition
6. Laboratory Procedural Manual, Forensic Ballistics, DFS, New Delhi.
7. K. Kumar (2015) “Forensic ballistics in Criminal Justice”,Eastern Book Company
8. S. N. Gaur (2020) “Firearms and Forensic Ballistics”, Delhi Law House, Delhi, 2nd Edition.
9. William J. Bodziak (2021) “Footwear Impressions Evidence Detection, Recovery, and Examination” by CRC Press, Second Edition.
10. Richard Saferstein (2018), “Criminalistics- An Introduction to Forensic Science” Published by Pearson.
11. Michael Sayer and Abhaaiman Singh, (2004), “Measurement, Instrumentation and Experiment Design in Physics and Engineering” by PHI Learning.
12. Laboratory Procedural Manual, Forensic Ballistics, DFS, New Delhi.
13. P. C. Varghese (2015), “Building Materials” Prentice Hall India Learning Private Limited, Second Edition.
14. Max M. Houck (2009), “Trace Evidence” by Facts on File, First Edition.
15. Harold Franck and Darren Franck (2012), “Forensic Engineering Fundamentals” By CRC Press, First Edition.
16. Brian J Heard(2017), “Handbook of Fire arm and ballistics” Second Edition
17. S N Gaur (2013), “Fire Arms, Forensic Ballistics, Forensic Chemistry and Criminal Jurisprudence” By Delhi Law House.

Course Outcomes

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

CO1	Explain the tool marks and trace evidences.	K2
CO2	Explain the treatment of 2D and 3D footwear impressions.	K2
CO3	Apply the examination methods for firearms.	K3
CO4	Identification of internal and external ballistics.	K2
CO5	Analyze the terminal and wound ballistics.	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Tool Marks and Trace Evidences**	**12 Hours**	**Mode**
	a. Tools: Common Hand Tools	3	PPT, Descriptive Methods, Group discussion
	b. Tool Marks: tool mark types	3	
	c. Trace Evidences: Soil, Glass, Paint, and Fiber	2	
	d. Gun Shot Residues (GSR)	2	
	e. Bullet and Cartridges matching	2	
Unit II	**Footwear Impressions**	**12 Hours**	**Mode**
	a. Casting 3-D Footwear Impressions	3	PPT, Descriptive Methods, Group discussion
	b. Methods of casting with dental stone	3	
	c. Treatment of 2-D Footwear Impressions	2	
	d. Lifting materials and choices	2	
	e. Enhancement of Footwear Impressions	2	
Unit III	**Fire Arms and Ammunition**	**12 Hours**	**Mode**
	a. Fire arms	3	PPT, Descriptive Methods,
	b. The percussion system	3	
	c. Rifling, revolver, Pistols, Bolt action rifle,	2	

	Shotgun, Sub machine gun, Machine gun, zip guns (Improvised Firearms).		Group discussion
	d. Ammunitions	2	
	e. Cartridge cases - Rimless, semi-rimmed, rimmed, belted. Bullet and its types, Shotgun ammunition-shotgun slugs.	2	
Unit IV	**Internal Ballistics & External Ballistics**	**12 Hours**	**Mode**
	a. Definition, ignition of propellants, shape and size of propellants	3	PPT, Descriptive Methods, Group discussion
	b. Various factors affecting the internal ballistics	3	
	c. Strength of barrel and other parts, Recoil, jump and vibration.	2	
	d. External Ballistics	2	
	e. Experimental determination and shape of trajectory	2	
Unit V	**Terminal & Wound Ballistics**	**12 Hours**	**Mode**
	a. Terminal Ballistics	3	PPT, Group discussion Brain Storming Activity
	b. Wound Ballistics	3	
	c. Determination of range of fire- burning	2	
	d. Wounding power of bullets	2	
	e. Differences in Entry and Exit Wounds	2	

Course designed by –Mr. Krushna S. Sonawane

Programme	**B. Sc Forensic Science**	**Programme Code**			**UFS**
Course Code	**20UFSC52**	**Number of Hours/Cycle**			**4**
Semester	**V**	**Max. Marks**			**100**
Part	**III**	**Credit**			**3**
Core Course XII					
Course Title	**Forensic Toxicology**		**L**	**T**	**P**
Cognitive Level	**Up to K4**		**60**		

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students to understand what is Forensic Toxicology. History, Scope and Branches of toxicology. Introduction, Principles of pharmacology and pharmacokinetics, routes of administration of poison. The Analytical Procedures & Extraction of poisons. The General Principles of Management and different instrumental techniques used for analysis of poison.

Unit I	**Toxicology**	**9 Hours**
	Introduction to Toxicology, History, Classification of toxicology. Scope of toxicology, Concept of Forensic Toxicology and its significance. Poisons: Definitions, laws on poisons, Nature, Classification (according to chemistry, action, motive) Common household poisons in India, Types of poisoning. Toxicological analysis: Diagnosis of poisoning (Living and Dead): Signs and symptoms of poisoning-Acute and Chronic, PM Appearances, stomach contents, Sample collection and preservation of Viscera, blood, urine and other biological samples. Medico-legal aspect of toxicology: Significance of toxicological findings, Case histories	
Unit II	**Pharmacology**	**9 Hours**
	Pharmacology: Introduction, Principles, routes of administration: Inhalation, Injection, Intramuscular-subcutaneous- Intradermal, Dermal and other routes. Pharmacokinetics: Introduction, Basic principles and Processes-Adsorption, Distribution, Localization, bio-transformation and Excretion. Pharmacodynamics: Introduction, Basic principles, Types and mechanism of their actions in the body and Factors affecting the mechanism of their actions in the body.	
Unit III	**Analytical Procedures & Extraction**	**9 Hours**
	Analytical Procedures - Extraction of the drug from the biological tissues, Purification and Qualitative and Quantitative detection of poisons of Metallic Poisons (Anions and Cations), Volatile poisons, Gaseous Poisons, Plant Poisons and Animal Poisons. Extraction: Introduction, Principles and methods: Liquid-Liquid extraction, Solid Phase Extraction, Direct solvent extraction, Solid phase Micro-extraction, Accelerated Solvent Extraction. Pre-concentration and clean up procedure.	
Unit IV	**General Principles of Management**	**9 Hours**
	General Principles of Management: Acute and Chronic Poisoning-Introduction, Immediate measures, Elimination of absorbed and unabsorbed poisons, symptomatic treatment and maintenance of vital functions. Antidotes: Introduction, Administration, Types, Mechanism of action.	

Unit V	**Identifying route of administration of poison & Instrumental Techniques in Toxicology**	**9 Hours**
	Introduction to routes of Poison Administration, Different types of routes of poison administration, Identifying route of administration of poison: Estimation of time and dose administered Recovery and after care of patients- Poison Information/Control Centre. Instrumental Techniques in Toxicology: Overview of working, instrumentation of Spectroscopic, Chromatographic and Immunoassay methods,	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Curry A.S (1986), Analytical Methods in Human Toxicology, Part II, CRC Press Ohio.
2. Krishnamurthy, R. (2011), Introduction to Forensic Science in Crime Investigation, Selective & Scientific Books, New Delhi.
3. Clark, E.G.C. (1986); Isolation and Identification of Drugs, Vol. I and Vol. II, Academic Press.

Reference Books

1. Working Procedure Manual (2000), Toxicology, BPR&D Publication.
2. Townsend Allen (2013), "Encyclopedia of Analytical Science", Elsevier, Third Edition.
3. Niesink RJM (1996), "Toxicology- Principles and Applications", CRC Press.
4. Turner Paul (1989) "Recent Advances in Pharmacology & Toxicology", Churchill Livingstone, Elenburgh.
5. Modi, Jaisingh P (2001), "Textbook of Medical jurisprudence & Toxicology, M.M. Tripathi, Publications.
6. Dr. Reddy K.S. and Dr.Murty O.P. (2017), "The essentials of Forensic Medicine and Toxicology", Jaypee-The Science Health Publishers.
7. Krishan Vij (2004), "Textbook of Forensic Medicine & Toxicology: Principles & Practice", Elsevier India, 5th edition.

E-Resources

1. www.sciencedirect.com
2. www.forensicsciencesimplified.org
3. www.efjs.springeropen.com
4. www.intechopen.com
5. https://epgp.inflibnet.ac.in

Course Outcomes

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

CO1	Explain the Forensic Toxicology, History, Scope and Branches.	K2
CO2	Explain the Pharmacology: Introduction, Principles, routes of administration	K2
CO3	Apply the Analytical Procedures & Extraction of poisons.	K3
CO4	Identification of the General Principles of Management	K2
CO5	Analyze the route of administration of poison & Instrumental Techniques in Toxicology	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Toxicology**	**9 Hours**	**Mode**
	a. Introduction to Forensic Toxicology, History, Scope and Branches.	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Definitions, laws on poisons, Nature, Classification, Common household poisons in India.	2	
	c. Types of poisoning	2	
	d. Signs and symptoms of poisoning-Acute and Chronic, PM Appearances, stomach contents.	2	
	e. Sample collection and preservation of Viscera, blood, urine and other biological samples.	1	
Unit II	**Pharmacology**	**9 Hours**	**Mode**
	a. Introduction and Principles of pharmacology	2	PPT, Descriptive Methods, Group discussion
	b. Different routes of administration of poisons and drugs.	2	
	c. Introduction and principles of pharmacokinetics. Different processes of pharmacokinetics	2	
	d. Introduction, Basic principles of pharmacodynamics.	2	
	e. Types and mechanism of poisons and drugs and their actions in the body and factors affecting the mechanism of their actions in the body.	1	
Unit III	**Analytical Procedures & Extraction**	**9 Hours**	**Mode**
	a. Analytical Procedures like extraction, purification, qualitative and quantitative detection of poisons.	2	PPT, Descriptive Methods, Group discussion
	b. Types of poisons	2	
	c. Introduction and Principles of extraction.	2	
	d. Different methods of extraction of poison	2	
	e. Pre-concentration and clean up procedures.	1	
Unit IV	**General Principles of Management**	**9 Hours**	**Mode**
	a. General Principles of Management of poisonous cases	2	PPT, Descriptive Methods, Group discussion
	b. Introduction to Acute and Chronic Poisoning and there Immediate measures	2	
	c. Methods of Elimination of absorbed and unabsorbed poisons	2	
	d. Symptomatic treatment and maintenance of vital functions	2	
	e. Antidotes: Introduction, Administration, Types, Mechanism of action.	1	
Unit V	**Identifying route of administration of poison & Instrumental Techniques in Toxicology**	**9 Hours**	**Mode**
	a. Identifying route of administration of poison	2	PPT, Group discussion Brain Storming Activity
	b. Estimation of time and dose administered	2	
	c. Recovery and after care of patients- Poison Information/Control Centre	2	
	d. Instrumental Techniques in Toxicology	2	
	e. Medico-legal aspect of toxicology	1	

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSC53	Number of Hours/Cycle		4
Semester	V	Max. Marks		100
Part	III	Credit		3
Core Course XIV				
Course Title	Digital and Cyber Forensics	L	T	P
Cognitive Level	Up to K4	40	5	15

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the Fundamental Concept of cyber crimes, their principles, Types of Cyber Crimes, Digital Evidences, Reasons behind the Commission of Cyber Crimes, Developing knowledge regarding Incident Response and its process, with Advance Investigating Concealment Techniques, Forensic Analysis Tools, along with the Information Technology Act for Accomplishing legal matters related to Cyber Crime and Digital Evidences.

Unit I	**Cyber Forensics**	**10 Hours**
	Cyber Crime & Digital Evidence, Cybercrime, Conventional crime VS Cybercrime, Types of Cybercrimes, Precautions in Cyberspace, Electronic Evidence, Digital Evidence, Digital Vs. Physical Evidence, Nature of Digital Evidence, Precautions while dealing with Digital Evidence. Reasons for commission of Cyber Crime, Kinds of Cyber Crimes – Cyber Stalking; Cyber Pornography, Cyber Terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and Hate Speech, Computer Vandalism.	
Unit II	**Incident Response**	**12 Hours**
	Introduction to Cyber Forensics, Cyber Forensic Steps (Identification, Seizure, Acquisition, Authentication, and Presentation). Incident Response Process, Computer Security Incident, Goals of Incident Response, Involvement in Incident Response Process, Incident Response Methodology, Formulate a Response Strategy, Investigation of Incident, Preparing for Incident response, Overview of Pre-incident Preparation, Identifying Risk after Detection of an Incident.	
Unit III	**Concealment Techniques**	**12 Hours**
	Introduction to Cryptography, Types of Cryptographic Algorithms (Secret Key Cryptography, Public Key Cryptography, Hash Function), Electronic Signature, Steganography, Reversing the Steganographic Process, Cloaking Techniques (Data Hide and Seek), Renaming files, Manipulating file system, Data hiding on NTFS with Alternate Data Stream.	
Unit IV	**Forensic Analysis and Recovery**	**14 Hours**
	Introduction to Open Source Analysis Tools like Slueth Kit Autopsy, OS Forensic, SoloImage Master, Disk Locker, FRAT (Forensic Registry Analysis Tool). Working with commercial tools like Encase and Forensic Tool Kit (FTK). Data Recovery: Disk Geometry, Data Recovery Procedures, Recovery of Swap Files/Temporary Files/Cache Files, Recovery-Formatted Partition Recovery, Data Recovery Tools- Open Source and Commercial.	

Unit V	Information Technology Act (IT Act 2000) & IPR	12 Hours
	Introduction, Definitions of Computer, Computer Network, Electronic Record, Data, Secure System, Digital Signature and Certifying Authority as per IT Act. Authentication of Electronic Records (Section 3), Legal Recognition of Electronic Records and Digital Signature (Section 4 and 5), Certifying Authorities and Controller, Offences as per IT Act (Section 65 78), Special Provision in Indian Evidence Act regarding Admissibility of Electronic Records (Section 65B of IEA, 1872). **Intellectual Property Rights:** Meaning, Objective, and Concept, Copyrights, Patent, Trademark, Domain Name Registration.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study, Hands-on Training, Demonstration

Text Books

1. Cybercrime: Investigating High- Technology Computer Crime" -Robert Moore 2nd Edition (25th September 2014), publisher Routledge.
2. "Incident Response and computer forensics", Kevin Mandia, Chris Prosise, Tata McGrawHill, 2006.
3. "Information Technology Act 2000" Bare Act, Law House, New Delhi.

Reference Books

1. D. P. Mittal (2002), "Indian Patents Law and Procedure", New Delhi, Allied Services (P) Ltd.1999.
2. Patent Act, 1970.
3. Copyright Act, 1957.
4. Trade Mark Act, 1999.
5. Information Technology Act, 2000.
6. Linda Volonino, Reynaldo (2006), "Computer Forensics: Principles and Practices", Pearson Publications, First Edition.
7. Eoghan Casey (2011), "Digital Evidence and Computer Crime", Academic Press, Third Edition.
8. Albert J. Menendez (2007), "Cyber Forensic a field manual for collecting, examining and preserving evidence of computer crimes" byAuerbach Publications, Second Edition.
9. Brian Carrier (2005), "File System Forensic Analysis", Publisher: Addison-Wesley Professional, First Edition.
10. Barkha &U Rama Mohan (2017), "Cyber Law & Crimes (IT Act 2000 & Computer Crime Analysis)" by Asia Law House, Third Edition.
11. Dr. R C Mishra (2008),"Cyber Crime", Publisher: Authors Press, First Edition.
12. M. Bhaskar and P. Ramachandran (2006), "Handbook of Security, Cryptography & Digital Signature",Viva Books Private Limited.

E-Resources

1. www.Youtube.com. Nptelhrd Channel
2. www.tutorialspoint.com
3. www.Javatpoint.com
4. www.ocw.mit.edu.com
5. www.edx.org.com

Course Outcomes

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

CO1	Define Basics of Cyber Crime and Digital Evidences	K1
CO2	Explain about Incident Response	K2
CO3	Explain the Concealment Techniques	K2
CO4	Apply the Examination of Forensic Analysis Software	K3
CO5	Analyze the need behind Information Technology Act 2000	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Cyber Forensics**	**10 Hours**	**Mode**
	a. Cyber Crime & Digital Evidence	2	PPT, Brain Storming Activity Group discussion
	b. conventional crime VS cybercrime	2	
	c. cybercrime and types of cybercrimes	2	
	d. Precautions while dealing with digital evidence	2	
	e. Reasons for commission of cyber crime	2	
Unit II	**Incident Response**	**12 Hours**	**Mode**
	a. Introduction to Cyber forensics	2	PPT, Descriptive Methods, Group discussion
	b. Cyber forensic steps	3	
	c. Incident response process	3	
	d. Incident response methodology	2	
	e. Overview of pre-incident preparation, Identifying risk after detection of an incident.	2	
Unit III	**Concealment Techniques**	**12 Hours**	**Mode**
	a. Introduction to Cryptography	2	PPT, Descriptive Methods, Group discussion
	b. Types of Cryptographic Algorithms	3	
	c. Steganography, Reversing the Steganographic process	3	
	d. Cloaking Techniques (Data Hide and Seek)	2	
	e. Data Hiding on NTFS with Alternate Data Stream	2	
Unit IV	**Forensic Analysis and Recovery**	**14 Hours**	**Mode**
	a. Introduction to Open Source Analysis Tools	2	PPT, Descriptive Methods, Group discussion
	b. FRAT (Forensic Registry Analysis Tool)	2	
	c. Working with commercial tools like Encase and Forensic Tool Kit (FTK)	4	
	d. Data Recovery	4	
	e. Data Recovery Tools- Open Source and Commercial	2	
Unit V	**Information Technology Act (IT Act 2000) & IPR**	**12 Hours**	**Mode**
	a. Introduction and Definitions of computer	3	PPT, Descriptive Methods, Group
	b. Digital Signature and Certifying Authority as per IT Act	2	
	c. Special Provision in Indian Evidence Act	2	

	regarding Admissibility of Electronic Records (Section 65B of IEA, 1872).		discussion Brain Storming Activity
	d. Intellectual Property Rights	4	
	e. Certifying Authorities and Controller, Offences as per IT Act (Section 65 to Section 78)	1	

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSC54	Number of Hours/Cycle		4
Semester	V	Max. Marks		100
Part	III	Credit		3
Core Course XV				
Course Title	Applied Forensic Science	L	T	P
Cognitive Level	Up to K4	45	-	15

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the Forensically relevant Databases, The historical perspective of secret writings, The counterfeiting examination, The Forensic Speaker Identification, The Quality management and Expert testimony.

Unit I	**Forensically Relevant Databases**	**8 Hours**
	STRBase, NCBI, PubMed, PubChem, ChemFinder™ Ultra academic| Sigma-Aldrich, CODIS, Forensic Information System for Handwriting (FISH), SICAR, AFIS, IBIS, Paint Data Query (PDQ), International Ink Library	
Unit II	**Secret Writings**	**12 Hours**
	Historical perspective of Secret writings: Invisible inks, Miniature writings, Hieroglyphics, Ciphers, Cryptograms, etc. Terminologies of Secret writing and Types of Cipher: Autokey, Cipher, Ciphertext, Code, Cryptanalysis, Cryptography, Decrypt, Encrypt, Key, Monoalphabetic substitution, Plaintext, Polyalphabetic substitution, Steganography, Transposition, Alphabetic substitution, Caesar Cipher, Alberti Discus, Trimethius Cipher Table, Vignenere Cipher	
Unit III	**Counterfeiting**	**14 Hours**
	Types: Currency, Coins, Government Bonds, Documents, Consumer Goods, Certificates, etc. Manufacture & Circulation of Government Coins & Currency their Minting Process of Genuine Coins. Types of Counterfeit Coin Processes and Detection: Cast Process and Struck Process. Characteristics of Genuine Currency Notes of various countries. Plastic Currency: Examination of Credit Cards and similar material, Security Features, Holographic Marks and Other Characteristics. Methods Employed by Counterfeiters and Methods for Detection of Counterfeits. Advanced Printing Technology: Offset Lithography, Thermography, Intaglio, Letter Press and Screen Printing. Global scenario on growth of Counterfeiting and Relevant Provisions of Indian Penal Code, 1860. Numismatic Forgery (Overview)	
Unit IV	**Forensic Speaker Identification**	**14 Hours**
	Introduction and Scope of Forensic Speaker Identification, Speaker Identification vs. Speaker Verification. Human vocal tract, Production and Description of Speech Sound, Acoustic characteristics of Speech Signal, Introduction to Phonetics and its importance in Forensic Speaker Identification, International Phonetics Alphabets (IPA) and its Symbolic representation. Methods of Speaker Identification Open and Close Set, Sound Spectrograph and its Analysis, Analysis of Vowel and Consonant Sounds. Voice Evidence: Collection of Voice Sample, Examination and Formation of Opinion in terms of Probability	

	scale, Presenting Evidence in Court of Law in view of Forensic Speaker Identification. Recent advancements- Automated Speaker Identification: Text Dependent and Text Independent Approach	
Unit V	**Quality Management and Expert Testimony**	**12 Hours**
	Introduction and Requirements of Quality Management Systems for Forensic Science Laboratories, Accreditation: Introduction and Objectives, Organizations and Certifying Bodies (NABL, ILAC, APLAC), Requirements as per ISO/IEC 17025:2005 or ISO 15189:2007 for accreditation of Laboratory. Proficiency Testing. Measurement of Uncertainty. Internal Audit and Laboratory Information Management Systems (LIMS). Expert testimony: Definition of Expert, Writing Report and Presentation of Evidence in court of law, Examination-in-chief, Cross-examination and Re-examination	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E).
2. A Course in Phonetics, Sixth Edition, Peter Ladefoged and Keith Johnson, Wardsworth Cengage Learning, Boston, USA, 2011.

Reference Books

1. Specific Guidelines for Accreditation of Forensic Science Laboratories and Checklist for Assessors, National Accreditation Board for Testing and Calibration Laboratories (NABL 113).
2. Oscar Tosi (1979), "Voice Identification: Theory and Legal Applications", University Park Press, Baltimore, USA.
3. Philip Rose (2003), "Forensic Speaker Identification",by CRC Press, USA,
4. Gunar Fant (2006), "Speech Acoustics and Phonetics", Springer Publishers, USA.
5. Lawrence J. Raphael, Gloria J. Borden, Katherine S. Harris (2011), "Speech Science Primer: Physiology, Acoustics, and Perception of Speech", by Lippincott Williams & Wilkins, Sixth Edition.
6. Donald J. Fucci and Norman J. Lass (1999), "Fundamentals of Speech Science", Published by Pearson.
7. Mehta M. K (1970), "The identification of Handwriting & Cross Examination of Expert, N.M. Tripathi, Allahabad.
8. Sulner, H.F (1966), "Disputed Document", Oceana Publications Inc., New York.
9. Roy A Huber, A.M. Headrick, (2021), "Handwriting Identification- Facts and Fundamentals, CRC Press, Second Edition.
10. Ron Morris (2020), "Forensic Handwriting Identification (fundamental concepts and Principals)", Elsevier Science Publishing Co, Inc, Second Edition.
11. Madinger J. and zalopany, A.R. (2012): Money Laundering CRC Press.
12. Manning, C.A (1999): Financial Investigations and Forensic Accounting CRC Press.
13. Harrison, W.R (1966), "Suspect Documents & their Scientific Examination", Sweet & Maxwell Ltd., London.
14. Brewster F (1932), "Contested Documents and Forgeries", The Eastern Law House, Calcutta.

15. Ordway Hilton (1982), "Scientific Examination of Questioned Documents", Revised Edition Elsevier, NewYork.
16. Gerald R. McMenamin (2002), "Forensic Linguistics- Advances in Forensic Stylistics, CRC Press, Washington, D.C., First Edition.
17. Ellen D (1997), "The scientific examination of Documents, Methods and techniques", Taylor & Francis Ltd., Second Edition.
18. Krishnamurthy R (2011), "Introduction to Forensic Science in Crime Investigation", Selective & Scientific Books, New Delhi.
19. Constitution of India.
20. Indian Evidence Act, 1872.
21. Indian Penal Code, 1860
22. NABL 100, National Accreditation Board for Testing and Calibration Laboratories (NABL), General Information Brochure, ISSUE NO.: 02, ISSUE DATE: 18-Aug-2020, AMENDMENT NO.: 01, AMENDMENT DATE: 09-Mar-2021.

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1. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000016FS/P000695/M011506/ET/1516250603FSC_P8_M27_e-text.pdf
2. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/S000016FS/P000695/M011507/ET/1516250699FSC_P8_M28_e-text.pdf
3. https://forensicyard.com/secret-writing-inks-and-decipherment-techniques/
4. https://austinpublishinggroup.com/forensicscience-criminology/fulltext/ajfsc-v4-id1061.pdf
5. http://www.jiwaji.edu/pdf/ecourse/pharmaceutical/NABL%20accreditation%20principle%20&%20%20procedure%20(1).pdf

Course Outcomes

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

CO1	List out the Forensically Relevant Databases in depth	K1
CO2	Interpret the Historical Perspective of Secret Writings	K2
CO3	Interpret Counterfeiting Examinations	K2
CO4	Apply Forensic Speaker Identification techniques	K3
CO5	Simplify The Quality Management and Expert Testimony	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Forensically Relevant Databases**	**8 Hours**	**Mode**
	a. STRBase, NCBI and PubMed	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. PubChem and ChemFinder™ Ultra academic| Sigma-Aldrich	2	
	c. CODIS and Forensic Information System for Handwriting (FISH)	1	
	d. SICAR, AFIS and IBIS	2	
	e. Paint Data Query (PDQ) and International Ink Library	1	
Unit II	**Secret Writings**	**12 Hours**	**Mode**
	a. Historical perspective of Secret writings	2	PPT, Descriptive Methods, Group discussion
	b. Terminologies of Secret writing and Types of Cipher: Autokey, Cipher, Ciphertext, Code, Cryptanalysis	2	
	c. Terminologies of Secret writing and Types of	2	

	Cipher: Cryptography, Decrypt, Encrypt, Key and Monoalphabetic substitution		
	d. Terminologies of Secret writing and Types of Cipher: Plaintext, Polyalphabetic substitution, Steganography, Transposition and Alphabetic substitution	3	
	e. Terminologies of Secret writing and Types of Cipher: Caesar Cipher, Alberti Discus.	3	
Unit III	**Counterfeiting**	**14 Hours**	**Mode**
	a. Types: Currency, Coins, Government Bonds, Documents, Consumer Goods, Certificates, etc.	2	PPT, Descriptive Methods, Group discussion
	b. Manufacture & Circulation of Government Coins & Currency. their Minting Process of Genuine Coins	3	
	c. Characteristics of Genuine Currency Notes of various countries. Plastic Currency: Examination of Credit Cards and similar material, Security Features.	3	
	d. Methods Employed by Counterfeiters and Methods for Detection of Counterfeits.	3	
	e. Advanced Printing Technology, Global scenario on growth of Counterfeiting and Relevant Provisions of Indian Penal Code, 1860. Numismatic Forgery (Overview)	3	
Unit IV	**Forensic Speaker Identification**	**14 Hours**	**Mode**
	a. Introduction and Scope of Forensic Speaker Identification, Speaker Identification vs. Speaker Verification and Human vocal tract, Production and Description of Speech Sound	3	PPT, Descriptive Methods, Group discussion
	b. Acoustic characteristics of Speech Signal Introduction to Phonetics and its importance in Forensic Speaker Identification.	3	
	c. Methods of Speaker Identification Open and Close Set, Sound Spectrograph and its Analysis, Analysis of Vowel and Consonant Sounds	3	
	d. Voice Evidence	3	
	e. Recent advancements- Automated Speaker Identification	2	
Unit V	**Quality Management and Expert Testimony**	**12 Hours**	**Mode**
	a. Introduction and Requirements of Quality Management Systems for Forensic Science Laboratories, Accreditation	3	PPT, Descriptive Methods, Group discussion Brain Storming Activity
	b. Proficiency Testing and Measurement of Uncertainty	2	
	c. Internal Audit and Laboratory Information Management Systems (LIMS)	3	
	d. Expert testimony: Definition of Expert, Writing Report and Presentation of Evidence in court of law	2	
	e. Expert testimony: Examination-in-chief, Cross-examination and Re-examination	2	

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	**B. Sc Forensic Science**	**Programme Code**			**UFS**
Course Code	**20UFSC5P**	**Number of Hours/Cycle**			**4**
Semester	**V**	**Max. Marks**			**100**
Part	**III**	**Credit**			**3**
Core Practical V					
Course Title	**Forensic Physics and Ballistics and Forensic Toxicology**		**L**	**T**	**P**
Cognitive Level	**Up to K4**				**60**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students to understand the significance of toxicological studies in Forensic science, Practical demonstration on toxicological cases, Demonstration activities on Forensic physics and ballistics, The methods of identifying firearms, Demonstration on footprint development & trace evidence analysis, The classification of firearms and their firing mechanisms and the characteristics of ammunition.

List of the Practicals:

Forensic Physics and Ballistics

1. Examination of Fire Arm according to Arms Act
2. Dismantling/ assembling of firearms.
3. Examination of ballistics evidences under ballistic comparison microscope.
4. Barrel wash test.
5. Study of glass fractures due to impacts/ heat.
6. Microscopic examination of paint sample/ Examination of plastic evidences under comparison microscope.
7. Photography of 3-D/ 2- D shoe/bear foot prints.
8. Casting of 3-D Shoeprint using plaster of Paris/dental stone in mud or clay/ using sulphur and other methods.
9. Identification of foot prints by crime lights and lifting by gelatin and adhesive lifting/ Enhancement of shoe/ bear print by specialized lighting source along with photography.
10. Development of latent shoe/ bear foot print using physical developer (powder method)/ Development and lifting of 2-D print by electrostatic methods.

List of the Practicals:

Forensic Toxicology

1. Extraction of substances from viscera by Liquid-Liquid Extraction method
2. Extraction of substances from viscera by solid phase extraction method
3. Identification of drugs (from the extract) by basic colour tests and TLC
4. Determination of a drug in any biological fluid by visible / UV spectrophotometry
5. Determination of a drug / pesticide in toxicological specimen by GC (Only Demonstration)
6. Determination of a drug / pesticide in toxicological specimen by HPLC (Only Demonstration)

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	**B. Sc Forensic Science**	**Programme Code**			**UFS**
Course Code	**20UFSC5Q**	**Number of Hours/Cycle**			**4**
Semester	**V**	**Max. Marks**			**100**
Part	**III**	**Credit**			**3**
Core Practical V					
Course Title	**Practical - Digital Cyber Forensics and Applied Forensic Science**		**L**	**T**	**P**
Cognitive Level	**Up to K4**				**60**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students to understand the fundamental of cyber crimes, potential evidence, analysis process for various evidences, applying the knowledge of various data recovery software's, learn about examination of security documents Currency note, visa-passport, relevant database ,analysis of voice samples.

List of the Practicals:
Digital and Cyber Forensics

1. Identification, Seizure, Search of Digital media
2. To Perform Digital Evidence Collection on crime scene
3. Demonstration of various Forensic tools like Partition magic, Encase, FTK, UFED IV PC, DT3 and Autopsy
4. Data Recovery, Deleted File Recovery viewing small Disk.
5. Demonstration of Concealment Techniques (Cryptography PGP)
6. Demonstration of Concealment Techniques (Steganography)
7. Demonstration of other Concealment Techniques
8. Conversion of file formats (wave to mp3, avi, wmp etc)

List of the Practicals:
Applied Forensic Science

1. Demonstration on various Forensically relevant Databases.
2. To study the indented and invisible writings.
3. Examination of Security Documents – Indian Bank Notes/ Travel Documents – Indian Passports and Visas/ rubber stamp and other mechanical impression
4. To record speech sample of a subject (Standard/ Specimen)
5. To segregate voice sample of a particular subject and to form clue words of given speech sample of a subject.
6. To perform auditory analysis on a given set of speakers.
7. Examination of alteration, erasures, overwriting, additions and obliteration/ Decipherment of secret writings using VSC.
8. To calibrate glassware and instruments.

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSE51	Number of Hours/Cycle		4
Semester	V	Max. Marks		100
Part	III	Credit		4
Course Elective Course I A				
Course Title	Multimedia Forensics	L	T	P
Cognitive Level	Up to K4	30	15	15

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the Fundamental Principles on which the science of Biometrics is based, their types based on Physiology and Behavioral aspects, Fundamentals of Multimedia along with its Types and Characteristics, Knowledge of Forensic Speaker Identification, Application of Speaker Identification, Fundamentals of Mobile Forensics and Investigation process.

Unit I	**Fundamental Aspects of Biometrics**	12 Hours
	Introduction to Biometrics, Various Types of Biometric Methods, Characteristics of Biometrics, Advantages and Disadvantages, General Biometric System (Identification and Verification), General Architecture Comparison of Different Biometric Technologies, Difficulties in implementation of Biometrics, Applications of Biometrics.	
Unit II	**Types of Biometrics**	**12 Hours**
	Physiological Biometrics- Fingerprints, Palm Prints, Iris, Retina, Geometry of Hand and Face. **Behavioral Biometrics-** Handwriting, Signatures, Keystrokes, Gait and Voice. Characteristics of Biometrics, Advantages and Disadvantages, General Biometric System (Identification and Verification), General Architecture Comparison of Different Biometric Technologies, Difficulties in Implementation of Biometrics, Applications of Biometrics.	
Unit III	**Multimedia Forensics**	**12 Hours**
	Introduction to Multimedia, Multimedia Components (Text, Graphics, Animation, Audio, Video), Multimedia Applications. Various Recording Devices and its Characteristics, Concepts of Noise and Construction of Filter for their Removal, Nature and Types of Forgery related to Multimedia and its Authentication. Investigation of crime scene in reference to Multimedia Evidences.	
Unit IV	**Forensic methods of Speaker Identification**	**12 Hours**
	Introduction and Scope of Forensic Speaker Identification, Speaker Identification vs. Speaker Verification, Human Vocal Tract, Production and Description of Speech Sound, Acoustic Characteristics of Speech Signal, Introduction to Phonetics and its importance in Forensic Speaker Identification, International Phonetics Alphabets (IPA) and its Symbolic Representation,	
Unit V	**Mobile Forensics**	**12 Hours**
	Mobile Forensics: The Cell Phone, PDA and GPS Devices, Android, ios, Mobile Edit, CDR (Call Data Recorder). Challenges to Mobile Forensic Evidences- Basics, Identifying Evidence, Collection of Evidence, Seizure Error, Transport of Evidences- Possession and Chain of Custody, Searching and	

	Seizure of Computer Related Evidences. Storage of Evidences, Evidence Analysis. Processing of Evidences and Preparation of Reports, Software's related to mobiles Forensics.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study, Hands-on Training, Demonstration.

Text Books

1. Handbook of Biometrics by A.K. Jain
2. Multimedia Forensics and Security, Chang-Tsun Li, Taylor and Francis, 2013
3. Forensic Speaker Identification, Philip Rose, CRC Press, USA, 2003.

Reference Books

1. Oscar Tosi (1979), "Voice Identification: Theory and Legal Applications", University Park Press, Baltimore, USA.
2. Peter Ladefoged and Keith Johnson (2015), "A Course in Phonetics", Wardsworth Cengage Learning, Boston, USA, Seventh Edition.
3. Gunar Fant (2006), "Speech Acoustics and Phonetics", Springer Publishers, USA, 2005th Edition
4. Alan C. Bovik (2005), "Handbook of Image and Video processing", Academic Press, Second Edition.
5. Robert C. Maher (2010), Overview of Audio Forensics, Springer.

E-Resources

1. www.Youtube.com. Nptelhrd Channel
2. www.tutorialspoint.com
3. www.Javatpoint.com
4. www.ocw.mit.edu.com
5. www.edx.org.com

Course Outcomes

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

CO1	Define the basics of Biometrics	K1
CO2	Explain the Classification of Biometrics	K2
CO3	Explain the concept behind Multimedia Forensics	K2
CO4	Identify the Forensic Speaker Identification	K3
CO5	Analyze the importance of Mobile Forensics	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Fundamental Aspects of Biometrics**	**12 Hours**	**Mode**
	a. Introduction to Biometrics	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Various Types of Biometric Methods, Characteristics of Biometrics	3	
	c. General Biometric System (Identification and Verification)	2	
	d. General Architecture Comparison of different Biometric Technologies	2	
	e. Difficulties in implementation of Biometrics, Applications of Biometrics	2	
Unit II	**Types of Biometrics**	**12 Hours**	**Mode**
	a. Physiological Biometrics	3	PPT, Descriptive Methods, Group discussion
	b. Behavioral Biometrics	3	
	c. Advantages and Disadvantages, General Biometric System	3	
	d. Applications of Biometrics	3	
Unit III	**Multimedia Forensic**	**12 Hours**	**Mode**
	a. Introduction to Multimedia	3	PPT, Descriptive Methods, Group discussion
	b. Multimedia components (Text, Graphics, Animation, Audio, Video)	2	
	c. Multimedia Applications	2	
	d. Various Recording Devices and its Characteristics	2	
	e. Investigation of crime scene in reference to Multimedia Evidences	2	
Unit IV	**Forensic Speaker Identification**	**12 Hours**	**Mode**
	a. Introduction and Scope of Forensic Speaker Identification	3	PPT, Descriptive Methods, Group discussion
	b. Human Vocal Tract, Production and Description of Speech Sound	3	
	c. Introduction to Phonetics and its importance in Forensic Speaker Identification	3	
	d. International Phonetics Alphabets (IPA) and its Symbolic Representation	3	
Unit V	**Mobile Forensics**	**12 Hours**	**Mode**
	a. Mobile Forensics	3	PPT, Descriptive Methods, Group discussion Brain Storming Activity
	b. Challenges to digital forensic evidences-Basics, Identifying evidence	2	
	c. Collection of evidence, Seizure error, Transport of evidence-	3	
	d. Possession and chain of custody, Searching and seizure of computer related evidences	2	
	e. Evidence Analysis. Processing of evidences and preparations of report.	2	

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSE52	Number of Hours/Cycle		4
Semester	V	Max. Marks		100
Part	III	Credit		4
Course Elective I B				
Course Title	Economic Offences	L	T	P
Cognitive Level	Up to K4	50	10	

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understandthe importance Basic economic and financial terminology, Economic crimes in India are linked to several other crimes, Economic crimes often have a bearing on national security, Types of common economic offences and their consequences, Steps involved in mitigating economic crimes.

Unit I	**Economic Offences**	**10 Hours**
	Taxonomy of Economic Offences / Criminogenic Factors - Fundamentals of economics in economic offences - Tax evasion, Tax avoidance, Excise duty evasion, Customs Act, Fraudulent bankruptcy. White collar crime. Economic exclusion. Black money, Money laundering and hawala transactions. Insurance frauds. Corporate frauds. Bank frauds.	
Unit II	**Corruption and bribery of public servants**	**20 Hours**
	Corruption and bribery of public servants, PC Commission Act, Ponzi scheme. Pyramid scheme. Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives. Illicit drug trafficking. Trafficking in human organs. Cultural objects trafficking. Racketeering in employment. Racketeering in false travel documents.	
Unit III	**Applied Economics in Processing Evidence**	**10 Hours**
	Applied Economics in Processing Evidence - Forensic accountancy and Forensic auditing, Accounting Standards, Valuation of economic losses. Violation of Intellectual Property Rights.	
Unit IV	**Prevention of Economic Offences**	**10Hours**
	Prevention of Economic Offences and Prevention of Money Laundering - Legislations to deal with different forms of economic offences. RBI Act. SEBI Act. Competition Commission of India Act - Credit card frauds.	
Unit V	**Enforcement agencies to deal with different forms of economic offences**	**10 Hours**
	Enforcement agencies to deal with different forms of economic offences. International perspectives – measures adopted by FBI and INTERPOL. Case histories of economic offences. Applications of Forensic Science in Economic Offences.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

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

Reference Books

1. Gilbert Geis, R. F. Meier, Lawrence M. Salinger (1995), "White-Collar Crime: Classic & Contemporary Views", Free Press, New York, Third Edition.
2. J. Reiman(2012), "The Rich get Richer and the Poor get Prison", Allyn & Bacon, Boston, 12th Edition.
3. Indian Audit and Accounts department, Audit of Fraud, Fraud Detection and Forensic Audit, 2007.
4. Investigation of Economic Offences, State Crime Branch, Haryana.

E-Resources

1. https://research-methodology.net/
2. https://bradscholars.brad.ac.uk/bitstream/handle/10454/4308/5%20-%20YA%20RA%20-%20Chapter%204%20-%20Research%20Methodology.pdf?sequence=5&isAllowed=y
3. https://www.open.edu/openlearn/money-management/understanding-different-research-perspectives/content-section-8
4. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/law/09._research_methodology/01._basics_of_research/et/8148_et_et.pdf
5. https://chilot.files.wordpress.com/2011/06/legal-research-methods.pdf

Course Outcomes

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

CO1	Define the economic offences	K1
CO2	Explain various corruption and bribery of public servants	K2
CO3	Applythe economics in processing the evidences	K3
CO4	Identification and prevention of economic offences	K3
CO5	Categorize and present Enforcement agencies to deal with different forms of economic offences	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Economic Offences**	**12 Hours**	**Mode**
	a. Taxonomy of Economic Offences / Criminogenic Factors	1	PPT, Descriptive Methods, Group discussion
	b. Fundamentals of economics in economic offences	3	
	c. Tax evasion. Excise duty evasion, fraudulent bankruptcy.	2	
	d. White collar crime. Economic exclusion.	3	
	e. Black money, Money laundering and hawala transactions. Insurance frauds. Illicit drug trafficking.	3	
Unit II	**Corruption and bribery of public servants**	**14 Hours**	**Mode**
	a. Corruption and bribery of public servants.	3	PPT, Descriptive Methods,
	b. Corporate frauds. Bank frauds. Ponzi scheme. Pyramid scheme.	3	

	c. Illicit trafficking in contraband goods. Illicit trafficking in arms. Illicit trafficking in explosives.	3	Group discussion
	d. Trafficking in human organs. Cultural objects trafficking.	3	
	e. Racketeering in employment. Racketeering in false travel documents.	2	
Unit III	**Applied Economics in Processing Evidence**	**12 Hours**	**Mode**
	a. Applied Economics in Processing	3	PPT, Descriptive Methods, Group discussion
	b. Evidence - Forensic accountancy and Forensic auditing.	3	
	c. Valuation of economic losses.	3	
	d. Violation of Intellectual Property Rights.	3	
Unit IV	**Prevention of Economic Offences**	**10 Hours**	**Mode**
	a. Prevention of Economic Offences	3	PPT, Descriptive Methods, Group discussion
	b. Legislations to deal with different forms of economic offences.	2	
	c. RBI Act, SEBI Act.	3	
	d. Competition Commission of India Act - Credit card frauds.	2	
Unit V	**Enforcement agencies to deal with different forms of economic offences**	**12 Hours**	**Mode**
	a. Enforcement agencies to deal with different forms of economic offences.	4	PPT, Descriptive Methods, Storming Activity
	b. International perspectives – measures adopted by FBI and INTERPOL.	4	
	c. Case histories of economic offences, Applications of Forensic Science in Economic Offences.	4	

Course designed by –Mr. Krushna Sonawane

Programme	**B. Sc Forensic Science**	**Programme Code**			**UFS**
Course Code	**20UFSE53**	**Number of Hours/Cycle**			**4**
Semester	**V**	**Max. Marks**			**100**
Part	**III**	**Credit**			**4**
Core Elective Course I C					
Course Title	**Criminal Psychology and Forensic Related Laws**		**L**	**T**	**P**
Cognitive Level	**Up to K4**		**45**		**15**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students to understand Forensic Psychology and Criminal Behavior, Juvenile Delinquency, Areas under Forensic Psychology, Relevant provisions of The Poisons Act, 1919, and Case Studies and Relevant Provisions of Forensic related cases.

Unit I	**Forensic Psychology and Criminal Behavior**	**12 Hours**
	Review of Forensic Psychology: Introduction, definition, History, development. Scope of Forensic Psychology, Ethics of Forensic Psychology, Psychopathology and Abnormal behavior/model of abnormal behavior/abnormal behavior. Biological factors & Crime, Social Learning theories, Psychosocial Factors, Abuse. Intelligence & Crime, Effects of Media, Gender & Crime. Psychology of Terrorism.	
Unit II	**Juvenile Delinquency**	**12Hours**
	Theories of Offending: Social Cognition, Moral Reasoning. Child Abuse: Physical, Emotional, Sexual,/ types of abuse, Juvenile Sex Offenders, Prevention of Delinquency	
Unit III	**Areas under Forensic Psychology**	**12 Hours**
	Areas under Forensic Psychology- Competency to stand trial/ Competency to stand trial, Sentence Litigation, Criminal Responsibility, Civil Commitment, Guardianship and Conservatorship	
Unit IV	**Legal aspects I**	**12 Hours**
	Relevant provisions of The Poisons Act, 1919. Case Studies and Relevant Provisions of 1. Indian Penal Code, 1860. 2. The Bureau Of Indian Standards Act, 1986 3. Prevention of Food Adulteration Act, 1954.	
Unit V	**Legal aspects II**	**12 Hours**
	Case Studies and Relevant Provisions of – 1. Explosives Act 1884 2. Explosive Substances Act Case studies and relevant provisions of Arms Act, 1959. Legal Aspects of Ammunition Juvenile in conflict with Law: (Juvenile Justice Act, 2000. Bail of Juvenile, Court orders regarding Juvenile, Penalties and Case-studies)	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. 'Handbook of Forensic Psychology' by Prof. Dr.VimalaVeeraraghavan.
2. Krishnamurthy, R., Introduction to Forensic Science in Crime Investigation, 2011, Selective & Scientific Books, New Delhi.

Reference Books

1. Criminology' by Larry Siegel
2. 'Introduction to Forensic Psychology' by Bruce Arrigo
3. 'Forensic & Criminal Psychology' by Dennis Howitt.
4. 'Abnormal Psychology' by Halgin&Whitbourne.
5. 'Abnormal Psychology', by Robert C. Carson, James N. Butcher, Susan Mineka, Jill M.Hooley thirteenth Edition, Thirteenth Edition.
6. 'Encyclopedia of Forensic Science' by Jay A. Siegel, PekkaJ. Saukko, Geoffey C. Knupfer, Volume-1 to Volume-5.
7. 'Mental Disorders and Treatment' by Katherine Marsland.
8. 'Handbook of Polygraph Testing' by Murray Kleine.
9. 'Brain Mapping-The Methods' by Arthur W. Toga & John C. Mazziotta, Second Edition.
10. 'Criminal Profiling and Introduction to Behavioural Evidence Analysis' by Brent Turve, Second Edition.
11. 'Forensic Psychology' by Graham Towel& David Crighton
12. Serial Crime, Theoretical & Practical issues in Behavioural Profiling, Petherick, Woodworth Publication.
13. Diagnostic & Statistical Manual-IV TR, American Psychological Association
14. DSM-IV Mental Disorders Diagnostics, Etiology and Treatment, by Michaen, Allan.
15. 'Psychological Testing' by Anne Anastasi, Susana Urbina, Seventh Edition.
16. 'Psychological Testing' by Robert J. Gregory, Fourth Edition.
17. 'Mental Health Act' 1987.
18. 'Juvenile Justice Act' 2000

Course Outcomes

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

CO1	To find out the review of Forensic Psychology and Criminal Behavior	K1
CO2	Interpret the Juvenile Delinquency	K2
CO3	Understand the importance of various areas under Forensic Psychology	K2
CO4	Applications of Forensic related laws	K3
CO5	Simplify the various case studies and relevant provisions.	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	Cos	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Forensic Psychology and Criminal Behavior**	**12 Hours**	**Mode**
	a. Review of Forensic Psychology: Introduction, definition, History, development.	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Scope of Forensic Psychology, Ethics of Forensic Psychology,	2	
	c. Biological factors & Crime, Social Learning theories, Psychosocial Factors, Abuse.	2	
	d. Intelligence & Crime, Effects of Media, Gender & Crime.	3	
	e. Psychology of Terrorism.	2	
Unit II	**Juvenile Delinquency**	**12 Hours**	**Mode**
	a. Theories of Offending: Social Cognition, Moral Reasoning.	3	PPT, Descriptive Methods, Group discussion
	b. Child Abuse: Physical, Emotional, Sexual,/ types of abuse.	3	
	c. Juvenile Sex Offenders	3	
	d. Prevention of Delinquency	3	

Unit III	**Areas under Forensic Psychology**	**12 Hours**	**Mode**
	a. Areas under Forensic Psychology- Competency to stand trial.	3	PPT, Descriptive Methods, Group discussion
	b. Sentence Litigation, Criminal Responsibility	3	
	c. Civil Commitment	3	
	d. Guardianship and Conservatorship	3	
Unit IV	**Legal aspects I**	**12 Hours**	**Mode**
	a. Relevant provisions of The Poisons Act, 1919	2	PPT, Descriptive Methods, Group discussion
	b. Case Studies	2	
	c. Indian Penal Code, 1860.	2	
	d. The Bureau Of Indian Standards Act, 1986	3	
	e. Prevention of Food Adulteration Act, 1954.	3	
Unit V	**Legal aspects II**	**12 Hours**	**Mode**
	a. Case Studies and Relevant Provisions of – Explosives Act 1884.	3	PPT, Descriptive Methods, Group discussion Brain Storming Activity
	b. Explosive Substances Act Case studies and relevant provisions of Arms Act, 1959.	3	
	c. Legal Aspects of Ammunition.	3	
	d. Juvenile in conflict with Law: Juvenile Justice Act, 2000. Bail of Juvenile.	2	
	e. Court orders regarding Juvenile, Penalties and Case-studies	1	

Course designed by –Mr. Krushna S. Sonawane

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSS51	Number of Hours/Cycle		2
Semester	V	Max. Marks		50
Part	IV	Credit		2
Skill Based Course III				
Course Title	Forensic Research Methodology	L	T	P
Cognitive Level	Up to K4	15	10	5

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the importance of Research process in the field of Forensic Science, the Statistical Significance of a Research study and Data collection. Also, to make students well-versed with preparation of reports of their Studies, Presentation techniques and Writing skills. To give knowledge on the Forensically Relevant Databases and Planning a Research study.

Unit I	Research Methodology	6 Hours
	Research Methodology: Meaning of Research in Forensic Science; Process of Research; Identification and Criteria of selecting a research problem (Hypothesis); Formulation of Objectives; Research plan and its components; Methods of research and difficulties in research; Research Proposal and Experimental Design: Key elements- Objective, Introduction, Design or Rationale of work, Guidelines for Design of experiments, Material and Methods, Designing experiments, Compilation and Documentation of data; Major organizations and Laboratories related to Forensic Science in India. Ethics in human and animal studies; Intellectual Property Rights and Plagiarism; Effective presentation of Research Findings.	
Unit II	**Sampling, Data Collection and Representation**	**6 Hours**
	Statistical methods: Basic definitions and applications. Sampling: Representative sample, Sample size, Sampling bias and Sampling techniques. Data collection and Presentation: Types of data, methods of collection of Primary and Secondary data. Methods of data presentation-graphical representation by Histogram, Polygon, Ogive curves and Pie diagrams.	
Unit III	**Measures of Central Tendency**	**6 Hours**
	Measures of Central Tendency: Mean, Median, Mode; Measures of Variability: Standard Deviations, Standard Error, Range, Mean Deviation and Coefficient of Variation. ANOVA.	
Unit IV	**Tests of Significance**	**6 Hours**
	Tests of significance: Small sample test (Chi-square, t-test, and F-test), Large sample test (Z-test) and Standard Error. Introduction to Probability theory and Distributions, (concept without deviation) Binomial, Poisson and Normal (only definitions and problems), R-Analysis.	
Unit V	**Scientific Writing**	**6 Hours**
	Writing and Presentation: Format of Research Paper and Report Writing, Procedure of Reference Citation; Significance of writing Research Papers and Review Articles; Major Scientific publishers; Impact Factor and Citation index; Ethics and Scientific conduct, A brief idea about Government Research Agencies such as DBT, DST, ICMR, CSIR, UGC, BPR&D, DRDO etc.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Craig Adam, (2010) "Essential Mathematics and Statistics for Forensic Science", Wiley Blackwell, John Wiley and Sons Ltd., UK, First Edition.
2. Kothari C.R (2019), "Research Methodology: Methods & Techniques", New Age International Publishers, Fourth Edition.

Reference Books

1. Bailey, N.T. J (2000), "Statistical Methods in Biology", Cambridge University Press, Third Edition.
2. Dr. Wayne W. Daniel (2014), "Biostatistics", Published by Wiley, 10th Edition.
3. Khan and Khanum Shiba Khan (2020), "Fundamental of Biostatistics", Ukaaz Publications, Sixth Edition.
4. H.C Ajay, Purohit Wagh (2009), "Research Methodology Tools and Techniques", Shree Publishers and Distributors
5. Wayne Dean Goddard, Stuart Melville (2014), "Research Methodology: An Introduction" Juta Academic, Second Edition.
6. Petter Laake, Haakon Breien Benestad and Bjorn Reino Olsen (Editor) (2007), "Research Methodology in the Medical and Biological Sciences", Academic Press, First Edition.
7. Gurumani N Gurumani (2011), "Research Methodology for Biological Science", MJP Publishers.
8. G.R. Basotia and K.K. Sharma (1999), "Research Methodology", Mangal Deep Publications.
9. C.H. Chaudhary (2009), "Research Methodology", RBSA Publication.
10. Ranjit Kumar (2014), "Research Methodology", SAGE Publications Pvt. Ltd., Fourth Edition.

E-Resources

1. https://research-methodology.net/
2. https://bradscholars.brad.ac.uk/bitstream/handle/10454/4308/5%20-%20YA%20RA%20-%20Chapter%204%20-%20Research%20Methodology.pdf?sequence=5&isAllowed=y
3. https://www.open.edu/openlearn/money-management/understanding-different-research-perspectives/content-section-8
4. http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/law/09._research_methodology/01._basics_of_research/et/8148_et_et.pdf
5. https://chilot.files.wordpress.com/2011/06/legal-research-methods.pdf

Course Outcomes

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

CO1	Identify the concept of Research methodology & meaning of research in Forensic Science	K3
CO2	Define various Statistical methods, Basic definitions and Applications of Research	K1
CO3	Explain various measures of Central Tendency	K2
CO4	Apply Tests of significances to relevant research studies	K3
CO5	Categorize and present their research works in a proper format	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	3	3	3	3	3	1	3	2	3	2	3	1
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	1	3	3	3	1	3	3	2	3	2	3	3
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Research Methodology**	**6 Hours**	**Mode**
	a. Research Methodology: Meaning of Research in Forensic Science; Process of Research.	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Formulation of Objectives; Research plan and its components	1	
	c. Research Proposal and Experimental Design: Key elements- Objective	1	
	d. Research Proposal and Experimental Design: Material and Methods, Designing experiments	1	
	e. Ethics and Scientific conduct, Ethics in human and animal studies	1	
Unit II	**Sampling, Data Collection and Representation**	**6 Hours**	**Mode**
	a. Statistical methods: Basic definitions and applications	1	
	a. Sampling: Representative sample, Sample size, Sampling bias and Sampling techniques	1	PPT, Descriptive Methods, Group discussion
	b. Data Collection and Presentation	1	
	c. Methods of Data Presentation- Graphical representation by Histogram and Polygon	1	
	d. Methods of Data Presentation- Graphical representation by Ogive curves and Pie diagrams	2	
Unit III	**Measures of Central Tendency**	**6 Hours**	**Mode**
	e. Measures of Central Tendency: Mean, Median, Mode	2	PPT, Descriptive Methods, Group discussion
	f. Measures of Variability: Standard Deviations and Standard Error	1	
	g. Measures of Variability: Range, Mean Deviation and Coefficient of Variation	1	
	h. Measures of Variability: Coefficient of Variation	1	
	i. ANOVA.	1	
Unit IV	**Tests of Significance**	**6 Hours**	**Mode**
	a. Tests of significance: Small sample test	2	PPT, Descriptive Methods, Group discussion
	b. Tests of Significance: Large sample test	1	
	c. Standard Error	1	
	d. Introduction to Probability theory and Distributions	1	
	e. Binomial, Poisson and Normal Distributions, R- Analysis	1	
Unit V	**Scientific Writing**	**6 Hours**	**Mode**
	a. Writing and Presentation: Format of Research Paper and Report Writing, Procedure of Reference Citation	2	PPT, Descriptive Methods, Group discussion Brain Storming Activity
	b. Significance of writing Research Papers and Review Articles	1	
	c. Major Scientific publishers, Impact Factor and Citation index	1	
	d. A brief idea about Government Research Agencies such as DBT, DST, ICMR, CSIR,	1	
	e. UGC, BPR&D, DRDO etc.	1	

Course designed by –Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSC61	Number of Hours/Cycle		4
Semester	VI	Max. Marks		100
Part	III	Credit		3
Core Course XVI				
Course Title	Forensic Anthropology and Odontology	L	T	P
Cognitive Level	Up to K4	50	5	5

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the Fundamentals of Forensic Anthropology, Scope, Application of Anthropology, Role of Forensic Anthropologist, Human Skeleton, Application of Human Skeleton, Identification of Data by Skeleton, Examination for Identification Indices, Principles and Application of Anthropometric Techniques and Analysis of Teeth and Bite Marks

Unit I	**Introduction to Forensic Anthropology**	**14 Hours**
	Introduction to Forensic Anthropology: Definition, History, Scope, Objectives and Development. Identification- Living or Dead, Absolute Identification, Partial Identification. Corpus Deliciti. Role of Forensic Anthropologist: Crimes and Mass disasters- Natural (Tsunami, Landslides, Earthquakes, Cyclone, Typhoon, Hurricane, Floods) and Man-made Disasters (Terrorist Attacks, Genocide, Fires and Explosions, Aviation and Rail accidents), Scene Documentation, Collection of Remains, Procurement of Ante Mortem Records.	
Unit II	**Human skeleton**	**10 Hours**
	Human skeleton, Comparative Skeletal Anatomy of Human and Non-Human. Determination of Race, Age, Sex, Stature- Identification of Data by Skeleton: Skull, Sutures, Mandible, Pelvis, Sacrum, Long Bones and External Examination. Identification Indices. Ossification Centers and Suture Enclosures.	
Unit III	**Introduction to Anthropometric Techniques**	**14 Hours**
	Introduction to Anthropometric Techniques- Portrait Parle/ Bertillon System. Tools, Instruments and Importance of Somatoscopy, Somatometry, Osteometry and Craniometry in determination of Age and Sex. Advanced Techniques- Photo fit/ Identi Kit System and Tissue Depth Analysis for Reconstruction of various Facial Features. Cranio-Facial Super Imposition Techniques: Photographic Super Imposition, Video-Superimposition, Roentgenographic Superimposition. Genetic and Congenital Anomalies: Causes, Types, Identification and their Forensic Significance.	
Unit IV	**Forensic Odontology**	**12 Hours**
	Forensic Odontology: Introduction Structure and Types of Teeth (Deciduous, Permanent, Successional, Superadded). Dentition and Dental Formula. Dental Charting (Zsigmondy System, Palmer System, Cunningham's Notation, FDI Notation). Determination of Age, Sex and Race- identification of Data by Teeth: Eruption and Calcification of Deciduous and Permanent Teeth, Appearance and Racial differences.	

Unit V	Teeth-marks and Bite marks	10 Hours
	Teeth-marks and Bite marks- Appearance of Human Bite-mark, Types of Bite-marks, Differential Diagnosis, Collection of Bite-mark Evidences: Non-invasive Forensic dental Photography (Alternate Light Imaging, Fluorescence Imagining Technique, UV, IR) & Invasive Techniques. Dental diseases.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Beals, R.L. and Hozier, H. (1985), An Introduction to Anthropology, Macmillan, New Delhi
2. Singh, I.P. and Bhasin M. K. (1968), Anthropometery, Kamla-Raj Publications, Delhi.

Reference Books

1. Indian Patents Law and Procedure, D. P. Mittal, 2002, New Delhi, Allied Services (P) David R. Senn and Paul G. Stimson (2nd Edition) (1999), Forensic Dentisty, CRC Press, LLC.
2. John. G Clement and David. L. Ranso (1998), "Craniofacial Identification in forensic Medicine, Oxiford University, Press.
3. Hooton, E.A. (1946), "Up from the Ape", Macmillan, New York.
4. Steward T.D. (1978), "Essentials of Forensic Anthropology, Charles C. Thomas Publisher, Limited.
5. Mahajan A.& Nath S (2009), "Application areas of anthropology",Reliance Publishing.
6. Pickering R. & Bachman D (2009), "The use of Forensic Anthropology", CRC Press, Second Edition.
7. Shukla B.R.K & Rastogi S.P.P. (2012), "Physical Anthropology and Human Genetics, Palaka Prakashan, First Edition.

E-Resources

1. www.slideshare.net
2. www.youtube.com
3. www.docs.google.com
4. www.link.springer.com

Course Outcomes

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

CO1	Define the basics of Forensic Anthropology	K1
CO2	Explain about Human Skeleton in depth	K2
CO3	Explain about Anthropometric Techniques	K2
CO4	Apply their knowledge in the examination of Forensic Odontological Evidences	K3
CO5	Analyze Teeth and Bite marks	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Introduction to Forensic Anthropology**	**14 Hours**	**Mode**
	a. Introduction to Forensic Anthropology: Definition, History, Scope, Objectives and Development	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Identification- Living or Dead, Absolute Identification, Partial Identification	5	
	c. Role of Forensic Anthropologist	2	
	d. Crimes and Mass disasters	2	
	e. Procurement of Ante Mortem Records.	2	
Unit II	**Human skeleton**	**10 Hours**	**Mode**
	a. Human Skeleton	2	PPT, Descriptive Methods, Group discussion
	b. Comparative Skeletal Anatomy of Human and Non-human	2	
	c. Determination of Race, Age, Sex, Stature	2	
	d. Identification of Data by Skeleton	2	
	e. Identification Indices. Ossification Centers and Suture Enclosures.	2	
Unit III	**Introduction to Anthropometric Techniques**	**14 Hours**	**Mode**
	a. Introduction to Anthropometric Techniques	3	PPT, Descriptive Methods, Group discussion
	b. Importance of Somatoscopy, Somatometry, Osteometry and Craniometry in Determination of Age and Sex	3	
	c. Advanced Techniques	3	
	d. Imposition Techniques	3	
	e. Genetic and Congenital Anomalies	2	
Unit IV	**Forensic Odontology**	**12 Hours**	**Mode**
	a. Introduction	2	PPT, Descriptive Methods, Group discussion
	b. Structure and Types of Teeth	3	
	c. Dentition, Dental Formula and Dental Charting	2	
	d. Determination of Age, Sex and Race-Identification of Data by Teeth	4	
	e. Eruption and Calcification of Deciduous and Permanent Teeth	1	
Unit V	**Teeth-marks and Bite marks**	**10 Hours**	**Mode**
	a. Appearance of Human Bite-mark	2	PPT, Descriptive Methods, Group discussion Brain Storming Activity
	b. Types of Bite-marks	3	
	c. Differential Diagnosis, Collection of Bite-mark Evidences	2	
	d. Non-invasive Forensic Dental Photography	2	
	e. Invasive Techniques and Dental Diseases	1	

Course designed by – Mr. Krushna S. Sonawane and Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSC62	Number of Hours/Cycle		4
Semester	VI	Max. Marks		100
Part	III	Credit		3
Core Course XVI				
Course Title	Forensic Medicine	L	T	P
Cognitive Level	Up to K4	50	5	5

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the importance of Forensic Medicine, The Human Anatomy and Physiology: Organizational Levels of human body, The Taphonomy: Introduction-Definition, types, modes and stages of death, The Definition, Nature and extent of wounds, Classification, and Thermal Injuries- Hypothermia, Burns, Scalds, Electrical, Lightning.

Unit I	**Human Anatomy**	**10 Hours**
	Human Anatomy: Introduction to various organizational levels of human body- Cardiovascular system, Digestive system, Respiratory system, Nervous system, Endocrine System, Urinogenital system.	
Unit II	**Forensic Medicine**	**14 Hours**
	Forensic Medicine: Historical perspectives and Scope, Global and Indian scenario. Legal aspects of Forensic Medicine: Inquest, Exhumation, Dying Declaration, Dying Deposition, Medical Certificates, Medical Report, Summons, oaths, Post Mortem and Ante Mortem records, MTP Act, Infanticides and Foetcide, Types of autopsies.	
Unit III	**Taphonomy**	**14Hours**
	Taphonomy: Introduction-Definition, types, modes and stages of death (somatic death and molecular death) Signs and Changes after death: Immediate Changes, Early changes (Algor mortis, Livor Mortis, Rigor Mortis, PM Caloricity) and Late Changes- External and Internal Changes (Putrefaction, Adipocere and Mummification) Changes in Blood, Cerebrospinal Fluid, Vitreous Humor. Medico legal aspects of death.	
Unit IV	**Mechanical Injuries**	**12Hours**
	Definition, Nature and extent of wounds, Classification, Types- Mechanical Injuries (Abrasions, Contusions, Lacerations, Incised, Stabs, Chop, Firearm wounds) Regional wounds- Head Injuries, Skull Fractures, Cerebral Injuries And concerning Medico-legal Aspects.	
Unit V	**Thermal Injuries and Mechanical Asphyxia**	**10Hours**
	Thermal Injuries- Hypothermia, Burns, Scalds, Electrical, Lightning. Mechanical Asphyxia: Hanging, Strangulation, Throttling, Suffocation, Smothering, Choking and Concerned Medico-legal Aspects.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books:

1. Modi J. P. (2001) Textbook of Medical Jurisprudence & Toxicology, M.M. Tripathi Publication.
2. Tortora GJ and Derrickson B (2017) Tortora's Principles of Anatomy and Physiology, Wiley Publications.

Reference books

1. Pillay V.V. (2017),"Handbook of Forensic Medicine and Toxicology", Paras Publications, 18th Edition.
2. James P.J. (2015),"Encyclopedia of Forensic and Legal Medicine", Elsevier Publications, 2nd Edition.
3. Smith D.G.V (1990),"A Manual of Forensic Entomology and Death: A Procedural Guide", Joyce's Publications.
4. Aggrawal A. (2017), "Textbook of Forensic Medicine and Toxicology", Avichal Publishing Company, Second Edition.
5. Guharaj P. V., Chandran M. R. (2006), "Forensic Medicine", 2nd, Universities Press(India) Pvt. Ltd., Hyderabad, Second Edition.
6. Parikh C.K, (2007), "Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology", CBS Publishers & Distributors Pvt. Ltd., India, Sixth Edition.
7. Waugh A. and Grant A. (2018) Ross and Wilson Anatomy and Physiology in Health and Illness, 13th (International) Edition.

E-Sources

1. www.slideshare.com
2. www.sciencedirect.com
3. www.youtube.com
4. www.acpjournals.com
5. www.medicalppt.blogspot.com

Course Outcomes

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

CO1	Define the basics of human anatomy and physiology	K1
CO2	Explain about the Forensic Medicine	K2
CO3	Explain about the Forensic importance of taphonomy	K2
CO4	Apply Forensic knowledge in the examination of injuries	K3
CO5	Analyze the thermal injuries	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Human Anatomy**	**12 Hours**	**Mode**
	a. Human Anatomy: Introduction to various organizational levels of human body- Cardiovascular system	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Digestive system	3	
	c. Respiratory system, Nervous system	2	
	d. Endocrine System	2	
	e. Urinogenital system	2	
Unit II	**Forensic Medicine**	**12 Hours**	**Mode**
	a. Forensic Medicine: Historical perspectives and Scope, Global and Indian scenario	3	PPT, Descriptive Methods, Group
	b. Legal aspects of Forensic Medicine:	3	

	Inquest, Exhumation, Dying Declaration, Dying Deposition		discussion
	c. Medical Certificates, Medical Report, Summons, oaths	2	
	d. Post Mortem and Ante Mortem records	2	
	e. MTP Act, Infanticides and Foetcide, Types of autopsies	2	
Unit III	**Taphonomy**	**14 Hours**	**Mode**
	a. Taphonomy: Introduction-Definition, types, modes and stages of death (somatic death and molecular death) Signs and Changes after death	3	PPT, Descriptive Methods, Group discussion
	b. Immediate Changes, Early changes (Algor mortis, Livor Mortis, Rigor Mortis, PM Caloricity)	3	
	c. and Late Changes- External and Internal Changes (Putrefaction, Adipocere and Mummification)	3	
	d. Changes in Blood, Cerebrospinal Fluid, Vitreous Humor	3	
	e. Medico legal aspects of death	2	
Unit IV	**Mechanical Injuries**	**12 Hours**	**Mode**
	a. Definition, Nature and extent of wounds, Classification, Types- Mechanical Injuries- Abrasions	2	PPT, Descriptive Methods, Group discussion
	b. Contusions, Lacerations	3	
	c. Incised, Stabs, Chop, Firearm wounds	2	
	d. Regional wounds- Head Injuries, Skull Fractures	4	
	e. Cerebral Injuries and concerning Medico-legal Aspects	1	
Unit V	**Thermal Injuries and Mechanical Asphyxia**	**10 Hours**	**Mode**
	a. Thermal Injuries- Hypothermia, Burns, Scalds	2	PPT, Descriptive Methods, Brain Storming Activity
	b. Electrical, Lightning	3	
	c. Mechanical Asphyxia: Hanging, Strangulation	2	
	d. Throttling, Suffocation, Smothering	2	
	e. Choking and Concerned Medico-legal Aspects	1	

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSC63	Number of Hours/Cycle		4
Semester	VI	Max. Marks		100
Part	III	Credit		3
Core Course XVIII				
Course Title	Forensic DNA Typing and Molecular Techniques	L	T	P
Cognitive Level	Up to K4	60		

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the concept behind Molecular Genetics, it's Principles, Working mechanism and Significance in Forensic Science. To impart knowledge regarding Human Genetics, DNA-typing for Human and Non-human Identification and Wildlife Forensics.

Unit I	Forensic Serology	12 Hours
	Forensic Serology: Introduction, History, Development and Significance. Blood: Nature, types of blood encountered on a crime scene, Blood Stain Pattern Interpretation, and Age. Biological Evidences encountered on a crime scene: Collection, Preservation and Examination (Presumptive, Confirmatory and Microscopic tests) of Blood, Semen, Saliva, Urine, Faeces, Milk samples.	
Unit II	**Serological Examination and Analysis**	**12 Hours**
	Human blood group systems: History, Biochemistry and Genetics of ABO, Rh, Mn and other Forensically significant blood group systems. Methods of ABO blood grouping (Absorption-Inhibition, Mixed Agglutination and Absorption Elution) from Blood Stains and other Body fluids/stains. Secretors and Non-secretors. Determination of Origin of Species by Immunological Methods. Serum Protein Polymorphism. Blood-related Disorders (Hemophilia, Thalassemia, Sickle Cell Anemia). Forensic Importance of Blood Groups. HLA Typing.	
Unit III	**DNA Extraction and Quantification Methods**	**12 Hours**
	DNA extraction and Quantification methods: Organic (Phenol-chloroform) extraction, Chelex extraction, FTA paper. Solid phase DNA extraction methods: Qiagen extraction Chemistry and kits, DNA IQ (Identification & Quantification), Prep Filer, Differential extraction. Introduction to Electrophoresis Techniques. DNA Amplification: Polymerase Chain Reaction (PCR)-Types, Instrumentation, working. DNA Quantification and DNA Sequencing: Overview.	
Unit IV	**DNA Typing**	**12 Hours**
	DNA Typing- History, Definition, Development and Forensic Significance. STR- Discovery, Structure, Development, STR markers, STR Polymorphisms and related Terminologies: Stutter peaks, Split peaks, Pull up, Template DNA, Overloaded Profiles, Low Template DNA Typing, Peak Balance, Mixtures, Degraded DNA, PCR Inhibition. RFLP, Blotting techniques.	

Unit V	Non-human DNA Testing and Wildlife Conservation Techniques	12 Hours
	Non-human DNA testing: Sources, Domestic Animal DNA Testing (Cat DNA, Dog DNA). Species Identification: Wildlife DNA testing using genetic markers (mtDNA Cytochrome b gene, mtDNA 12S rRNA gene, mtDNA COI gene), Geographic Origin Identification. Wildlife Conservation Techniques: Biosensors, DNA banks for endangered animals and DNA databases (Types and limitations).	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Butler J M, Advanced Topics in Forensic DNA Typing Methodology
2. Pierce B, Genetics a conceptual approach: Fourth Edition
3. Dr. Krishnamurthy R., Forensic Biology

Reference Books

1. Goodwin W (2010), "An Introduction to Forensic Genetics",Wiley J & Sons Ltd.,Second Edition.
2. Richard Li (2015), "Forensic Biology", CRC Press, Second Edition.
3. Waldman A.S. (2004), "Genetic Recombination", Humana Press Inc., 1st Edition.
4. Gunn A (2009), "Essential Forensic Biology, Wiley-Blackwell, Second Edition.
5. Giblett Eloise R (1975), "Genetic Markers in Human Blood", Wiley Blackwell Scientific Publications.

E-Resources

1. www.sciencedirect.com
2. www.youtube.com
3. www.ncbi.nlm.nih.gov
4. www.books.google.co.in
5. www.epgp.inflibnet.ac.in

Course Outcomes

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

CO1	Find out the concept behind Forensic Serology and Significance	K1
CO2	Relate to Human Genetics at a deeper level	K2
CO3	Explain the principle behind DNA extraction and Quantification methods	K2
CO4	Identify the concept of DNA Typing and its Forensic Significance	K3
CO5	Analyze Non-human DNA testing & Wildlife Conservation Techniques	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Forensic Serology**	**12 Hours**	**Mode**
	a. Forensic Serology: Introduction, History, Development and Significance. Blood: Nature, types of blood encountered on a crime scene	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Blood Stain Pattern interpretation, and Age	3	
	c. Biological Evidences encountered on a crime scene Collection Preservation and Examination (Presumptive, Confirmatory and Microscopic tests) of Blood	2	
	d. Semen, Saliva	2	
	e. Urine, Faeces, Milk samples	2	
Unit II	**Serological Examination and Analysis**	**12 Hours**	**Mode**
	a. Human blood group systems: History, Biochemistry and Genetics of ABO, Rh, Mn	2	PPT, Descriptive Methods, Group discussion
	b. Other forensically significant blood group systems Methods of ABO blood grouping from blood stains and other body fluids/stains	2	
	c. Secretors and Non-secretors Determination of Origin of Species by Immunological Methods	3	
	d. Serum Protein Polymorphism. Blood-related Disorders	3	
	e. Forensic Importance of Blood Groups and HLA Typing	2	
Unit III	**DNA Extraction and Quantification Methods**	**12 Hours**	**Mode**
	a. DNA extraction and Quantification Methods	3	PPT, Descriptive Methods, Group discussion
	b. Solid Phase DNA Extraction Methods	3	
	c. Introduction to Electrophoresis Techniques	1	
	d. Polymerase Chain Reaction (PCR)- Types, Instrumentation and Working	3	
	e. DNA Quantification and DNA Sequencing: Overview	2	
Unit IV	**DNA Typing**	**12 Hours**	**Mode**
	a. DNA Typing- History, Definition, Development and Forensic Significance	1	PPT, Descriptive Methods, Group discussion
	b. STR- Discovery, Structure, Development, STR markers and STR Polymorphisms	3	
	c. STR related Terminologies: Stutter peaks	3	
	d. STR related Terminologies: Low Template DNA Typing, Peak Balance, Mixtures, Degraded DNA, PCR Inhibition	3	
	e. RFLP and Blotting Techniques	2	
Unit V	**Non-human DNA Testing & Wildlife Conservation Techniques**	**12 Hours**	**Mode**
	a. Non-human DNA Testing	2	PPT, Group discussion Brain Storming Activity
	b. Species Identification: Wildlife DNA Testing using Genetic Markers and Geographic Origin Identification	3	
	c. Wildlife Conservation Techniques	3	
	d. DNA banks for endangered animals	2	
	e. DNA database (Types and limitations)	2	

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	**B. Sc Forensic Science**		**Programme Code**		**UFS**
Course Code	**20UFSC6P**		**Number of Hours/Cycle**		**8**
Semester	**VI**		**Max. Marks**		**100**
Part	**III**		**Credit**		**6**
Core Project I					
Course Title	**Dissertation**		**L**	**T**	**P**
Cognitive Level	**Up to K4**		**60**		**60**

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. Concerned department shall provide all required infrastructure to carry out dissertation work. The format for dissertation report will be similar to the research thesis style; incorporating chapters on: Introduction, Review of Literature, Materials and Methods, Results and Discussion and References / Bibliography.

The dissertation will be submitted in a typewritten and bound form. Copy of each dissertation will be DEPARTMENT OF FORENSIC SCIENCE; G. T. N Arts COLEGE (Autonomous), Dindigul and the centre will store it permanently. Project work on will be based on - Forensically significant and need based problems in the area of Forensic Science.

Course designed by – Mr. Krushna S. Sonawane

Programme	**B. Sc Forensic Science**	**Programme Code**			**UFS**
Course Code	**20UFSC6Q**	**Number of Hours/Cycle**			**4**
Semester	**VI**	**Max. Marks**			**100**
Part	**III**	**Credit**			**3**
Core Practical VI					
Course Title	**Practical- Forensic Anthropology and Odontology and Forensic Medicine**		**L**	**T**	**P**
Cognitive Level	**Up to K4**				**60**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students to understand the fundamental Practical knowledge of Forensic Anthropology and Odontology. Hands-on about Forensic Anthropology and Odontology. Bite mark analysis- comparison and examination. Importance of Forensic Medicine. Postmortem findings and their Forensic Significances. Demonstrations on Forensic Medicine.

List of the Practical's:

Forensic Anthropology and Odontology

1. Identification of Human Skeleton.
2. To perform Exhumation for reinvestigation.
3. Age estimation from skull sutures, and sacrum.
4. Age estimation from teeth.
5. Sex identification from skull.
6. Sex identification from pelvis.
7. Bite mark analysis- comparison and examination.
8. Osteometric measurements on Long bones.
9. Craniometric measurements on skull.
10. To perform Somatometric measurement on living.

Forensic Medicine

1. To perform pre-morgue analysis of a cadaver.
2. To study post-mortem findings of a cadaver.
3. To study modes and stages of death.
4. To study the various types of injuries.
5. Case study Preparation.
6. Post-mortem visit.
7. Mortuary Visit.
8. Demonstration on Medical Report.
9. To study Post Mortem records.
10. To study Ante Mortem records.

Course designed by – Mr. Krushna S. Sonawane and Sumit V. Sarwade

Programme	B. Sc., Forensic Science	Programme Code	UFS
Course Code	20UFSE61	Number of Hours/Cycle	4
Semester	VI	Max. Marks	100
Part	III	Credit	4

Core Elective Course II A				
Course Title	Forensic Professional Ethics	L	T	P
Cognitive Level	Up to K2	60	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

Students completing this course will gain a better understanding of the fundamental concepts of ethics, morals, areas of different ethics, Global issues concerning forensic ethics and other relevant aspects of responsibilities of Forensic Scientists for a crime-free society

Unit I	**Human Values**	**10 Hours**
	Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity. Human values, morals and self-discipline for shaping various elements- Integrity, Work ethics, Honesty, Courage, Empathy And Personality.	
Unit II	**Forensic Ethics**	**14 Hours**
	Introduction to Forensic ethics- Meaning, Types, Areas concerning ethics, need and significance. What are Ethics? Ethics in Forensic Science, Ethics in the Criminal Justice System and Law Enforcement, Criminal Investigation Ethics, Ethical Duties of Attorneys, Judicial Ethics, Ethics in the Courtroom and in Testimony, Ethics in the Crime Laboratory and CSI, Whistleblowers, Teaching Ethics and Implementing Ethical Codes, Ethics Codes in the Sciences and Forensic Science, Use of Animals in Forensic Science Research.	
Unit III	**Forensic Science for a crime-free society**	**12 Hours**
	The challenge of crime in a free society: Introduction to Forensic Science, Toward Understanding and Preventing Crime, Role of Forensic Scientists, Significance of evidences, Crime scene investigation, prevention and solving of crime, Forensic science awareness. Global issues- Forensic ethics worldwide- Computer ethics in cybercrimes. Identity theft cases.	
Unit IV	**Safety and Responsibilities**	**10 Hours**
	Safety measures to be followed by Forensic Scientists- In lab, on Crime scenes, and courtroom. Responsibilities and risk management for mass disaster scenario, Legal and Human Considerations during Investigations, Health and Safety Considerations, First-Responder Procedure for isolation and seizure of Digital Exhibits.	
Unit V	**Standards for Examinations**	**14 Hours**
	SWGDOC (Scientific Working Group for Forensic Document Examination) Standards, ASTM International (American Society for Testing and Materials), American Society of Questioned Document Examiners (ASQDE), Bureau of Indian Standards, IEEE Standards.	

Pedagogy

Lecture classes, Power point presentation, Group Discussions, Role- play, Case Discussions, Group activities.

Text Book

1. Gamble, T.K. & Gamble, M (2002) Communication Works, McGraw Hill, New York
2. Life Skills training Manual, RGNIYD, Govt. of India.
3. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
4. Barnett P.D. (2001), Ethics in Forensic Science: Professional Standards for the Practice of Criminalistics, CRC press.

Reference Books

1. Morreale, Spitzberg& Barge (2001) Human Communication: Motivation, Knowledge and Skills, Thomson Learning, Wadsworth.
2. Narula, Uma, (2006) Dynamics of Mass Communication: Models, Perspective, Strategies, Atlantic.
3. The challenge of crime in a free society, A report by the president's commission on law enforcement and administration of justice.
4. M.K.Bhasin and S. Nath (2002), Role of Forensic Science in the New Millennium, University of Delhi, Delhi.
5. S.H. James and J.J. Nordby (2005), Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, Boca Raton, 2nd edition.
6. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001),Henry Lee's Crime Scene Handbook, Academic Press,USA, 1st edition.
7. R. Saferstein (2004) Criminalistics, Prentice Hall, New Jersey, 8th edition.
8. W.J. Tilstone, M.L. Hastrup and C. Hald (2013), Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton.

E-Resources

1. https://www.swgdoc.org
2. https://www.astm.org
3. https://www.bis.gov.in
4. http://www.asqde.org
5. https://www.ieee.org

Course Outcomes

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

CO1	Define the fundamental aspects Human Values	K1
CO2	Explain the Forensic Ethics	K2
CO3	Explain the role of Forensic Science for Crime- Free Society	K2
CO4	Identify the importance of Safety and Responsibilities	K3
CO5	Analyze the Standards for examination.	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Human Values**	**10 Hours**	**Mode**
	a. Understanding the need, basic guidelines, content and process for Value Education	2	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Self-Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration	3	
	c. Continuous Happiness and Prosperity. Human values, morals and self-discipline for shaping various elements- Integrity, Work ethics	2	
	d. Honesty, Courage, Empathy and Personality	3	
Unit II	**Forensic Ethics**	**14 Hours**	**Mode**
	a. Introduction to Forensic ethics- Meaning, Types, Areas concerning ethics	3	PPT, Descriptive Methods, Group discussion
	b. What are Ethics? Ethics in Forensic Science, Ethics in the Criminal Justice System and Law Enforcement	2	
	c. Criminal Investigation Ethics, Ethical Duties of Attorneys, Judicial Ethics	3	
	d. Ethics in the Crime Laboratory and CSI, Whistleblowers, Teaching Ethics and Implementing Ethical Codes	3	
	e. Ethics Codes in the Sciences and Forensic Science, Use of Animals in Forensic Science Research	3	
Unit III	**Forensic Science for a crime-free society**	**12 Hours**	**Mode**
	a. The challenge of crime in a free society: Introduction to Forensic Science	2	PPT, Descriptive Methods, Group discussion
	b. Toward Understanding and Preventing Crime, Role of Forensic Scientists	2	
	c. Significance of evidences, Crime scene investigation, prevention and solving of crime	3	
	d. Forensic science awareness	2	
	e. Global issues- Forensic ethics worldwide- Computer ethics in cybercrimes. Identity theft cases	3	
Unit IV	**Safety and Responsibilities**	**10 Hours**	**Mode**
	a. Safety measures to be followed by Forensic Scientists- In lab, on Crime scenes, and courtroom	2	PPT, Descriptive Methods, Group discussion
	b. Responsibilities and risk management for mass disaster scenario	2	
	c. Legal and Human Considerations during Investigations	2	
	d. Health and Safety Considerations	2	
	e. First-Responder Procedure for isolation and seizure of Digital Exhibits	2	
Unit V	**Standards for Examinations**	**14 Hours**	**Mode**
	a. SWGDOC (Scientific Working Group for Forensic Document Examination) Standards	3	PPT, Descriptive Methods, Group discussion Brain Storming
	b. ASTM International (American Society for Testing and Materials)	3	
	c. ASB Technical Report 071, First Edition 2022	3	
	d. American Society of Questioned Document	3	

	Examiners (ASQDE)		Activity
	e. Bureau of Indian Standards, IEEE Standards	2	

Course designed by – Mr. Krushna S. Sonawane and Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSE62	Number of Hours/Cycle		4
Semester	VI	Max. Marks		100
Part	III	Credit		4
Core Elective Course II B				
Course Title	Criminology- Victimology and Penology	L	T	P
Cognitive Level	Up to K4	60		

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the Fundamental Principles on Crime and its Types, Classification, Sociological theory of crime, Concepts of Victim, Historical perspective on Victim in India along with Global scenario, Types of victims, Basics of Compensation, its Development in India and Internationally, Concepts of Penology, Nature and Types of Punishments, Historical Perspective of Correction in India and outside India.

Unit I	**The Concept of Crime-Criminology**	**14 Hours**
	Introduction of crime, Early Concept of Crime, Predatory Crime, Violent Crime, Classification of Crime, Nature and Scope of Criminology, Schools of Criminology, Heredity and Crime, Mental Disorder and Criminality, M'Naughten's rule of Criminal Responsibility, Sociological theory of crime.	
Unit II	**The Concept of Victim-Victimology**	**10 Hours**
	Meaning and Definition of Victimology, Historical Development of Victimology in India, Key Concepts in Victimology, Nature of Victimology, Scope of Victimology in India, Role of Victimologists. Victims of Crime, Abuse of Power, Victims of Abuse of Power, Types of Victims.	
Unit III	**Global Perspectives for Victims of Crime**	**12 Hours**
	U. N. Declaration on Basic Principles of Justice for Victims of Crime and Abuse of Power (1985), South Asian Society for Criminology and Victimology, World Society of Victimology, Indian Society of Victimology, National Policies for Victims of Crime.	
Unit IV	**The Concept of Penology**	**10 Hours**
	Introduction: Definitions: Penology, Punishment: Nature and Scope, Social Defense Approach; Correctional Model - Recent Trends in Punishments. Type of Punishment; Purposes of Punishment; Theories of Punishment; Punishment and the Prison; Cultural and Political Contexts of Punishment in India; Capital Punishment – Current Debate on Capital Punishment.	
Unit V	**Historical Perspective for Correction**	**14 Hours**
	Institutional Correction-Prison Systems: Historical Development of Prison Systems; Living in Prison - Prison life and Prison Rights; Ironic of Imprisonment; Politics of Injustices; Prison Administration; Prison Act; Problems of Prisons; Prison Reforms in India; Origin and Development of Indian Prison System- Daily routine- Prison as an Institution- Scientific Classification of Prisons and Prisoners.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Criminology, Penology and Victimology, Prof. N. V. Paranjape, Central law publications
2. Victimology in India: An Introductory Study ,Rajan, V.N, Allied Publishers, New Delhi, 1981

Reference Books

1. Schur, Edwin M(1965), "Crimes without victims", Prentice Hall. Inc.
2. Sparks Richard F, Genn, Hezel G, Dodd, David. J(1977), "Surveying victims", John Wiley and Sons' Ltd.
3. Geiser, Robert. L (1979), "Hidden Victims – The Sexual abuse of the Children", Beacon Press, Boston.
4. Parsonage, William H(1979), "Perspectives on Victimology", Sage Publications.
5. Bhattacharya, S.K. (2003),"Social defence: An Indian Perspective, Astral International (P) Ltd, Daya, 1st Edition.
6. Brodie, S.R. (1976), "Effectiveness of Sentencing", Home Office, London.
7. Carney, Louis P. (1981), "Corrections: Treatment and philosophy", Prentice Hall Inc.
8. Carney, Louis P. (1977), "Probation and parole: legal and social dimensions", McGraw Hill Book, Co.
9. Chockalingam K. (1993),"Issues in Probation in India", Madras University Publications, Madras.

E-Resources

1. www.Youtube.com. Nptelhrd Channel
2. https://epgp.inflibnet.ac.in/

Course Outcomes

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

CO1	Define the Basic Concept of Crime	K1
CO2	Explain the Concept of Victim	K2
CO3	Explain the Global Perspectives for Victims of Crime and Compensation	K2
CO4	Identify the Concept of Penology	K3
CO5	Analyze the Historical Perspective for Correction	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	COs	K-Level	Section A		Section B	Section C
			MCQs		Either/ or Choice	Open Choice
			No. of Questions	K-Level	No. of Question	No. of Questions
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (Either/or)	Section C (Open Choice)	Total Marks	% of Marks without Choice	Consolidated (Rounded off)
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**The Concept of Crime-Criminology**	**14 Hours**	**Mode**
	a. Introduction to Crime	2	PPT, Descriptive Methods, Brain Storming Activity
	b. Early Concept of crime, Predatory Crime, Violent Crime	2	
	c. Classification of Crime, Nature and Scope of Criminology	4	
	d. Schools of Criminology	4	
	e. Sociological theory of crime.	2	
Unit II	**The Concept of Victim-Victimology**	**10 Hours**	**Mode**
	a. Meaning and Definition of Victimology	2	PPT, Descriptive Methods, Group discussion
	b. Historical Development of Victimology in India	2	
	c. Nature of Victimology and Scope of Victimology in India	3	
	d. Role of Victimologists and Types of	3	

	Victims		
Unit III	**Global Perspectives for Victims of Crime and Compensation**	**12 Hours**	**Mode**
	a. U. N. Declaration on Basic Principles of Justice for Victims of Crime and Abuse of Power (1985)	2	PPT, Descriptive Methods, Group discussion
	b. South Asian Society for Criminology and Victimology	2	
	c. Indian Society of Victimology and National Policies for Victims of Crime	3	
	d. World Society of Victimology, Indian Society of Victimology	2	
	e. National Policies for Victims of Crime	3	
Unit IV	**The Concept of Penology**	**10 Hours**	**Mode**
	a. Introduction: Definitions: Penology, Punishment: Nature and Scope	2	PPT, Descriptive Methods, Group discussion
	b. Social Defense Approach; Correctional Model - Recent Trends in Punishments	2	
	c. Type of Punishment; Purposes of Punishment; Theories of Punishment	2	
	d. Punishment and the Prison; Cultural and Political Contexts of Punishment in India	2	
	e. Capital Punishment – Current Debate on Capital Punishment	2	
Unit V	**Historical Perspective for Correction**	**14 Hours**	**Mode**
	a. Institutional Correction-Prison Systems: Historical Development of Prison Systems.	4	PPT, Descriptive Methods, Group discussion Brain Storming Activity
	b. Ironic of Imprisonment; Politics of Injustices; Prison Administration	3	
	c. Prison Act; Problems of Prisons; Prison Reforms in India	3	
	d. Origin and Development of Indian Prison System- Daily routine	2	
	e. Prison as an Institution- Scientific Classification of Prisons and Prisoners.	2	

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20UFSE63	Number of Hours/Cycle		4
Semester	VI	Max. Marks		100
Part	III	Credit		4
Core Elective Course II				
Course Title	Security and Vigilance	L	T	P
Cognitive Level	Up to K4	45		15

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To facilitate the students to understand the Introduction to Principles of Security Management, Introduction and Evolution of the CVC (Central Vigilance Commission), Security Management, Security Methods and Laws and Procedures for the Investigation of various related cases.

Unit I	**Introduction to Principles of Security Management**	**12 Hours**
	Introduction to Principles of Security Management and Preventive System. Characteristic of Security and Management System a) Observation b) Patrolling c) Verbal and Non-Verbal Communication d) Traffic Controlling Dynamics of Security a) Threat Analysis b) Espionage c) Surveillance	
Unit II	**Introduction and Evolution of the CVC**	**12 Hours**
	Introduction and Evolution of the CVC (Central Vigilance Commission) Act 2003 and its importance Scope of Vigilance and role in Public and Private Sector a) Financial institution b) Government Industries c) Public Sector Preliminary inquiry/Investigation & Disciplinary Proceedings of Vigilance Unit (Departmental and Domestic Inquiry)	
Unit III	**Security Management**	**12 Hours**
	Security Management in Industrial, Commercial, Residencies a) Industrial: Gate area, Processing Unit area, Loading and Exit area b) Commercial: Entry, Aisles Unit, Exit c) Residencies: Outside, Terminal Building, Parking, Exit Importance of Safety and Security in Political, Social, Religions Gatherings a) Before b) During c) After Different types of Security gadgets and Equipment to protect Man, Material and Animal	
Unit IV	**Security Methods**	**12 Hours**
	Security Methods in Airport, Railway Station, Bus station, Metro and Pipeline Frisking method in the Security and Safety Management a) Male b) Female c) Vehicles: Two wheeler, Three wheeler and Four wheeler Private Security Agency (Regulation) Act 2005	
Unit V	**Laws and Procedures for the Investigation of various related cases**	**12 Hours**
	Law and Procedure of Domestic Enquiry, Modernization of Police, National Police Commissions and research	

	Procedure of Investigation of cases: a. Theft and smuggling of idol, vehicular theft b. Air crash/Crimes in Airport c. Crimes on Railways d. Homicide and scientific evidences e. Road accidents f. Dacoity cases g. Arson cases – Fire and Arson investigation methods and limitations	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Central Vigilance Commission Act, 2003 along with Related Acts
2. National Security Act, 1980

Reference Books

1. National Security Guard Act, 1986
2. Private Security Agencies (Regulation) Act 2005 along with Rules, 2006
3. Sharma B. R (2008) - Bank Frauds; Prevention & Detection (3rd edition), Universal Law Publishing Co., New Delhi.
4. Skogan G. Wesley & Maxfield G. Michael (1981) - Coping with Crime: Individual and neighbourhood, Volume 124, Sage Publication, Beverly Hills, London.
5. Industrial Security Management by R K SINHA

E-Resources

1. http://catalogue.pearsoned.co.uk/samplechapter/078973446X.pdf
2. https://www.nr.no/~abie/RA_by_Jenkins.pdf
3. http://www.ntu.edu.sg/home/anwitaman/TeachingMaterial/notes-riskanalysisandmanagement.pdf
4. https://www.files.ethz.ch/isn/195675/DCAF_BG_3_The%20Security%20Sector.11.15.pdf
5. https://hsema.dc.gov/sites/default/files/dc/sites/hsema/publication/attachments/Security%20Guidance%20FINAL_0.PDF
6. http://www.thepassionateseeker.com/security-management-of-industrial-plants/
7. https://science.howstuffworks.com/transport/flight/modern/airport-security1.htm
8. http://blog.safe-passage.com/types-of-security-screening-checkpoints-at-the-airport
9. http://gps-securitygroup.com/types-security-systems-used-airports/
10. http://indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/Annualreport10-11/Security.pdf
11. https://www.bsia.co.uk/Portals/4/Publications/231-security-searches-cop.pdf

Course Outcomes

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

CO1	To find out the review of Principles of Security Management	K1
CO2	To understand theIntroduction and Evolution of the CVC	K2
CO3	Understand the importance of Security Management	K2
CO4	Applications of Security Methods	K3
CO5	Simplify the Laws and Procedures for the Investigation of various related cases	K4

Mapping of Course Outcomes (Cos) with Programme Specific Outcomes

	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO 10	PSO 11	PSO 12
CO1	1	3	3	3	1	3	3	2	3	2	3	3
CO2	1	3	3	3	1	3	3	2	3	2	3	3
CO3	3	3	3	3	3	1	3	2	3	2	3	1
CO4	3	3	3	3	3	1	3	2	3	2	3	1
C05	1	1	2	3	3	1	3	1	1	2	1	1

3. High; 2. Moderate; 1. Low

Articulation Mapping – K Levels with Course Outcomes (Cos)

Units	**COs**	**K-Level**	**Section A**		**Section B**	**Section C**
			MCQs		**Either/ or Choice**	**Open Choice**
			No. of Questions	**K-Level**	**No. of Question**	**No. of Questions**
1	CO1	Up to K2	2	K1&K2	2 (K1 & K1)	1 (K1)
2	CO2	Up to K2	2	K1&K2	2 (K2 & K2)	1(K2)
3	CO3	Up to K2	2	K1&K2	2 (K2 & K2)	1 (K2)
4	CO4	Up to K3	2	K1&K2	2 (K3 & K3)	1 (K3)
5	CO5	Up to K4	2	K1&K2	2 (K4 & K4)	1 (K4)
No of Questions to be asked			10		10	5
No of Questions to be answered			10		5	3
Marks for each Question			1		4	10
Total marks for each Section			10		20	30

K1 – Remembering and recalling facts with specific answers
K2 – Basic understanding of facts and stating main ideas with general answers
K3 – Application oriented – Solving problems
K4 – Examining, analyzing, presentation and make inferences with evidences

Distribution of Section – wise Marks with K Levels

K Levels	**Section A (No Choice)**	**Section B (Either/or)**	**Section C (Open Choice)**	**Total Marks**	**% of Marks without Choice**	**Consolidated (Rounded off)**
K1	5	8	10	23	23	23%
K2	5	16	20	41	41	41%
K3	-	8	10	18	18	18%
K4		8	10	18	18	18%
Total Marks	10	40	50	100	100	100%

Lesson Plan

Unit I	**Introduction to Principles of Security Management**	**12 Hours**	**Mode**
	a. Introduction to Principles of Security Management and Preventive System.	3	PPT, Descriptive Methods, Brain Storming Activity Group discussion
	b. Characteristic of Security and Management System c. a)Observation b) Patrolling	3	
	d. c) Verbal and Non-Verbal Communication d)Traffic Controlling	2	
	e. Dynamics of Security a) Threat Analysis	2	
	f. b) Espionage c) Surveillance	2	
Unit II	**Introduction and Evolution of the CVC**	**12 Hours**	**Mode**
	a. Introduction and Evolution of the CVC (Central Vigilance Commission) Act 2003 and its importance	2	PPT, Descriptive Methods, Group discussion
	b. Scope of Vigilance.	2	
	c. Role of Vigilance in Public and Private Sector d. a) Financial institution b) Government Industries c) Public Sector	2	
	e. Preliminary inquiry/Investigation & Disciplinary Proceedings of Vigilance Unit	3	
	f. Departmental and Domestic Inquiry	3	
Unit III	**Security Management**	**12 Hours**	**Mode**
	a. Security Management in Industrial: Gate area, Processing Unit area, Loading and Exit area	2	PPT, Descriptive Methods, Group discussion
	b. Security Management inCommercial: Entry, Aisles Unit, Exit	3	
	c. Residencies: Outside, Terminal Building, Parking, Exit	3	
	d. Importance of Safety and Security in Political, Social, Religions Gatherings a) Before b) During c) After	3	
	e. Different types of Security gadgets and Equipment to protect Man, Material and Animal	3	
Unit IV	**Security Methods**	**12 Hours**	**Mode**
	a. Security Methods in Airport, Railway Station, Bus station, Metro and Pipeline	3	PPT, Descriptive Methods, Group discussion
	b. Frisking method in the Security and Safety Management in Males.	3	
	c. Frisking method in the Security and Safety Management in Females.	2	
	d. Frisking method in the Security and Safety Management , Vehicles: Two wheeler, Three wheeler and Four wheeler	2	
	e. Private Security Agency (Regulation) Act 2005.	2	
Unit V	**Laws and Procedures for the Investigation of various related cases**	**12 Hours**	**Mode**
	a. Law and Procedure of Domestic Enquiry, Modernization of Police	3	PPT, Descriptive Methods, Group discussion
	b. National Police Commissions and research	3	
	c. Procedure of Investigation of cases: a)Theft and smuggling of idol, vehicular theft	3	

	b)Air crash/Crimes in Airport c.)Crimes on Railways		Brain Storming Activity
	d. Procedure of Investigation of cases: d) Homicide and scientific evidences e) Road accidents f) Dacoity cases	2	
	e. Arson cases – Fire and Arson investigation methods and limitations	1	

Course designed by – Mr. Krushna S. Sonawane

Programme	**B. Sc Forensic Science**	**Programme Code**			**UFS**
Course Code	**20UFSS6P**	**Number of Hours/Cycle**			**2**
Semester	**VI**	**Max. Marks**			**100**
Part	**III**	**Credit**			**2**
Skill Based Course IV					
Course Title	**Demonstrations on CSI CSM and CSR**		**L**	**T**	**P**
Cognitive Level	**Up to K4**				**30**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students learn practical knowledge on various types of crime by creating and reconstructing the various crime scenes, guide the students how to investigate the crimes scene and How to resolve the significant errors during the reconstruction of various crime scenes.

List of the demonstrations:

1. Reconstruction and evaluation of various scenes of crime.
2. To study crime scene reconstruction methods.
3. To perform rough/ final sketching of crime scene
4. Reconstruction of an old crime scene.
5. Analysis of blood stains patterns.
6. To examine the road accident cases.
7. Investigation of Drowning Case.
8. Investigation of Suicide Scene.
9. Investigation of an Arson Scene.
10. Investigation of Archaeological Scene

Course designed by – Mr. Krushna S. Sonawane

Value added courses

Programme	**B. Sc., Forensic Science**	**Programme Code**	**UFS**
Course Code	**20CFSC31**	**Number of Hours/Cycle**	**2**
Semester	**III**	**Max. Marks**	**100**
Part	**IV**	**Credit**	**2**

Value added courses				
Course Title	**The Constitution of India**	**L**	**T**	**P**
Cognitive Level	**Up to K2**	**30**	**-**	**-**

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

Students completing this course will gain a better understanding of the fundamental concepts of The Indian Constitution, Structure of Constitution, Principals of constitution, Fundamentals Rights, Fundamental duties. The Constitution contains the fundamental law of the land. It is the source of all powers of, and limitations on, the three organs of State, viz. the executive, legislature and judiciary

Unit I	**History of The Indian Constitution**	**6 Hours**
	Brief History of constitution, Constitution – Fundamental Law of the Land: Making of the Indian Constitution, Aims and Objectives; Essential Features of Constitution	
Unit II	**Structure of The Indian Constitution**	**6 Hours**
	Theory of Basic Structure; Principles of Federalism; Nature of the Indian Constitution – Federal, Unitary, Quasi-federal, Body of Constitution	
Unit III	**Fundamental Rights (General) -I**	**6 Hours**
	State' under Article 12, 'Law' under Article 13; Also Articles 31A, 31B, 31C, 368, Doctrine of Eclipse, Waiver of Fundamental Rights, Severability, Power of Parliament to modify the fundamental rights (Article 33) Martial Law (Article 34)	
Unit IV	**Fundamental Rights (General) -II**	**6 Hours**
	Right to Equality – Articles 14,15,16,17, Right to Freedom – 19,20,21,21A,22, Right against Exploitation – 23,24, Right to Freedom of Religion – 25,26,27,28 Cultural and Educational Rights – 29,30	
Unit V	**Global Scenario of various Constitution**	**6 Hours**
	Introduction ,Political Systems around the world, silent features of constitution of various democratic countries, borrowed features of Indian Constitution ,comparison of Indian Constitution with that of others	

Pedagogy

Lecture classes, Power point presentation, Group Discussions, Role- play, Case Discussions, Group activities.

Text Book

1. J.N. Pandey (2018), "The Constitutional Law of India", Central Law Agency, New Delhi.

Reference Books

1. M.P. Jain 2018, "Indian Constitutional Law" Lexis Nexis, New Delhi 8th Edition.
2. D.D. Basu 2018, "Shorter Constitution of India", Lexis Nexis, New Delhi 15th Edition.
3. Mahendra P. Singh 2008, "V. N. Shula's Constitution of India" Eastern Book company, Lucknow 11th Edition.

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc., Forensic Science	Programme Code	UFS
Course Code	20CFSC41	Number of Hours/Cycle	2
Semester	IV	Max. Marks	100
Part	IV	Credit	2

Value added courses				
Course Title	Scientific and Legal Principles of Forensic Evidence	L	T	P
Cognitive Level	Up to K4	30	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

Students completing this course will gain a better understanding of the fundamental concepts of evidence, burden and standard of proof, judge and jury, types of evidence, witnesses, degrees of certainty, and other relevant aspects of the principles of evidence in a legal investigation.

Unit I	**Evidence Basics**	**6 Hours**
	What is Evidence? Types of evidence: eyewitness, expert, physical, direct, circumstantial, demonstrative. Evidence Identification, Collection and Preservation; Crime Scene to Courtroom; physical forensic evidence.	
Unit II	**Fundamental Concepts**	**6 Hours**
	Fundamental Concepts: Relevance, Admissibility, Weight of Evidence, Unreliable evidence, confessions, eyewitness identifications, latent print evidence, accomplice testimony.	
Unit III	**Witnesses**	**6 Hours**
	Witnesses: competence and compellability (subpoena), due process, confrontation clause/ Documentation, Report Writing, degrees of scientific certainty, chain of custody Locating, Evaluating and Selecting Experts; qualifying the expert, battle of the experts, discrediting experts, lawsuits against experts, who is an expert, role of the expert.	
Unit IV	**Pre-trial proceedings**	**6 Hours**
	Pre-trial proceedings and other types of sworn testimony: admissibility hearings, depositions, affidavits, meeting with opposing counsel, discovery. The course of evidence: burden and standard of proof, ultimate issue, trial chronology.	
Unit V	**Testimony**	**6 Hours**
	Testimony: direct and cross-examination of a witness (hostile witness), hearsay (common law and statutory exceptions), impeachment (prior inconsistent statements), juror comprehension, testimony tips Post Trial proceedings: appeals, mistrials, retrials, bifurcated trials (penalty phase) post-conviction litigation, ethics.	

Pedagogy

Lecture classes, Power point presentation, Group Discussions, Role- play, Case Discussions, Group activities.

Text Book

1. B S Nabar (2013), “Forensic Science in Crime Investigation”, Asia Law House, Hyderabad, 3rd edition.
2. Batuk Lal (2015), “The Law of Evidence”, Central Law Agency.

Reference Books

1. S.H. James and J.J. Nordby (2005), "Forensic Science: An Introduction to Scientific and Investigative Techniques", CRC Press, Boca Raton, 2nd edition.
2. Henry C. Lee; Timothy M. Palmbach and Marilyn T. Miller (2001), "Henry Lee's Crime Scene Handbook", Academic Press, USA, 1st edition.
3. R. Saferstein (2004), "Criminalistics", Prentice Hall, New Jersey, 8th edition.
4. K.D. Gaur (2016), "The Indian Penal Code", Universal Law Publishing, 6th edition.
5. J.N. Pandey (2018), "The Constitutional Law of India", Central Law Agency.
6. Ratanlal and Dhirajlal (2017), "The Indian Penal Code", LexisNexis, 35th edition.
7. Ratanlal and Dhirajlal (2015), "The Criminal Procedure Code", LexisNexis, Student Edition.
8. N.V. Paranjape (2017), "Criminology & Penology with Victimology", Central Law Publications.

Course designed by – Mr. Krushna S. Sonawane

Programme	B. Sc Forensic Science	Programme Code		UFS
Course Code	20CFSC51	Number of Hours/Cycle		2
Semester	VI	Max. Marks		100
Part	III	Credit		2
Value Added Courses				
Course Title	New Edge Forensics	L	T	P
Cognitive Level	Up to K4	60		

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

To make the students understand the Fundamental Aspects of Biometrics, Various Types of Biometrics, Introduction to multimedia, Multimedia components, History, Definition and disciplines of Forensic linguistics, Challenges to digital Forensic evidences.

Unit I	**Fundamental Aspects of Biometrics**	**6 Hours**
	Introduction to biometrics, various types of biometric methods, Characteristics of biometrics, Advantages and disadvantages, General biometric system (Identification and Verification), General architecture comparison of different biometric technologies, difficulties in implementation of biometrics, Applications of biometrics.	
Unit II	**Types of Biometrics**	**6 Hours**
	Physiological Biometrics -Fingerprints, palm prints, iris, retina, geometry of hand and face, Behavioral Biometrics-Handwriting, signatures, keystrokes, gait and voice. Characteristics of biometrics, Advantages and disadvantages, General biometric system (Identification and Verification), General architecture comparison of different biometric technologies, difficulties in implementation of biometrics, Applications of biometrics.	
Unit III	**Multimedia Forensics**	**6 Hours**
	Introduction to multimedia, Multimedia components (text, graphics, animation, audio, video) Multimedia Applications. Various recording devices and its characteristics, concepts of noise and construction of filter for their removal, nature and types of forgery related to multimedia and it's Authentication. Investigation of crime scene in reference to multimedia evidences.	
Unit IV	**Forensic Linguistics**	**6 Hours**
	History, Definition and disciplines of Forensic linguistics, types of Forensic text, History of Computational Linguistics, Stylistic Profiling, Intuitive and Statistical method, Individual and Language use, language of legal processes, text analysis, phonetics Language acquisition, Universal education and language Homogeneity, Authorship profiling, Veracity of Language, Forensic text type.	
Unit V	**Mobile Forensics**	**6 Hours**
	Mobile Forensics: The Cell Phone, PDA and GPS Devices, Mobile Edit, CDR (call data Recorder).Challenges to digital forensic evidences-Basics, Identifying evidence, collection of evidence, Seizure error, Transport of evidence- Possession and chain of custody, Searching and seizure of computer related evidences. Storage of evidences, evidence Analysis. Processing of evidences and preparations of report.	

Pedagogy

Class Room Lectures, Power point presentation, Group Discussion, Seminar, Quiz, Assignments, Experience Sharing, Brain storming, Activity, Case Study.

Text Books

1. Handbook of Biometrics by A.K. Jain
2. Multimedia Forensics and Security, Chang-Tsun Li, Taylor and Francis, 2013
3. Forensic Speaker Identification, Philip Rose, CRC Press, USA, 2003.

Reference books

1. Oscar Tosi (1979), "Voice Identification: Theory and Legal Applications", University Park Press, Baltimore, USA.
2. Peter Ladefoged and Keith Johnson (2011), "A Course in Phonetics, Wardsworth Cengage Learning, Boston, USA, 7th Edition.
3. Gunar Fant (2006), "Speech Acoustics and Phonetics", Springer Publishers, USA, 2005th Edition
4. Alan C. Bovik(2005), "Handbook of Image and Video processing", Academic Press, Second Edition.
5. Robert C. Maher (2010), Overview of Audio Forensics, Springer.
6. Gerald R. McMenamin (2002), "Forensic Linguistics- Advances in Forensic Stylistics, CRC Press, Washington, D.C., First Edition.
7. John Gibbons, Maria Teresa Turell (2008), "Dimensions of forensic linguistics" John Benjamins Publishing.
8. Gerald R. McMenamin (1993), "Forensic stylistics", Elsevier.
9. John Olsson (2008),"Forensic Linguistics: An Introduction to Language, Crime and the Law", Bloomsbury Publications, 2nd Edition.
10. Malcom Coulthard (2007), "An introduction to Forensic linguistics: language in evidence", Taylor and Francis Ltd.
11. Alan Davies (2007), "An introduction to applied linguistics: from practice to theory", Edinburgh University Press, 2nd edition.
12. Henry G. Widdowson, Guy Cook, Barbara Seidlhofer (2010), "Principle and Practice in Applied Linguistics: Studies in Honour Lawrence M. Solan, Peter M. Tiersma Speaking of Crime: The Language of Criminal Justice, Oxford University Press.

E-Resources

1. www.Youtube.com. Nptelhrd Channel
2. www.sciencedirect.com
3. www.youtube.com
4. www.ncbi.nlm.nih.gov
5. www.books.google.co.in
6. www.epgp.inflibnet.ac.in

Course designed by –Mr. Sumit V. Sarwade

Programme	B. Sc., Forensic Science	Programme Code	UFS
Course Code	20CFSC61	Number of Hours/Cycle	2
Semester	VI	Max. Marks	100
Part	IV	Credit	2

Value added courses				
Course Title	Entrepreneurship & Innovation	L	T	P
Cognitive Level	Up to K4	30	-	-

L-Lecture Hours T-Tutorial Hours P-Practical Hours

Preamble

Students completing this course will gain a better understanding of Concepts of Entrepreneurship, Information Support System, Business Plan, Innovation & Motivation, Patent, Copy Right & Trade Mark Laws.

Unit I	**Introduction to Concepts of Entrepreneurship**	**6 Hours**
	Scope of Entrepreneurship, Definitions of Entrepreneurship and entrepreneur, Characteristics of an Entrepreneur, Entrepreneurial Development models and Theories. Major types of Entrepreneurship – Techno Entrepreneurship, Women Entrepreneurship, Social Entrepreneurship.	
Unit II	**Information Support System**	**6 Hours**
	Information Support System: Government schemes, NGO, state/central motivation Policy, CED, IDI, EDI and MSME.	
Unit III	**Business Plan**	**6 Hours**
	Business Plan: Project Report, Information related to product, cost elements, product process, Plant & machinery, Finance sources, secured/unsecured loan, Logistics aspects.	
Unit IV	**Innovation & Motivation**	**6 Hours**
	Innovation & Motivation: Concept of Idea, Motivation Factors, Brain Storming, Incentives, Product innovation, Value potential, R & D importance, customer choice, motivational theory.	
Unit V	**Patent, Copy Right & Trade Mark Laws**	**6 Hours**
	Patent, Copy Right & Trade Mark Laws: Patent Acts for Design, IC circuit layout, Literacy, Art, copy right, Trade mark, PCT, Patent definition, patentable & non-patentable, merits & de-merits, Patent procedure, Monitoring system, Govt. agencies, patent norms.	

Pedagogy

Lecture classes, Power point presentation, Group Discussions, Role- play, Case Discussions, Group activities.

Text Book

1. Peter F. Drucker (2006), “Innovation and Entrepreneurship”, Harper Business; Reprint edition.

Reference Books

1. Eric Ries (2011), “The Lean Startup: How Constant Innovation Creates Radically Successful Businesses”, Penguin UK, United Kingdom.
2. Pankaj Goyal (2017), “Before You Start Up: How to Prepare to Make Your Startup Dream a Reality”, Fingerprint! Publishing, India.
3. Hayden A. Ellis (2014), “Innovation and Entrepreneurship: Practice and Principles”, Createspace Independent Pub.
4. V K Ahuja (2017), “Law Relating to Intellectual Property Rights”, Lexis Nexis; Third edition, India.

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