Annexure: I

Faculty of Science

Department of Forensic Science

Ordinance, Curriculum & Syllabus

Master of Science (Forensic Science)

(2020-21)

Shree Guru Gobind Singh Tricentenary

University, Gurugram (Haryana)- 122505, India

SHREE GURU GOBIND SINGH TRICENTENARY (SGT) UNIVERSITY,

BUDHERA, GURUGRAM (HARYANA)

FACULTY OF SCIENCE

MASTER OF SCIENCE [FORENSIC SCIENCE]

ORDINANCE

1. PREAMBLE

The University Grants Commission (UGC) has initiated several measures to bring equity, efficiency and excellence in the Higher Education System of country. The important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters.

The UGC has formulated various regulations and guidelines from time to time to improve the higher education system and maintain minimum standards and quality across the Higher Educational Institutions (HEIs) in India. The academic reforms recommended by the UGC in the recent past have led to overall improvement in the higher education system.
Department of Forensic Science, Faculty of Science, Shree Guru Gobind Singh Tricentenary University, Gurugram with the aim to enhance academic standards in quality of higher education has adopted the UGC guidelines in its Postgraduate (PG) program (M. Sc. Forensic Science)

The grading system is considered to be better than the conventional marks system and in order to facilitate student mobility across institutions with in India and across countries the community grade point average (CGPA) has been introduced in all the PG courses. The guidelines as follows,

CHOICE BASED CREDIT SYSTEM (CBCS):

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective, skill and ability enhancement courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

Outline of Choice Based Credit System:

a. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

b. **Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/

subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

i. **Discipline Specific Elective (DSE) Course**: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

ii. **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

c. **Skill Enhancement Course:** The course based upon the content that leads to Knowledge enhancement.

d. **Ability Enhancement Compulsory Course:** The course based upon the content that leads to the development of a professional of ability.

e. **Open Elective Course:** The course based upon the content that enhances interdisciplinary knowledge.

2. Program Educational Objectives (PEOs):

1. To impart fundamental and necessary knowledge essential for practicing forensic principles and procedures in criminal justice system.

2. To provide a platform to exchange views, discuss latest developments and conduct interdisciplinary collaborative research in a holistic manner for the advancement of forensic science.

3. To improve student's communication skills to make them capable to express their ideas clearly and persuasively in written and oral forms at technical and social platforms.

4. To inculcate moral values, ethics and leadership qualities in the students to work effectively in any multicultural environment.

5. To develop the habit of self-learning to remain at the leading edge and respond to challenges of an ever-changing environment with the most current knowledge and technology.

3. Program Outcomes (POs):

On successful completion of the Program, students will be able to

PO 1. Disciplinary Knowledge

Investigate and explain the real time forensic issues in legal and social context along with the in depth understanding of criminal justice system.

PO 2. Critical Thinking and Problem Solving
Precisely hypothesize and reconstruct the events surrounding a crime scene based on their critical thinking and observation skills.

PO 3. Analytical / Scientific Reasoning
Analyse and describe theoretical, conceptual and experimental data and interpret the final results.

PO 4. Research Related Skills
Generate, record, collate and interpret scientific data for conducting research and writing forensic related research projects.

PO 5. Effective Communication:
Communicate effectively their thoughts, opinions and findings related to professional conduct and social issues in the form of technical writing and oral presentations.

PO 6. Social Interaction and Effective Citizenship:
Interact wisely and smartly within the society with a focus on achieving their target without spoiling the societal harmony.

PO 7. Multicultural Competency and Leadership Readiness:
Foster self-confidence, self-awareness, leadership and collaborative skills to work in a multicultural and multidisciplinary environment.

PO 8. Ethics
Practice moral values and professional ethics while keeping up with their expertise and genuineness.

PO 9. Environment and Sustainability
Practice and follow the processes required for a sustainable, healthy and safe environment and will be abreast with the contextual knowledge of current environmental issues.

PO 10. Self-directed and Life-long Learning:
Acquire a habit of continuous self-learning through various online/offline learning platforms for personal academic/professional growth.

4. Definitions

(i) '**Course**' means a unit of teaching / individual subject comprising of Lectures, Tutorials and / or Lab that typically lasts one academic term (semester / year) led by one or more instructors (teachers or professors), and has a fixed roster of students. Each Course shall have an individual Course Code e.g. Forensic Chemistry (theory) and Practical-Forensic Chemistry (Lab) to be given separate course codes.

(ii) '**Credit**' means a unit by which course work is measured. One hour of lecture / tutorial is equal to one credit and one hour of lab / workshop / project etc. is equal to half credit.

(iii)'**Program**' means any combination of courses and/or requirements leading to a degree, diploma or certificate e.g. M.Sc. (Forensic Science).

(iv)'**Scheme of Study**' means the Academic Term wise listing of courses which will be normally offered in the entire Program.

(v) **'Semester Grade Point Average (SGPA)'** means the ratio of sum of the product of the number of credits with the numerical grade scored by a student in all the courses taken by a student in a particular Semester and the sum of the number of credits of all the Courses undergone by a student, i.e. SGPA(Si) =$\sum$ (Ci x Gi) /$\sum$Ci.

(vi)'**Cumulative Grade Point Average (CGPA)**' means the ratio of sum of the product of the number of credits with the numerical grade scored by a student in all the courses taken by a student in all Semesters and the sum of the number of credits of all the Courses undergone by a student i.e, CGPA =$\sum$(Ci x Si) / $\sum$Ci.

(vii) **'Open Elective Course'** means a course offered by a Faculty / Department other than that owns a particular Program.

5. Duration and Nomenclature of the Program:

The duration of M.Sc. Forensic Science program shall be of two academic years consisting of four (04) semesters (16 weeks per semester) under Choice Based Credit System (CBCS). On successful completion of all the four semesters, the student will be awarded M.Sc. Forensic Science degree. The student shall complete the program within a maximum period of 4 years from the date of admission to the first semester as per N+2 rule by UGC (where N stands for minimum duration years of the program). However, in exceptional circumstances a further extension of one more year may be granted. In such cases, permission from competent authorities of the University is mandatory, failing which he/she will be disqualified from the program.

6. Eligibility Criteria for Admission in a program:

For admission to the 1st Semester of M.Sc. (Forensic Science) program, the candidate must be graduate with Physics, Chemistry & Mathematics, Physics, Chemistry & Biology OR Agricultural sciences OR BCA OR B.Pharm. OR B.Sc.(Nursing) OR Engineering sciences OR B.Sc.(Forensic Sciences) OR Medical sciences with 50% marks (45%marks in case of SC/ST candidates of Haryana only) in aggregate or equivalent grade from any university recognized by UGC.

7. Registration of Courses at the start of an academic term

Every student admitted in a Program shall be required to register various courses he/she needs to undergo in a particular Semester as per the approved Scheme of Study applicable to M.Sc. Forensic Science Program in the prescribed format within the defined timelines.

8. Medium of Instructions:

The medium of the instruction for all Programs shall be English only.

9. Scheme of Study and Syllabi:

(i) Scheme of Study and Syllabi shall be governed by the UGC regulations.

(ii) In M.Sc. Forensic Science, formal classes / labs shall be held for 5 days in a week i.e. Monday to Friday and Saturday shall be reserved for Professional Activities (Curricular / Co-curricular and Extra-Curricular).

(iii) Minimum number of Credits required to earn M.Sc. Forensic Science degree shall be 87 credits.

(iv) Provision has been made in the Scheme of Study for students to earn upto three credits in each Semester through online MOOC courses on the specified portals.

For example, a student may enroll in the courses offered on SWAYAM platform of the Government of India (https://swayam.gov.in/). The courses offered on SWAYAM on SWAYAM portal are offered by the top ranked Universities / Institutions of National Importance spanning 4-12 weeks in higher education domain. A 4-week, 8 week and 12 or more week courses may have 1, 2 & 3 credits respectively. The credits will be accepted if the student appears in the term end examination conducted by the host institution and earns credits for the same with appropriate grade. Similarly, other such platforms may be identified by the department time to time.

(v) For Open Elective Course, a slot of one hour (preferably last lecture) during first three days of the week (Monday to Wednesday) for the whole semester will be earmarked in the time table.

(vi) The syllabus of various theory courses has been designed and distributed in four units and is balanced in terms of Academic workload (e.g. the syllabus has been designed in such a way that the entire theory syllabus is to be covered in 11C hours where C means number of credits per week. 2C/3C hours shall be utilized for discussing performance of

the students in class test/assignment and covering currently relevant topics related to the subject).

(vii) The weightage of continuous/ formative evaluation and term-end/ summative evaluation for theory classes is in the ratio of 40 and 60 respectively. Every course has 100 marks for evaluation.

(viii) Continuous/ Formative Evaluation of theory courses is done in following manner:

a) Mid Semester Examination (Subjective/Objective, Average of two) : 20 Marks

b) Assignments (Average of two) : 10 Marks

c) Professional Activities (Problems/Projects/Seminars/Case Study etc.) : 10 Marks

(ix) A student will be required to register for Professional Activities in the very beginning of the Academic Term (semester) which will be open ended and consists of curricular / co-curricular / extra-curricular activities. Such activities will include extra projects beyond syllabus (SGTU Synergy / Competitive Projects such as Hackathon / Robocon /BAJA/ SAE etc.), extension and activities related to clubs / societies / chapters of professional bodies / NSS / NCC / Sports etc. Each such activity shall be undertaken by the student under the supervision of a Faculty Member who will keep records of the activity undertaken by the student. Faculty Mentor concerned shall be informed about all the activities being undertaken by every student. Each student shall maintain a diary / log book of activities perform by her/him which will be countersigned by the Faculty Activity in-charge on fortnightly basis. Three weeks before the last day of classes, every student shall submit a portfolio of activities performed by him/her along with diaries / log books to the Faculty Mentor concerned. Head of the Department concerned shall constitute a Portfolio Evaluation Committee consisting of two Faculty members of the Department and a representative of Dean Student Welfare. Portfolio Evaluation Committee shall evaluate the performance of each student separately and award marks on scale of 0 to 10 based upon the efforts put by each student and the outcomes. Portfolio Evaluation Committee shall submit the evaluation report to the Head of the Department concerned who after satisfying herself/himself about the quality of evaluation shall notify the marks to all the Teachers taking theory classes in that Semester for incorporating marks earmarked for professional activities. Such professional activities shall be undertaken on week days after working hours and Saturdays. This provision / evaluation shall measure the group activities, attitude and behavior of the student.

(x) The weightage of continuous/formative evaluation and term-end/summative evaluation of lab classes/summer training/project work are in the ratio of 60 and 40 respectively. Every lab course has 100 marks for evaluation.

(xi) Continuous/Formative Evaluation of lab courses is done in following manner: -

a)	Attendance and Regularity in Lab Work	:	10 Marks
b)	Lab/Project Work Report	:	10 Marks
c)	Mid Term Oral Exam./ Assessment	:	10 Marks
d)	Conduct/ Demonstration	:	30 Marks

The distribution of formative (internal) assessment marks for the summer training and project work to be kept in-line with the above.

10. Teacher Diary and Course File

(i) Every faculty member should maintain a separate Teacher Diary and a Course file for each course including lab courses.

(ii) Teacher Diary will be maintained in the pre-printed booklet issued from the university store which consists of Index, Syllabus (Theory and Lab), Subject Time Table, Course plan, Daily Diary (Course Coverage), Attendance Record, Evaluation (Internal Assessment) Record, List of Low Performing Students, Value Added Lecture Plan, Internal Practical (Continuous Evaluation) marks for laboratory, Parent Teacher Meeting Record etc.

(iii) Each course file shall contain the following:

- Syllabus
- Learning Resources prescribed
- Tutorial Sheets / Assignments
- Current and Previous Class Test / Sessional Question Papers
- Previous Term-End Examination Question Papers
- Lecture Notes (In the Current file only).

(iv) At the end of the semester, faculty member should submit Teacher Diary and Course File to HODs. HODs shall maintain the record of all course files for at least 5 years.

(v) Faculty member can withdraw his or her handwritten notes from the course file before submitting to HODs.

(vi) In case, Faculty member is allotted same subject in the next semester, then he/she can take same course file from Principal / HODs for few days for the reference purpose only.

11. Home Assignments

a) Home Assignment will be designed as per the final examination pattern as per the details given in the table.

		No of Questions per Assignment									
			1 Marks	2 Marks	4 Marks	6 Marks	10 Marks	12 Marks	Total Marks	Time Per Assignment	Total Time (Hrs.)
		Marks	1	2	4	6	10	12			
S.No.	Examination Pattern	No of Assignments	2.5	6	10	15	25	30			
1.	Pattern	Two per course / One per two units	10	10	5	3	0	0	68	180	12.0

b) Minimum one home assignment shall be given from every two unit.

Penalty for late submission of Home Assignment

a) Every Home Assignment shall have the Date of Release and last Date of Submission.

b) Penalty for late submission for Home Assignment in the form of %age of marks deduction shall be as under:

- Within 7 Calendar days: 20%
- Within 8 to 15 Calendar days: 40%
- More than 15 Calendar days: 50%

c) Teachers will ensure that there is no plagiarism in Home Assignment. If plagiarism is detected, a penalty of 30% may be levied and the student will be asked to re-submit the Home Assignment within 7 Calendar days.

12. Question Banking and Question Paper Setting for Term End Examination

(i) Question Banking for Term End Evaluation and home assignments shall be done with questions having 1, 2, 4 and 6marks. The time allotted to each question shall be as under:

Description	Marks			
	1	2	4	6
Term End Examination is for 60 marks	2.5 minutes	5 minutes	10 minutes	15 minutes

(ii) Each question shall be set in the following format: -

S. No.	Question	Marks Allotted	Time Allotted	Bloom Taxonomy (Cognitive Domain) Level	Difficulty Level	Course Outcome Number

(iii)Bloom Taxonomy (Cognitive Domain) levels shall be: Knowledge, Comprehension, Application, Analysis, Evaluation and Synthesis.

(iv)Difficulty levels shall be: Easy, Moderate and Difficult.

(v) Course Outcome Number shall be the number of specific outcomes given in the Course Objective and Course Outcome Matrix.

(vi)Term-End Examination question papers shall be set for all courses as per pattern given in the following table.

Question Paper Setting											
			No of Questions per subject								
			1 Mark	2 Marks	4 Marks	6 Marks	10 Marks	12 Marks	Case Study	Maximum Marks	Total Time (min)
S.No.	Examination Pattern	Marks	1	2	4	6	10	12	40		
		No of Units↓/ Time→	2.5	5	10	15	25	30	NA		
1	Pattern	4	12	4	4	4	0	0	NA	60	150.0

Guidelines

a. Duration of end term theory examination: 3 hours.
b. Maximum marks: 60.
c. All Questions shall be compulsory.
d. The Question paper will be divided into four sections A, B, C and D.
e. Section A is compulsory and comprises of 12 questions of one mark each, 3 from each unit. The questions shall be asked in such a manner that there are no direct answers including one-word answer, fill in the blanks or multiple choice questions (2.5 minutes each)
f. Section B comprises of 4 questions of 2 marks each, one from each unit. (5 minutes each)
g. Section C Comprises of 4 questions of 4 marks each, one from each unit. (10 minutes each). Each question may have two alternatives, out of which student will be required to attempt one.
h. Section D Comprises of 4 questions of 6 marks each, one from each unit. (15 minutes each). Each question may have two alternatives, out of which student will be required to attempt one.
i. The questions shall be set in such a manner that these cover first five level of Bloom Taxonomy i.e. Knowledge (10-15%), Comprehension (15-25%), Application (15-25%), Analysis (15-25%) and Synthesis (10-15% in normal papers; 50-80% in design papers).
j. The questions shall have three difficulty level namely Easy, Moderate and Difficult with ratio of 1:2:1 respectively.
k. Each question will be linked with the relevant CO.

13. Examination Scheme for Class Test / Sessional Question Papers

(i) Mid Semester Question Papers/ Class Test shall be held normally in 7th and 13th weeks in the semester. Question papers shall be set from minimum 2 units (50% syllabus of each course). Duration shall be 90 minutes. Maximum marks shall be 30.

(ii) The structure of the sessional question papers shall remain the same as in term-end examination question paper.

14. Attendance Requirements/Eligibility to Appear in Term End Examination:

(i) A student should have minimum 75% attendance in each Course to be eligible to appear in Term End Examination failing which she/he shall be detained from appearing in the Term End Examination of that particular Course. A maximum condonation to the extent of 10% may be granted by the Dean of Faculty of Science based upon genuine reasons such as

hospitalization of self / parents / siblings, death in the family, participation in University sponsored activities outside the University campus and voluntary blood donation etc.

(ii) It will be the responsibility of the student to keep a track of her/his attendance in each Course in an Academic Term (semester) through ERP Portal and / or Course Teacher.

(iii)If a student is detained in a particular case, she/he shall be required to make-up the deficiency of attendance in the subsequent Academic Terms by attending classes, appearing in class tests and submitting additional home assignments. Once such student has made-up the deficiency, she/he will be allowed to appear in the next supplementary examination.

(iv) If the deficiency is more than 25% in a particular Course (having less than 50% attendance), the student will be required to pay additional fee specified by the university time to time for attending the classes again for which she/he will have to register for the Course(s) again in the subsequent term with the approval of the HOD/Dean concerned.

15. Term End Examination Rules

(i) The Term End examination for all semesters shall ordinarily be held in the month of December and May/June for all regular and reappear candidates. The examination dates are fixed by the Controller of Examination with the approval of Vice Chancellor.

(ii) Examination Rules including appointment of Examiners, Evaluation of answer sheets, compilation of results, calculation of SGPA/CGPA etc. shall be notified separately.

(iii)Answer sheets for the Term End Examination shall be shown to the Examinees before compilation of result by the Faculty members as per schedule (normally in two parts) notified by Head of the Department concerned in consultation with the Controller of Examination.

(iv)Normally the schedule for showing answer sheets to the examinees shall be so prepared that they are shown bulk of the answer sheets before last regular examination. Answer sheets related to last two/three exams can be shown within a week from the last date of examination.

(v) If a student raises objection to the award of marks in a particular answer sheet, the same shall be considered by a Committee of two Faculty members appointed by Head of the Department and settled on the same day with the approval of Head of the Department concerned.

(vi)No request for re-evaluation of answer sheets shall be entertained after the declaration of results.

16. Project / Dissertation

(i) Topic Selection and Appointment of Guide/Supervisor: - Normally selection of project topic / research problem shall be finalized in the previous Semester. HOD concerned shall call applications for allotment of project topic / research problem from the students minimum six weeks before the last date of classes in the previous Semester along with a detailed proposal in the specified format.\

(ii) HOD concerned shall constitute a Committee for allotment of project topic / research problem for dissertation consisting of minimum 3 Faculty members. The Committee will interview each student and submit the proposed project topic / research problem for each student along-with the suitable Project / Research Mentor. HOD shall approve the recommendation of the committee after satisfying herself/ himself about the project topic / research problem / Mentor recommended. In case, a Project requires a team activity in an undergraduate program, project team shall not have more-than 3 members and role of each team member shall be well defined.

(iii) Student shall start working on the literature review in the previous Semester itself and start the project / research activities right from day-1 of the Academic Term in which the Project / Dissertation is included in the Scheme of Study.

(iv) It will be mandatory for each student to publish at-least one review / research paper in SCOPUS / Web of Science indexed Journal to become eligible for the award of postgraduate degree. For the purpose of eligibility for the award of degree acceptance by the Journal will be sufficient. In case of undergraduate degree program, If a Project is allotted to a team of 3 or less students or an individual, one review / research paper by each team / individual will be desirable.

(v) Each student / team, as the case may be, shall submit minimum 3 copies of Project Report / Dissertation in the specified format.

(vi) Evaluation of Project / Dissertation: A project / dissertation undertaken by students shall be evaluated by one external and one internal examiner. External examiner shall be appointed by the Dean of Faculty concerned out of the panel approved by the Vice Chancellor.

17. Internship / Field Training

The duration of the Internship will be 4 weeks of 4 credits. The formative and summative assessment marks are mentioned in the scheme of study. The final viva voce and reports will be adjudged by the joint Board of External and/or Internal Examiners.

18. Improvement of Division after the award of Degree

(i) A student may re-appear for improvement in not more than 5 theory papers only after award of degree within one year from the date of declaration of result of the last / final examination to improve his/her Division after depositing the prescribed Examination Fee as notified by the University from time to time.

(ii) In the case of re-appearance in paper, the result will be prepared on the basis of the candidate's best performance in either of the Examination.

19. Evaluation Process – Theory and Practical:

(i) **Evaluation of Answer Books**:

The answer books may be evaluated either by the paper setter or any other internal or external examiner to be nominated by the Controller of Examiners with the approval of the Vice-Chancellor from the panel of examiners approved by the Board of Studies.

(ii) **Fail/ Reappear candidates:**

Fail / re-appear candidate of any semester may appear in the re-appear exams, as an ex-student, during any term end exams of his/her remaining semesters and up to two years after his final semester as per N+2 rule.

(iii)**Practical Examinations - Appointment of Examiner:**

The practical examinations shall be conducted by a Board of two Examiners consisting of one internal and one external examiner to be nominated by the Vice-Chancellor from the panel of examiners.

(iv)**Marks Distribution:**

The distribution of marks in examination of the practical course will be as per the criteria given below:

a. Demonstration/Conduct/Presentation = 50% marks

b. Viva-Voce Examination = 50% marks

20. Evaluation and Gradation Criteria

Evaluation and Gradation Criteria for Continuous / Formative Assessment and Term End / Summative Assessment shall be followed as mention below:

(i) Minimum pass percentage will be 40% for Continuous/Formative Assessment and 40% for Term End/Summative Assessment respectively in all Theory/Practical Courses, making overall minimum pass percentage to be 40%.

(ii) If a student fails to obtain minimum 40% marks in Continuous/Formative Assessment in a Theory paper, he/she will be required to improve the same by appearing in additional class tests and submitting additional assignments before the close of the Academic term. Such students will be allowed to appear in the Term End Examination of that particular Course provided he/she meets the minimum attendance criteria. However, If a student fails to meet the minimum requirement of 40% marks in Continuous/Formative Assessment before the Term End Exams, his/her result in that course will be shown as RL (FCA), in which case he/she will be required to obtain minimum 40% marks in Continuous/Formative Assessment by appearing in additional class tests and submitting additional assignments in subsequent terms.

(iii) The Letter and Numerical Grades for different range of percentage of marks obtained Continuous and Term End Assessment together in a particular Course shall be as under:-

Percentage of Marks Obtained	Letter Grade	Numerical Grade	Performance Level
90% and above	O	10	Outstanding
80% and above but less than 90%	A+	9	Excellent
70% and above but less than 80%	A	8	Very Good
60% and above but less than 70%	B+	7	Good
50% and above but less than 60%	B	6	Above Average
Above 40% but less than 50%	C	5	Average
Minimum Pass Marks 40%	D	4	Pass

Below 40%	F	0	Fail

(iv) If it is required to calculate the percentage of marks obtained by a student for the entire Program, the same will be calculated by multiplying overall CGPA with a factor of 10.

(v) Grace marks of maximum 1% of the Theory courses may be permitted in a particular Semester.

21. Declaration of Results:

(i) The Controller of Examinations shall declare the results as early as possible after the conclusion of each examination, but before the start of teaching for the next academic session.

(ii) Each successful student/ the student placed in reappear shall receive a copy of the Detailed Marks Certificate/ Grade Card Sheet of each semester examination.

(iii) The student whose result is declared late without any fault on his/her part may attend classes for the next higher semester provisionally at his /her own risk and responsibility, subject to his /her passing the concerned semester examination. In case, the student fails to pass the concerned semester examination, his/her attendance/internal assessment in the next higher semester in which he / she was allowed to attend classes provisionally will stand cancelled.

22. Criteria for Promotion to Higher Semester(s):

All students shall be promoted to the next semester / year irrespective of the number of papers cleared/passed in the lower semesters.

23. Improvement of Division after the award of Degree

(iii) A student may re-appear for improvement in not more than 5 theory papers only after award of degree within one year from the date of declaration of result of the last / final examination to improve his/her Division after depositing the prescribed Examination Fee as notified by the University from time to time.

(iv) In the case of re-appearance in paper, the result will be prepared on the basis of the candidate's best performance in either of the Examination.

24. Striking off the name of the defaulting students from the rolls of the University

(i) If a student remains absent for a continuous period of seven working days without written authorization from the Head of the Department of concerned, her/his name shall be struck off from the rolls of the University. However, such students may be re-admitted on payment of the Re-admission fee as prescribed by the University from time to time; if Dean/Principal is satisfied that re-admission of the student will not fall short of requisite percentage of the attendance.

(ii) If a student fails to pay fees by the last cut of date as prescribed by the University from time to time, her/his name shall be struck off from the rolls of the University. However, such students may be re-admitted on payment of the Re-admission fee as prescribed by the University from time to time; if Dean/Principal is satisfied that re-admission of the student will not fall short of requisite percentage of the attendance.

(iii) If a student is re-admitted, all his previous records shall be revived under the current structure, regulations and schedule of fees.

25. Other Provisions:

(i) Nothing in the Ordinance shall debar the University from amending the Ordinance and the same shall be applicable to all the students whether old or new.

(ii) Any other provision not contained in the Ordinance shall be governed by the rules and regulations framed by the University from time to time.

(iii) In case of any dispute, the Vice-Chancellor will be competent authority to interpret the rules and his interpretation shall be final.

DEPARTMENT OF FORENSIC SCIENCE

M.Sc. FORENSIC SCIENCE

Program Structure based on Choice Based Credit System (CBCS) 2020-22

Semester	Course Code	Course Name	Course structure			Contact hours/ week	Credits	Max. Marks	Formative Assessment	Summative Assessment
			L	T	P					
I	**Core Courses (CC)**									
	17050101	Basic Forensic Sciences	3	0	0	3	3	100	40	60
	17050102	Instrumentation I	3	0	0	3	3	100	40	60
	17050103	Crime Scene Investigation	3	0	0	3	3	100	40	60
	17050104	Fundamentals of Fingerprint and Questioned Document Examination	3	0	0	3	3	100	40	60
	17050105	Practical (Crime Scene Investigation)	0	0	6	6	3	100	60	40
	17050106	Practical (Fundamentals of Fingerprint and Questioned Document Examination)	0	0	6	6	3	100	60	40
	Ability Enhancement Compulsory Course (AECC)									
	17050107	Professional Ethics & Human Values	2	0	0	2	2	100	40	60
	Skill Enhancement Course (SEC)									
	17050108	Forensic Quality Management	2	0	0	2	2	100	40	60
	TOTAL CREDITS		**16**	**0**	**12**	**28**	**22**	**800**	**360**	**440**
II	**Core Courses (CC)**									
	17050201	Fundamentals of Forensic Accounting and Digital Forensics	3	0	0	3	3	100	40	60
	17050202	Instrumentation II	3	0	0	3	3	100	40	60
	17050203	Proactive and Reactive Forensic	3	0	0	3	3	100	40	60
	17050204	Forensic Physical Anthropology and Medicine	3	0	0	3	3	100	40	60
	17050205	Practical (Proactive and Reactive Forensic)	0	0	6	6	3	100	60	40
	17050206	Practical (Forensic Physical Anthropology and Medicine)	0	0	6	6	3	100	60	40
	Ability Enhancement Compulsory Course (AECC)									
	17050207	Research Methodology	2	0	0	2	2	100	40	60
	Skill Enhancement Course									

	17050208	Forensic Photography	2	0	0	2	2	100	40	60
	TOTAL CREDITS		**16**	**0**	**12**	**28**	**22**	**800**	**360**	**440**
	Summer Training (4-6 Weeks)									
	17050209	Summer Training					**4**	**200**	**100**	**100**
	Specialization									
	Discipline Specific Elective Courses (DSEC)									
		DSEC – 1	3	0	0	3	3	100	40	60
		DSEC – 2	3	0	0	3	3	100	40	60
		DSEC – 3	3	0	0	3	3	100	40	60
III		DSEC-4	3	0	0	3	3	100	40	60
		DSEC – 1 Lab	0	0	6	6	3	100	60	40
		DSEC – 2 Lab	0	0	6	6	3	100	60	40
	Skill Enhancement Course (SEC) (Common for all the Specializations -Choose any one of the following subjects)									
	17050319	Forensic Psychology	2	0	0	2	2	100	40	60
	17050320	Forensic Biology and Serology	2	0	0	2	2	100	40	60
	17050321	Forensic Chemistry and Toxicology	2	0	0	2	2	100	40	60
	TOTAL CREDITS		**14**	**0**	**12**	**26**	**20**	**700**	**320**	**380**
IV	**The specialization will be continued which has been adopted in the third semester)**									
	Research Training(Mandatory)(Common for all the specializations)									
	17050401	Dissertation/ Project					20	400	200	200
	TOTAL CREDITS		**0**	**0**	**0**	**0**	**20**	**400**	**200**	**200**
	Grand Total		**46**	**0**	**36**	**82**	**88**	**2700**	**1260**	**1440**

Scheme of Examination M.Sc. Forensic Science 2020-21	
Category	**%**
Core Course	**37.12**
Discipline Specific Elective Course	**39.18**
Skill Enhancement Course	**6.18**

Semester wise Credit Matrix M.Sc. Forensic Science: 2020-21

Semester	CC	DSEC	SEC	AECC	Total
I	18	-	2	2	**22**
II	18	-	2	2	**22**
III		18	2	-	**20**

Ability Enhancement Course	**4.12**
Summer Training	**4.12**
Online Courses from Swayam	**9.29**
	100

IV	-	20	-	-	**20**
Total	**36**	**38**	**6**	**4**	**84**
Summer Training (4/6 Weeks) after second semester					**4**
Online courses from SWYAM (Sem – I to Sem – III) Maximum 3 Credit each sem					**9**
Grand Total					**97**
Minimum Credits for award of degree					**87**

Name of the Faculty : Faculty of Science

Name of the Program : M.Sc. (Forensic Science) 2021

Sr. No.	Semester/ Year	Course Code	Nomenclature	Theory/ Practical	Core/ AECC/ SEC/ DSE/ GE/OE	L	T	P	Credits	Theory							Practical										Overall maximum marks	Overall Pass Marks	Whether to be offered under CBCS (Yes/No)	Scheme of Examinations (Theory+Internal+Practical +Oral/Theory +Internal+Practical/ Theory+Practical
										Summative Assessment		Formative Assessment					Summative Assessment				Formative Assessment									
										Max	Pass	Midterm	Assignment	Professional Activities	Max	Pass	Demonstration/Conduct/Presentation	Viva-voce	Max	Pass	Attendance & Regularity in Lab Work	Project/Laboratory work report	Midterm Oral Examination/Assessment	Conduct/Demonstration	Max	Pass				
				ASSIGNED MARKS						60	24	20	10	10	40	16	20	20	40	16	10	10	10	30	60	24	100	40		
1	I / I	17050101	Basic Forensic Sciences	Theory	Core	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
2		17050102	Instrumentation I	Theory	Core	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
3		17050103	Crime Scene Investigation	Theory	Core	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
4		17050104	Fundamentals of Fingerprint and Questioned Document Examination	Practical	Core	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Theory+Internal
5		17050105	Practical (Crime Scene Investigation)	Practical	Core	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
6		17050106	Practical (Fundamentals of Fingerprint and Questioned Document Examination)	Practical	Core	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
7		17050107	Professional Ethics & Human Values	AECC	Core	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
8		17050108	Forensic Quality Management	SEC	Core	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
9	II / I	17050201	Fundamentals of Forensic Accounting and Digital Forensics	Theory	Core	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
10		17050202	Instrumentation II	Theory	Core	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
11		17050203	Proactive and Reactive Forensic	Theory	Core	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
12		17050204	Forensic Physical Anthropology and Medicine	Practical	Core	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Theory+Internal
13		17050205	Practical (Fundamental of Forensic Ballistics)	Practical	Core	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
14		17050206	Practical (Forensic Physical Anthropology and Medicine)	Practical	Core	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
15		17050207	Research Methodology	AECC	Core	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
16		17050208	Forensic Photography	SEC	Core	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
		17050209	Summer Training	Practical		0	0	0	4								40	40	80	32	20	20	20	60	120	48	200	80	No	Practical +Internal
17		17050301	Forensic Chemistry	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
18		17050302	Forensic Toxicology	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
19		17050303	Pharmacology and Pharmacokinetics	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
20		17050304	Analytical Forensic Toxicology	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
21		17050305	Practical (Forensic Chemistry)	Practical	DSE	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
22		17050306	Practical (Forensic Toxicology)	Practical	DSE	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
23		17050307	Elements of Forensic Biology and Serology	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal

24		17050308	Forensic Botany, Microbiology and Entomology	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
25		17050309	Advanced Forensic Biology and serology	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
26		17050310	Forensic Genetics and DNA Profiling	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
27	III / II	17050311	Practical (Forensic Botany, Microbiology and Entomology)	Practical	DSE	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
28		17050312	Practical (Forensic Biology and serology)	Practical	DSE	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
29		17050313	Forensic Ballistics	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
30		17050314	Forensic Physics	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
31		17050315	Advanced Fingerprints and Questioned Document Examination	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
32		17050316	Computer and Cyber Forensics	Theory	DSE	3	0	0	3	60	24	20	10	10	40	16											100	40	No	Theory+Internal
33		17050317	Practical (Elements of Forensic Ballistics and Physics)	Practical	DSE	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
34		17050318	Practical (Advanced Fingerprints and Questioned Document Examination/Computer and Cyber Forensics)	Practical	DSE	0	0	6	3								20	20	40	16	10	10	10	30	60	24	100	40	No	Practical +Internal
35		17050319	Forensic Psychology	SEC	DSE	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
36		17050320	Forensic Biology and Serology	SEC	DSE	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
37		17050321	Forensic Chemistry and Toxicology	SEC	DSE	2	0	0	2	60	24	20	10	10	40	16											100	40	No	Theory+Internal
38	IV/II	17050401	*Project Work	Practical		0	0	0	20								80	80	160	64	40	40	40	120	240	96	400	160	No	Practical +Internal
39			**Online Courses during 1st, 2nd and 3rd semesters***						9																						

***Project Work: The project work may be carried out at in-house labs or outside agencies having required facilities for the specified work. On successful completion of the project, every candidate has to submit a final dissertation/report to their concerned department.**

***4 week course- 1 credit, 8 week course- 2 credits, 12 weeks course- 3 credits**
Every semester a student may opt for either:
One, 12 week course or
One, 4 week course & One, 8 week course or
Three, 4 week courses

DEPARTMENT OF FORENSIC SCIENCE

M.Sc. FORENSIC SCIENCE

Program Structure based on Choice Based Credit System (CBCS) 2020-22

Semester	Course Code	Course Name	Course structure credits			Contact hours/ week	Credits	Max. Marks	Formative Assessment	Summative Assessment
			L	T	P					
I	**Core Courses (CC)**									
	17050101	Basic Forensic Sciences	3	0	0	3	3	100	40	60
	17050102	Instrumentation I	3	0	0	3	3	100	40	60
	17050103	Crime Scene Investigation	3	0	0	3	3	100	40	60
	17050104	Fundamentals of Fingerprint and Questioned Document Examination	3	0	0	3	3	100	40	60
	17050105	Practical (Crime Scene Investigation)	0	0	6	6	3	100	60	40
	17050106	Practical (Fundamentals of Fingerprint and Questioned Document Examination)	0	0	6	6	3	100	60	40
	Ability Enhancement Compulsory Course (AECC)									
	17050107	Professional Ethics & Human Values	2	0	0	2	2	100	40	60
	Skill Enhancement Course (SEC)									
	17050108	Forensic Quality Management	2	0	0	2	2	100	40	60
	TOTAL CREDITS		**16**	**0**	**12**	**28**	**22**	**800**	**360**	**440**
II	**Core Courses (CC)**									
	17050201	Fundamentals of Forensic Accounting and Digital Forensics	3	0	0	3	3	100	40	60
	17050202	Instrumentation II	3	0	0	3	3	100	40	60
	17050203	Proactive and Reactive Forensic	3	0	0	3	3	100	40	60
	17050204	Forensic Physical Anthropology and Medicine	3	0	0	3	3	100	40	60
	17050205	Practical (Proactive and Reactive Forensic)	0	0	6	6	3	100	60	40

	17050206	Practical (Forensic Physical Anthropology and Medicine)	0	0	6	6	3	100	60	40
	Ability Enhancement Compulsory Course (AECC)									
	17050207	Research Methodology	2	0	0	2	2	100	40	60
	Skill Enhancement Course									
	17050208	Forensic Photography	2	0	0	2	2	100	40	60
	TOTAL CREDITS		**16**	**0**	**12**	**28**	**22**	**800**	**360**	**440**
	Summer Training (4-6 Weeks)									
	17050209	Summer Training					**4**	**200**	**100**	**100**
	Specialization									
	Discipline Specific Elective Courses (DSEC)									
		DSEC – 1	3	0	0	3	3	100	40	60
		DSEC – 2	3	0	0	3	3	100	40	60
		DSEC – 3	3	0	0	3	3	100	40	60
		DSEC-4	3	0	0	3	3	100	40	60
III		DSEC – 1 Lab	0	0	6	6	3	100	60	40
		DSEC – 2 Lab	0	0	6	6	3	100	60	40
	Skill Enhancement Course (SEC) (Common for all the Specializations -Choose any one of the following subjects)									
	17050319	Forensic Psychology	2	0	0	2	2	100	40	60
	17050320	Forensic Biology and Serology	2	0	0	2	2	100	40	60
	17050321	Forensic Chemistry and Toxicology	2	0	0	2	2	100	40	60
	TOTAL CREDITS		**14**	**0**	**12**	**26**	**20**	**700**	**320**	**380**
IV	**The specialization will be continued which has been adopted in the third semester)**									
	Research Training(Mandatory)(Common for all the specializations)									
	17050401	Dissertation/ Project					20	400	200	200
	TOTAL CREDITS		**0**	**0**	**0**	**0**	**20**	**400**	**200**	**200**
	Grand Total		**46**	**0**	**36**	**82**	**88**	**2700**	**1260**	**1440**

Scheme of Examination M.Sc. Forensic Science 2020-21	
Category	**%**
Core Course	**37.12**
Discipline Specific Elective Course	**39.18**
Skill Enhancement Course	**6.18**
Ability Enhancement Course	**4.12**
Summer Training	**4.12**
Online Courses from Swayam	**9.29**
	100

Semester wise Credit Matrix M.Sc. Forensic Science: 2020-21					
Semester	CC	DS EC	SEC	AECC	Total
I	18	-	2	2	**22**
II	18	-	2	2	**22**
III		18	2	-	**20**
IV	-	20	-	-	**20**
Total	**36**	**38**	**6**	**4**	**84**
Summer Training (4/6 Weeks) after second semester					**4**
Online courses from SWYAM (Sem – I to Sem – III) Maximum 3 Credit each sem					**9**
Grand Total					**97**
Minimum Credits for award of degree					**87**

S.No.	Course Code	Course Name
SPECIALIZATION-1 (Forensic Chemical Sciences)		
1.	17050301	Forensic Chemistry
2.	17050302	Forensic Toxicology
3.	17050303	Pharmacology and Pharmacokinetics
4.	17050304	Analytical Forensic Toxicology
5.	17050305	Practical (Forensic Chemistry)
6.	17050306	Practical (Forensic Toxicology)
SPECIALIZATION-1 (Forensic Biological Sciences)		
7.	17050307	Elements of Forensic Biology and Serology
8.	17050308	Forensic Botany, Microbiology and Entomology
9.	17050309	Advanced Forensic Biology and serology
10.	17050310	Forensic Genetics and DNA Profiling
11.	17050311	Practical (Forensic Botany, Microbiology and Entomology)
12.	17050312	Practical (Forensic Biology and serology)
SPECIALIZATION-1 (Forensic Physical Sciences)		
13.	17050313	Forensic Ballistics
14.	17050314	Forensic Physics
15.	17050315	Advanced Fingerprints and Questioned Document Examination
16.	17050316	Computer and Cyber Forensics
17.	17050317	Practical (Elements of Forensic Ballistics and Physics)
18.	17050318	Practical (Advanced Fingerprints and Questioned Document Examination/Computer and Cyber Forensics)

DEPARTMENT OF FORENSIC SCIENCE

Core papers:

Semester I

1. Basic Forensic Sciences
2. Instrumentation I
3. Crime Scene Investigation
4. Fundamentals of Fingerprint and Questioned Document Examination
5. Practical (Crime Scene Investigation)
6. Practical (Fundamentals of Fingerprint and Questioned Document Examination)

Ability Enhancement Courses:

7. Professional Ethics & Human Values

Skill Enhancement Courses:

8. Quality Management

Semester II

1. Fundamentals of Forensic Accounting and Digital Forensics
2. Instrumentation II
3. Proactive and Reactive Forensic
4. Forensic Physical Anthropology and Medicine
5. Practical (Proactive and Reactive Forensic)
6. Practical (Forensic Physical Anthropology and Medicine)

Ability Enhancement Courses:

7. Research Methodology

Skill Enhancement Courses:

8. Forensic Photography

Semester III

Specialization: Forensic Chemical Sciences

1. Forensic Chemistry
2. Forensic Toxicology
3. Pharmacology and Pharmacokinetics
4. Analytical Forensic Toxicology
5. Practical (Forensic Chemistry)
6. Practical (Forensic Toxicology)

Specialization: Forensic Biological Sciences

1. Elements of Forensic Biology and Serology
2. Forensic Botany, Microbiology and Entomology
3. Advanced Forensic Biology and serology
4. Forensic Genetics and DNA Profiling

5. Practical (Forensic Botany, Microbiology and Entomology)
6. Practical (Forensic Biology and Serology)

Specialization: Forensic Physical Sciences

1. Forensic Ballistics
2. Forensic Physics
3. Advanced Fingerprints and Questioned Document Examination
4. Computer and Cyber Forensics
5. Practical (Elements of Forensic Ballistics and Physics)
6. Practical (Advanced Fingerprints and Questioned Document Examination/ Computer and Cyber Forensics)

Discipline Specific Elective Courses

1. Forensic Psychology
2. Forensic Biology and Serology
3. Forensic Chemistry and Toxicology

Semester IV

Project Work

1. Name of the Department: Forensic Science						
2. Course Name	Basic Forensic science		**L**	**T**	**P**	
3. Course Code	17050101		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ()
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This core paper provides the basic knowledge, history, and scope of forensic science. In addition, structure and functioning of various organizations and laws used in criminal investigation is discussed.

9. Course Objectives

1. To understand the basic concepts and fields of Forensic Science
2. To describe structure and functioning of forensic laboratories.
3. To develop an understanding and appreciation for the scope of Forensic Sciences and its role in investigative system.
4. To familiarize with the important sections of IPC, CrPC, IEA and various other acts.

10. Course Outcomes (COs)

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

1. Know about the basics, history of Forensic science and the organizational set up of Forensic science laboratories.
2. Understand the structure and functioning of various international investigative agencies in combating crime.
3. Practice crime scene management and report various evidence found at scene of crime.
4. Apply knowledge related to IPC, CrPC, and IEA sections with respective to the crime investigated.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** General Forensic Science

Forensic Science: Definition of Forensic Science, The Role of the Forensic Laboratory, History and Development of Forensic Science in India & Abroad, Pioneers in Forensic Science, Forensic Evidences. Organizational Setup of Forensic Labs, **Laws and Principles of Forensic Science:** Law of Exchange (Locard), Law of Individuality, Law of Comparison, Law of Progressive Changes and Law of Probability, Branches of Forensic Science. **Admissibility of Forensic Evidence in Court:** Admissibility of Expert Testimony and Evidence in Court, Frye and Daubert standards. Forensic Report: Forensic Expert, Forensic Report, Court Testimony, Examination in chief, Cross Examination and Re-examination.

Unit – 2	**Number of lectures = 10**	**Title of the unit: Introduction to Toxicology & Serology**

Definition of Toxicology & Forensic Toxicology, scope of forensic toxicology, dosage, administration of poisons, Classification of poisons, action of poisons & factors modifying its action, Role of toxicologists, Significance of toxicological findings, Functions and roles of toxicologists in a forensic science lab, Brief study of the techniques used in toxicology examination.

Definition & Scope of Forensic Biology & Serology in crime investigation, Nature & Type of Biological evidences (Both animal & plant origin), various body fluids, their composition & Forensic Importance

Unit – 3	**Number of lectures = 10**	**Title of the unit:** Introduction to Forensic Ballistics

Introduction to Ballistics (Internal, terminal and external), Firearm and its parts, brief introduction to ammunition, types of ammunitions, various components of ammunitions (Primary charge, Main charge, Projectiles and their types, wads, lubricants etc.), Rifling, Firing mechanism, identification of firearms.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Criminology and Laws

Criminology: Concept and definition of crime. Causes of crime. Social changes and crime. Aim and scope of criminology and criminal anthropology. Theory of criminal behavior. Organized crime and public disorders. Control and prevention of crime. Criminal profiling. Understanding modus operandi. Filing of criminal charges. **Forensic Law:** Definition and related Laws & Issues, Evidence in Enquiries and Trials, Expert Witness (CrPC. 291-93). **Indian Evidence Act (IEA):** Section 32, 45, 46, 47, 57. **Offences against the person (IPC):** Sections- 299, 300, 302, 304B, 307, 375 and 377.

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

1. https://www.youtube.com/watch?v=sv96E5Hbgf8
2. https://www.youtube.com/watch?v=I3i19qRjSSg
3. https://www.youtube.com/watch?v=nNvy7_73ecc
4. https://www.youtube.com/watch?v=MV4DAuR1O1M
5. https://epgp.inflibnet.ac.in/ahl.php?csrno=16
6. https://drive.google.com/file/d/122C9NaIYt5xamwKhiUa2X_tJCvR3x6vE/view
7. https://drive.google.com/file/d/1MY557S0fZc1Mv2GXxAY4CFi0m5Wr03gG/view
8. http://www.forensicpage.com/new10.htm
9. https://www.futurelearn.com/courses/introduction-to-forensic-science
10. https://www.youtube.com/watch?v=R6a4d4wUnUM
11. https://byjus.com/free-ias-prep/central-intelligence-and-investigative-agencies/
12. https://www.ssbcrack.com/2016/05/8-indian-intelligence-agencies-you-must-know.html
13. https://improb.com/best-intelligence-agencies-in-the-world/

13. Books Recommended

1. Houck MM, Siegel, JA; Fundamentals of Forensic Science, Academic Press, London, 2006.

2. Sharma BR. Forensic Science in Criminal Investigation & Trials, Universal Publishing Co., New Delhi, 2003.
3. Nanda BB, Tewari RK. Forensic Science in India- A vision for the Twenty First Century, Select publisher, New Delhi, 2001.
4. James SH, Nordby JJ. Forensic Science- An Introduction to Scientific and investigative Techniques, CRC Press, USA, 2003.
5. JA Siegel, PJ Saukko. Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press, 2000.
6. Saferstein; Criminalistics- An Introduction of Forensic Science, Prentice Hall Inc, USA, 2007.
7. Indian Evidence Act.
8. Criminal Procedure code.
9. Indian Penal Code.
10. D. Bnejea, AP Mukherjee, DK Chaterjee. Central Police Organisations. Allied Publishers Pvt. Ltd., 2005.
11. JC. Chaturvedi. Police Administration and Investigation of Crime, 2006, p.224.
12. David H. Bayley. The Police and Political Development in India, 1969, p.51.
13. Rajinder Prasher. Police Administration: Organisation& Structure, Recruitment & Training, Unionism & Public Relations. Deep & Deep publishers, 1986.
14. KM. Mathur. Police In India Problems And Perspectives. Gyan Publishing House, 2013.
15. Arvind Verma, KS Subramanian. Understanding the Police in India. Lexis Nexis India, 2009.

1. Name of the Department: Forensic Science						
2. Course Name	Instrumentation I		**L**	**T**	**P**	
3. Course Code	17050102		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ()
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

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

9. Course Objectives

1. To understand the basic concepts of Microscopic techniques.
2. To understand about the Molecular Spectroscopic techniques.
3. To Introduce about the Chromatographic and Radiochemical techniques
4. To demonstrate the application of various instrumental techniques in the field of forensic science.

10. Course Outcomes (COs)

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

1. Describe and use variousMicroscopic techniques for academic, professional and research purpose.
2. Describe and apply various Molecular Spectroscopic techniques for examination of various evidence found at the scene of crime.
3. Explain and use various Chromatographic and radiochemical techniques
4. Illustrate merits and demerits of all the techniques and choose the most appropriate technique for analysis.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Microscopy

Light and Energy, Electromagnetic Radiations, Wavelength and Frequency. **Microscopy:** Theory and basic principles, setup and Forensic applications of Compound, Comparison, Fluorescence, Polarized, Stereo-zoom microscope. Introduction, Geometrical optics, Image formation, Magnification and Resolution, Lens aberrations, Distortion of image and curvature of field. **Electron Microscopy:** Theory and basic principles of Electron Microscopy, Structure and Forensic applications of Scanning Electron microscope (SEM), Transmission Electron Microscope (TEM)..

Unit – 2	**Number of lectures = 10**	**Title of the unit:** Molecular Spectroscopy

Basic concepts of Spectroscopic techniques: Introduction to spectrophotometry, Interaction of electromagnetic radiations with matter: phenomena of absorption, emission, reflection, fluorescence, phosphorescence. Detection of radiations: Photographic detectors, thermal detectors, photoelectric detectors. Basic concepts of atomic spectra, energy levels, quantum numbers, designation of states, selection rules, atomic spectra. **Ultraviolet and Visible-visible (UV-vis) Spectroscopy** Introduction, Review of UV-Visible spectroscopy-Fundamental laws of spectrophotometry, Deviation from Beer's Law, Instrumentation and techniques, Analytical Protocols, Forensic applications. Fluorescence and phosphorescence spectroscopy: Types of sources, structural factors, instrumentation, comparison of luminescence and UV-visible absorption methods and applications.

Unit – 3	**Number of lectures = 10**	**Title of the unit:** Separation and Detection Techniques

Chromatographic Techniques: General Principles, stationary phase, mobile phase, Classification of chromatographic techniques, General principles of Adsorption chromatography, partition chromatography, Size Exclusion (permeation) chromatography, Affinity chromatography. Ion-exchange chromatography, Capillary Chromatography, column chromatograph. **TLC/ HPTLC**: Principle, Theory and Instrumentation, visualization, Qualitative and Quantitative concepts and Forensic applications. **Gas Chromatography:** Gas solid chromatography, Gas-liquid chromatography, types of columns, types of detectors used. Advantages and Limitations of different Detectors, GC-HS, Pyrolysis GC. Applications of GC in forensic science. **High Performance Liquid Chromatography**: Basics of LC, types of columns and stationary phase, mobile phase, column conditioning, types of detectors, interpretation of chromatogram. **Ion Chromatography:** Basic Principle, Instrumentation and Forensic applications.

Unit 4	**No. of Lectures = 10**	**Title of the unit:** Radiochemical techniques

Nuclear Magnetic Resonance (NMR): Basic Principle, Properties of Nuclei, Width of Absorption Lines, Chemical shifts, Spin-spin coupling, Instrumentation, Analytical Protocols and Forensic applications. **Neutron Activation Analysis:** Principles, Theory, Instrumentation Various Neutron Sources, Detection and Measurement of Gamma- Rays for Qualitative And Quantitative Analysis. **Electrophoresis:** Theory and General Principles, Various factors affecting electrophoresis, Low and High Voltage electrophoresis, Horizontal and Vertical Electrophoresis, Electrophoresis for DNA, RNA and Proteins. **Electrophoresistechniques:**Immuno-electrophoresis, Sodium dodecyl sulphate (SDS) polyacrylamide gel electrophoresis, Iso-electric focusing (IEF), Capillary Electrophoresis (CE): Theory and basic principles, Instrumentation and Forensic applications.

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

1. https://www.youtube.com/watch?v=DB7Cyr4lzR8
2. https://www.youtube.com/watch?v=g5voLRKi4fA
3. https://www.youtube.com/watch?v=NyaDkwMlNT0
4. https://www.youtube.com/watch?v=PSJTBwh35jk
5. https://www.youtube.com/watch?v=FX-NiPVsYPM
6. https://www.youtube.com/watch?v=45hjG3QwTNQ
7. https://www.youtube.com/watch?v=AWDWamCH_ls

8. https://www.youtube.com/watch?v=wXvET5RTMxQ
9. https://www.youtube.com/watch?v=wXvET5RTMxQ
10. https://www.youtube.com/watch?v=XJ1TvPR_c7g
11. https://www.youtube.com/watch?v=gYIfiE52wUw
12. https://www.youtube.com/watch?v=DVv2F0KiD8w
13. https://www.youtube.com/watch?v=Qt-Ab5lxp-A
14. https://www.youtube.com/watch?v=ppYgHtlrRmc
15. https://www.youtube.com/watch?v=N_V_2FAs9r8
16. https://www.youtube.com/watch?v=guqjF_DQu0s
17. https://www.youtube.com/watch?v=ZVJFF2Uk8xU
18. https://www.youtube.com/watch?v=FX-NiPVsYPM
19. https://www.youtube.com/watch?v=wJF_Cxkw4ok
20. https://www.youtube.com/watch?v=x38hseArkdw
21. https://www.youtube.com/watch?v=_7hIMJiAiUg
22. https://www.youtube.com/watch?v=76rLqg9BJro
23. https://www.youtube.com/watch?v=1hGiptAhSr4

13. Books Recommended

1. James W. Robinson, Eileen Skelly Frame, George M. Frame II. Undergraduate Instrumental Analysis (7thEdn). CRC Press, 2014.
2. Settle FA. Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.
3. Sue Jickells, Adam Negrusz. Clarke's Analytical Forensic Toxicology. Pharmaceutical Press, 2008.
4. Robinson JW. Atomic Spectroscopy (2ndEdn). Marcel Dekkar, Inc, New York, 1996.
5. Workman J. Art Springsteen; Applied Spectroscopy- A compact reference for Practitioners. Academic Press, London, 1997.
6. Willard HH, Lynne L. Merrett, J. Dean, A. Frank, A. Settle. Instrumental Methods of Analysis (7thEdn). CBS pub. & Distributors, New Delhi, 1988.
7. Khandpur RS. Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co. New Delhi, 2004.
8. Thomson KC, Renolds RJ. Atomic Absorption Fluorescence & Flame Emission Spectroscopy: A Practical Approach (2ndEdn). Charles Griffith & Company, New South Wales, 1978.
9. Dudley H. Williams, Fleming I. Spectroscopic Methods in Organic Chemistry (4thEdn). Tata McGraw- Hill Publishing Company, New Delhi, 1994.
10. Hobart Willard. Instrumental Methods of Analysis. Wadsworth Publishing Company, 1988.
11. Douglas Skoog, James Holler, Stanley Crouch. Principles of Instrumental Analysis

(7thEdn). Cengage Learning, 2017.

12. V.B Patania. Spectroscopy. Campus Books International, 2004.
13. R.S Khandpur. Handbook of Analytical Instruments. Tata Mac Graw Hill Publ. Co., 2004.
14. G.R Chatwal, S.K Anand. Instrumental Methods of Chemical Analysis. Himalaya Publ. House, 2004.
15. Silverstein RM, Webster FX. Spectrometric Identification of Organic Compounds (6thEdn). John Wiley & Sons, Inc. 1997.
16. G.R Chatwal. Analytical Spectroscopy (2nd Edition). Himalaya Publishing House, 2002

1. Name of the Department : Forensic science						
2. Course Name	Crime Scene Investigation		**L**	**T**	**P**	
3. Course Code	17050103		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = Nil**		**Practical = Nil**		

8. Course Description

This core course provides an excellent opportunity to learn aboutreconstruction of a scene of crime. It also emphasizes on applications of Forensic Podiatry, Cheiloscopy in personal identification of suspect.Describe Chain of custody in forensic science and Crime scene photography will be explained.

9. Course Objectives

1. To demonstratereconstruction of a scene of crime.
2. To introduce the concept Forensic Podiatry and Cheiloscopy in personal identification of suspect.
3. To describe the purpose and relevance of Chain of custody in forensic science.
4. To demonstrate the concepts and procedure followed forCrime scene photography.

10. Course Outcomes (COs)

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

1. Reconstruct a scene of crime.
2. Utilized Forensic Podiatry, Cheiloscopy in personal identification of suspect.
3. Describe and maintain Chain of custody in various cases.
4. Perform Crime scene photography.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:**Criminalistics

Criminalistics: Definition, Meaning of Recognition, collection, identification, individualization and interpretation of physical evidence. **Pursuit to crime scene**: Securing the scene, Crime scene search methods, Documentation crime scene (including photography and sketching.

Unit – 2	**Number of lectures = 10**	**Title of the unit:**Basic Principles & Stages Involved

Basic Principles & Stages Involved: Data Collection, Conjecture, Hypothesis formulation, Testing & Theory formation; Pattern evidence; Writing a reconstruction report of cases of Special Importance pertaining to forensics. **Forensic Podiatry**: Foot prints and shoeprints, Importance, Gait pattern, Casting of footprints in different medium, electrostatic lifting of latent footprints, Taking of control samples and comparison of tool marks and evaluation. **Cheiloscopy:** Significance, Nature, location, collection and evaluation. **Ear prints**: Significance, Nature, location, collection and evaluation.

Unit – 3	**Number of lectures = 10**	**Title of the unit:**Crime Scene Reconstruction (CSR)

Crime Scene Reconstruction (CSR): Nature & Importance of CSR. **Investigation of Road Accident crime scene**: Examination of scene, Victim and the vehicle, Collection of the evidence, **Tyre marks/prints and skid marks**: Significance, Nature, location, collection and evaluation. Forensic significance of Glass, Soil and Paint. **Interpretations of Bloodstain Pattern Analysis (BPA):** Biological and physical properties of human blood, Droplet Directionality from bloodstain patterns, Determination of Point of Convergence and Point of Origin, Impact spatter and mechanisms, Importance and Legal aspects of BPA. **Tool Marks examination**: Types of tool marks, Class characteristics and individual characteristics, Lifting of tool marks, Examination.

Unit – 4	**Number of lectures = 10**	**Title of the unit:**Chain of custody & Legal aspects of forensic science

Chain of custody & Legal aspects of forensic science: Difference between a civil case & a criminal case, Case acceptance, case opening, and case examination, production of evidence, Expert Witness. **Crime scene photography**: Crime scene and laboratory photography, Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close up work, Digital Photography of crime scene.

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

1. https://www.youtube.com/watch?v=7KL_JT-jUiI
2. https://www.youtube.com/watch?v=pBogHJqCY08
3. https://www.youtube.com/watch?v=QzpZTZzPBz0
4. https://www.youtube.com/watch?v=PKMib2ekIB0
5. https://www.youtube.com/watch?v=U4ugXCTVexg
6. https://www.youtube.com/watch?v=3bXFuccJqko
7. https://www.youtube.com/watch?v=Od0yP81kqrg
8. https://www.youtube.com/watch?v=Pk1h3ovCzZw
9. https://www.youtube.com/watch?v=lwrtwz_kiaE
10. https://www.youtube.com/watch?v=4eSC1ss649E
11. https://www.youtube.com/watch?v=LqvIaEzjFno
12. https://www.youtube.com/watch?v=61vuauxdJJs
13. https://www.youtube.com/watch?v=U8iVeuBAwzQ
14. https://www.youtube.com/watch?v=UIGbN5xjcs8

13. Books Recommended

1. Kirk. Vehicular Accident investigation and reconstruction, 2000.
2. H. James, Wouldiam G. Eckert. Interpretation of Blood stains evidence at Crime Scene, 2nd edition, CRC Press, 1999.
3. Sharma BR. Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad, 1974.
4. Lundquest& Curry. Forensic Science, Vol I to IV, Charles C. Thomas, Illinois, USA, 1963.
5. Saferstein: Forensic Science Handbook, Vol I, II & III, Prentice Hall Inc. USA.

6. Saferstein R. Criminalistics, Prentice Hall Inc. USA., 1976.
7. Kirk. Criminal Investigation Interscience Publisher Inc. New York, 1953.
8. Sharma BR. Footprints, Tracks and Trials. Central Law Agency. Allahabad, 1980.

1. Name of the Department: Forensic Science						
2. Course Name	Fundamentals of Fingerprint and Questioned Document Examination		**L**	**T**	**P**	
3. Course Code	17050104		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This core course will explain various terminologies, history and various classification system used in fingerprinting. In addition, different ridge characteristics and its examination, comparison of handwriting and signature specimens, determination of authenticity of printed documents and currency notes will also be explained.

9. Course Objectives

1. To introduce students about the basic concepts, terminologies, history and classification system used in fingerprinting.
2. To demonstrate identification and comparison of fingerprints on the basis of different ridge characteristics.
3. To impart knowledge of questioned document examination and comparison of handwriting and signature specimens using various tools and techniques
4. To explain authenticity of printed documents and currency notes.

10. Course Outcomes (COs)

Upon successful completion of this course:

1. Students would be able to utilize various terminologies, history and various classification system used in fingerprinting.
2. Students would be able to identify and compare the fingerprints on the basis of different ridge characteristics.
3. They would be able to compare handwriting and signature specimens.
4. Students would be able to examine the authenticity of printed documents and currency notes.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Basics ofFingerprints

Dactylography, Dermatoglyphics, and Dactyloscopy, Definition of fingerprints, history and development of fingerprints, formation of ridges, biological significance, Fingerprint as forensic Evidence, Relevance of sweat in fingerprint analysis, composition of sweat, Types of fingerprints encountered at crime scene, comparison preserving and lifting of fingerprints, development of fingerprints using various methods.

Unit – 2	Number of lectures = 10	Title of the unit: Classification of Fingerprints for Comparison purposes
Fingerprint card, Methods of Taking Fingerprints: From living and dead persons, Fingerprint pattern types, class and individual characteristics, ridge characteristics, Poroscopy and Edgeoscopy, Fingerprint as forensic Evidence.		
Unit – 3	**Number of lectures = 10**	**Title of the unit:** Introduction to Questioned Documents
Definition of document and questioned documents and types of questioned documents, forged documents, genuine documents, disguised documents, genuine, forged and disguised signatures and writing. **Handwriting Characteristics:** General Characteristics, Individual Characteristics, Development of Individuality in Handwriting Comparison of Handwriting: Natural Variations, Fundamental Divergences. Suitable standards for comparison, admitted signature/writing, specimen signature/writings, methods of selection of standard signatures.		
Unit 4	**No. of Lectures = 10**	**Title of the unit:** Examination of Questioned Documents
Alterations in the document: Erasures, additions, overwriting, obliterations and sheet insertion in writings, secret writing, computer generated typing, manual type writing, ink and paper examination, examination of carbon copies, fax copies, photocopies, pencil writing. **Currency Note examination:** Identifying features of fake and genuine Indian currency notes. **Instrumentation and Photography of Documents:** Basic Principles & Techniques Visible and Florescence (UV and IR), Photomicrography & Microphotography, Stereo-zoom Microscopy, Video Spectral Comparator (VSC) and Electrostatic Detection Apparatus (ESDA). **Report Writing & Court Room Testimony:** Evidence and testimony in court, Information required by the Forensic expert, Components of Forensic Reports, Preparation of Report, Presenting findings in a Report format		

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

1. https://www.youtube.com/watch?v=oMrsXZAOSbA
2. https://www.youtube.com/watch?v=D6_SxRDs3Bg
3. https://www.youtube.com/watch?v=MBMVKv12zNQ
4. https://www.youtube.com/watch?v=Zc0yGQbL9qY
5. https://www.youtube.com/watch?v=tIZTScph0lM
6. https://www.youtube.com/watch?v=NNZCN5e2rD0
7. https://www.youtube.com/watch?v=AxubbuQJ9LU
8. https://www.youtube.com/watch?v=emCPoUKNQ0E
9. https://www.youtube.com/watch?v=4iCBLgMEoNM
10. https://www.youtube.com/watch?v=Wxc-ike51k0
11. https://www.youtube.com/watch?v=34JxLDoF6kM
12. https://www.youtube.com/watch?v=-x5S4X9mhMM
13. https://www.youtube.com/watch?v=p9bmGt1_Pxo

13. Books Recommended

1. Saferstein R. Criminalistics, Prentice Hall, New York, 1990.

2. David R. Ashbaugh. Quantitative and Qualitative Friction Ridge Analysis, CRC Press, 1999.
3. Roland Menzel. Fingerprint Detection with Lasers, 2nd Ed., Marcel Dekker, Inc. USA, 1999.
4. James F. Cowger. Friction Ridge skin, CRC Press London, 1993.
5. Mehta MK. Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi Pub. Bombay, 1980.
6. Chatterjee SK. Speculation in Finger Print Identification, Jantralekha Printing Works, Kolkata, 1981.
7. Cowger James F. Friction ridge skin- Comparison and Identification of fingerprints, CRC Press, NY, 1993.
8. JA Siegel, PJ Saukko. Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press, 2000.
9. Huber AR. and Headrick, A.M. Handwriting Identification: Facts and Fundamentals CRC LLC, 1999.
10. Ellen D. The scientific examination of Documents, Methods and techniques. 2nd ed., Taylor & Francis Ltd., 1997.
11. Morris. Forensic Handwriting Identification (fundamental concepts and Principles), 2000.
12. Harrison W.R Suspect Documents & their Scientific Examination, Sweet & Maxwell Ltd., London, 1966.
13. Hilton O. The Scientific Examination of Questioned Document, Elsevier North Holland Inc., New York, 1982.
14. Mehta MK. The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad., 1970.
15. Saxena BL. Saxena's Law & Techniques Relating to Finger Prints, Foot Prints & Detection of Forgery, Central Law Agency, Allahabad, 1968.
16. Osborn AS. Questioned Documents, Boyd Printing Co., Chicago, 1929

1. Name of the Department: Forensic Science						
2.Course Name	Practical (Crime Scene Investigation)		**L**	**T**	**P**	
3. Course Code	17050105		0	0	3	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

Thispractical course emphasizes on learning the basic skills helpful forreconstruction of a scene of crime. It also emphasizes on applications of Forensic Podiatry, Cheiloscopy in personal identification of suspect, description of Chain of custody and Crime scene photography.

9. Course Objectives

1. To make students understand in detail about crime scene investigation.
2. To develop skills to reconstruct a crime scene.
3. To demonstrate comparison and examination of foot, shoe, lip prints and various other evidence.
4. To understand about chain of custody and crime scene photography.

10. Course Outcomes (COs)

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

1. Secure, search, collect and pack evidence from scene of crime.
2. Perform examination of foot, shoe, lip prints and other evidence.
3. Reconstruct and sketch a crime scene.
4. Take crime scene photographs and videos.

11. List of Experiments

1. To secure and sketch a crime scene.
2. Photography of crime scene.
3. Videography of crime scene.
4. Crime scene searching methods.
5. Evidence collection and packaging.
6. Collection and examination of foot prints from crime scene.
7. Collection and examination of shoe prints from crime scene.
8. Collection and examination of lip prints from crime scene.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals.

1.Name of the Department: Forensic Science						
2.Course Name	Practical (Fundamentals of Fingerprint and Questioned Document Examination)		**L**	**T**	**P**	
3. Course Code	t7050106		**0**	**0**	3	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

Thispractical course emphasizes on learning the basic skills of collection and classification of fingerprints, ridge tracing, ridge counting and comparison of fingerprints. It also includes analysis of currency notes, identification and comparison of handwriting, signatures, typewritten scripts under question.

9. Course Objectives

1. To understand the techniques used for collection, development and classification of fingerprints.
2. To make students capable of performing Ridge tracing and Ridge counting.
3. To explain comparison of fingerprints, handwriting and signatures under scrutiny.
4. To understand about the currency note examination.

10. Course Outcomes (COs)

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

1. Collect, classify and compare fingerprints.
2. Perform Ridge tracing and Ridge counting.
3. Identify and compare handwriting and signatures under question.
4. Examine currency notes and type written documents.

11. List of Experiments

1. To obtain plain and rolled inked finger prints.
2. To identify the finger print patterns.
3. To perform ridge tracing and ridge counting.
4. To identify the ridge characteristics (Minutia).
5. Identification of handwriting: Class and Individual Characteristics.
6. Comparison of handwritings.
7. Comparison of typewritten scripts.
8. Currency note examination.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals.

1. Name of the Department :						
2. Course Name	Professional ethics and human values	**L**		**T**	**P**	
3. Course Code	17050107	2		0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE ()**	**AEC (✓)**	**SEC ()**	**OE ()**
5. Pre-requisite (if any)	NA	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 26		**Tutorials = 0**		**Practical = 0**		

8. Course Description:

This ability enhancement course provides students with the knowledge of ethics in professional and social life. Some of the examples from history and day to day life will make the students more responsible towards their profession, society and family.

9. Course Objectives:

1. To understand Ethics and Universal Declaration on Bioethics and its need.
2. To give due regard to nature and other forms of life by protecting the environment and become socially responsible citizens
3. To inculcate moral and human values for the sustainable growth of the society.
4. To become professionally strong by taking responsibility for what they do in their professional and social life.

10. Course Outcomes (COs):

5. The students will understand the values of ethics and moral values deeply.
6. The students will understand the value of environment and respect for nature.
7. The students will realize the values of responsible citizens to work for the society.
8. The students will be able to take strong decisions and perform their duties responsibly as a professional.

11. Unit wise detailed content

Unit-1	**Number of lectures = 7**	**Title of the unit: Introduction to Ethics and Bioethics**

Introduction, Definition, Understanding Ethics, Medical Ethics and Bioethics, History and Development of Ethics, Universal declaration on Bioethics, Need and Importance of professional ethics,

Unit –2	**Number of lectures = 7**	**Title of the unit: Different types of Ethics**

Environmental Ethics, Respect for nature, Respect for cultural diversity and pluralism. Bio-Safety and Ethical use of animals in the laboratory, Disaster Bioethics, Ethics in Media and Technology, Research Ethics, Ethical Issues in Cyber space.

Unit –3	**Number of lectures = 6**	**Title of the unit: Value of Human Life**

Human Rights and Values: Autonomy, Consent, Equality, Confidentiality, Vulnerability and

Personal Integrity, Religious and Cultural Values, Importance of a Family, Guidance to youngsters, Gender Equality sharing of benefits,		
Unit - 4	**Number of lectures = 6**	**Title of the unit: Professional Ethics**
Professional Ethics and Public Policy, Goals, Dignity of Labour, Responsibilities towards Safety and Risk, Voluntary vs involuntary Risk, Designing and Research ethics, Privacy, Authorship, Intellectual Property Rights.		
12. Brief Description of self learning / E-learning component		
1. https://www.youtube.com/watch?v=cFOZplkRqsk 2. https://www.youtube.com/watch?v=Fqt7m8LH5GY 3. https://www.youtube.com/watch?v=2VYF_t51FyE 4. https://www.youtube.com/watch?v=9JJykyE2MHw		
13. Books Recommended		
1. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana – Maruthi Publications. 2. Professional Ethics and Human Values by A. Alavudeen, R.KalilRahman and M. Jayakumaran – University Science Press. 3. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill – 2013		

1. Name of the Department: Forensic Science						
2. Course Name	Quality Management		**L**	**T**	**P**	
3. Course Code	17050108		2	0	0	
4. Type of Course (use tick mark)		**Core ( )**	**DSE ( )**		**SEC (✓)**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 26		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This skill enhancement course emphasizes on basics of quality management system in the field of forensic science. The students will also learn about various quality audits, organizations involved insetting guidelines and maintaining quality system.

9. Course Objectives

1. To describe and understand the functioning of NABL, ILAC, APLAC.
2. To make students understand the functioning of ASCLD, ISO-IEC, BIS.
3. To develop synthetic skills of polymeric product.
4. To explain quality management Systems.

10. Course Outcomes (COs)

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

1. Describe the functioning of NABL, ILAC, APLAC, ASCLD, ISO-IEC, BIS.
2. Describe quality management systems.
3. Understand the scope of QMS in accreditation of Forensic Science laboratories.
4. Apply the knowledge of QMS in the requirement of competencies for the testing and calibrations needed in laboratories.

11. Unit wise detailed content

Unit-1	**Number of lectures = 5**	**Title of the unit:** Introduction to Quality Management System

Introduction to Quality Management Systems, requirements of QMS, need of maintaining quality of Forensic laboratories, Definition of Accreditation, Benefits of Accreditation.

Unit-2	**Number of lectures = 7**	**Title of the unit:** Scope and need of Quality Management Systems

Scope of quality Management System in an organization. Description and need of Quality Manual, Quality Manager, Quality Assurance, Quality Control, and Quality Planning.

Unit-3	**Number of lectures = 6**	**Title of the unit:** Quality Audits and Internal Audits

Definition, Objectives, Organizations of internal audit and Implementation of internal audits, Records and reports of internal audits. Laboratory information management system, validation and safety equipments

Unit-4	**Number of lectures = 8**	**Title of the unit:** Accreditations and procedures

Organizations involved insetting guidelines and maintaining quality system: National Accreditation Board for Testingand Calibration Laboratories (NABL), International Laboratory Accreditation Co-operation(ILAC), Asia Pacific Laboratory Accreditation Co-operation

(APLAC), American Society of CrimeLaboratory Directors (ASCLD), International Organization for Standardization (ISO), Bureau ofIndian Standards (BIS).

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

1. https://www.youtube.com/watch?v=d5O1Iu1ZINA
2. https://www.youtube.com/watch?v=PnHaca_08vY
3. https://www.youtube.com/watch?v=g-OwCpoGXxg
4. https://www.youtube.com/watch?v=PnHaca_08vY
5. https://www.youtube.com/watch?v=d5O1Iu1ZINA
6. https://www.youtube.com/watch?v=b5ZrDy0l5wk
7. https://www.studocu.com/en-au/document/griffith-university/forensic-lab-accred-qual-sys/lecture-notes/forensic-lab-accred-and-qual-sys-exam-notes/1293870/view
8. https://www.in.gov/isp/labs/files/Lab_QA_Manual_03-16-16.pdf
9. https://epic.org/state-policy/foia/dna-software/18-Quality-Manual-071615-Rev-16.pdf
10. http://www.contentextra.com/lifesciences/files/topicguides/LS_TG4_4.pdf

13. Books Recommended

1. JA Siegel, PJ Saukko. Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press, 2000.
2. NABL - Guide for Internal audit and Management Review for Laboratories.
3. KS Yogesh. Fundamental of Research Methodology and Statistics, 2006.
4. DFSS: Manuals of Forensic Sciences.

SEMESTER II

1. Name of the Department: Forensic Science						
2. Course Name	Fundamentals of Forensic accounting and Digital forensics		**L**	**T**	**P**	
3. Course Code	17050201		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		
8. Course Description						
This core course provides students the knowledge of basics of forensic accounting, fraud risk assessment and detection along with forensic aspects of digital evidence and its analysis.						
9. Course Objectives						
1. To make students understand the basic concepts of forensic accounting. 2. To make students understand about the fraud risk assessment and detection. 3. To introduce about digital forensics. 4. To demonstrate the forensic aspects of digital evidence.						
10. Course Outcomes (COs)						
Upon successful completion of this course, the students will be able to: 1. Describe the basics of forensic accounting. 2. Assess fraud risk along with its prevention and detection. 3. Explain basics of digital crimes. 4. Explain basics and importance of digital evidence.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 10**	**Title of the unit:** Basics of Forensic Accounting				
Background of fraud auditing and forensic accounting, Fraud principles-definition, fraud triangle, role of the forensic accountant in society; differences between forensic accounting and auditing; scope and fraudster profile Fraud Schemes: ACFE fraud tree, financial statement schemes, corruption schemes and other schemes (Ponzi schemes, bank frauds, wire frauds, insurance fraud etc.) The effect of suspected fraud on the audit of financial statements or a forensic investigation; common indicators of fraud; common analytical procedures; sources of forensic evidence; Case studies of accounting frauds						
Unit – 2	**Number of lectures = 10**	**Title of the unit:** Fraud Risk Assessment and Detection				
Red flags- Common red flags and specific red flags, & fraud detection model, Fraud Risk						

Assessment: Risk assessment factors, best practices and checklists and documentation, Fraud prevention and fraud detection, Fraud and the accounting information system. Investigative techniques used by forensic accountants; interview and interrogation techniques, seriousness of Fraud in the Accounting Profession, Psychology of Fraud		
Unit – 3	**Number of lectures = 10**	**Title of the unit:** Basics of Digital Crime
What are digital crimes, digital forensics and its current trends, operating system and their file systems, storage and memory, types of data, encryption and hashing, disk duplication (imaging, cloning, image restoration), write blocking and crime scene management.		
Unit 4	**No. of Lectures = 10**	**Title of the unit:** Digital Evidence
Mobile Forensic, Types of Evidence present in mobile phones - Files present in SIM card, external memory dump, and evidences in memory card. Seizure and Preservation of mobile phones and PDA. Mobile phone evidence extraction process, Data Acquisition Methods – Physical, File System, Logical and Manual Acquisition. Good Forensic Practices, Mobile Forensic Investigation Toolkit. Tracking of mobile phone location. Challenges to Mobile forensics.		
12. Brief Description of self-learning / E-learning component		
1. https://www.youtube.com/watch?v=oTjty8Utxc0 2. https://www.youtube.com/watch?v=Vm6LjcQTY6A 3. https://www.youtube.com/watch?v=5IoHJfAqc5c 4. https://www.youtube.com/watch?v=G_aJVGEWmuc 5. https://www.youtube.com/watch?v=_DLg_3rXkHM 6. https://www.youtube.com/watch?v=2ESqwX3qb94 7. https://www.youtube.com/watch?v=QQ9ZLlj36qs 8. https://www.youtube.com/watch?v=j3lgxdylktM 9. https://www.youtube.com/watch?v=Er0okQM7sTo		
13. Books Recommended		

1. Mary-Jo Kranacher and Richard Riley. Forensic Accounting and fraud examination. Wiley, 2020.
2. Joseph Ugwulali. Essential of forensic accounting and fraud management. First edition design publisshing 2019
3. Andrew Hoog; "Android Forensics Investigation, Analysis and Mobile Security for Google Android", Syngress, USA, 2011.
4. George Mohey, Alison Anderson, Byron Collie, Olivier De Del, Rod McKemmish; "Computer and Intrusion Forensics", Artech House, London, 2003.
5. HakimaChaouchi, Maryline Laurent-Maknavicius; "Wireless and Mobile Network Security", Wiley, 2007.
6. Seymour Bosworth, Michel E. Kabay; "Computer security handbook", John Wiley & Sons, Inc.2008.
7. Satish Bommisetty, Rohit Tamma and Heather Mahalik, "Practical Mobile Forensics – Dive into mobile Forensics on iOS, Android, Windows and Blackberry Devices with action-packed, practical guide", PACKT Publishing, 2015.
8. Tara M. Swaminathan and Charles R. Eldon, "Wireless Security and Privacy- Best Practices and Design Techniques", Addison Wesley, 2002.
9. Jonathan Zdziarski, "iOS Forensic Investigative Methods", 2012.
10. Iosif I. Androulidakis, "Mobile Phone Security and Forensics – A Practical Approach", Springer New York Heidelberg, 2012.

1. Name of the Department: Forensic Science						
2. Course Name	Instrumentation II		**L**	**T**	**P**	
3. Course Code	17050202		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ( )	Every Sem ()
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		
8. Course Description						
This core course provides students the knowledge of method validation, various techniques used for elemental analysis, molecular and mass spectroscopy along with their forensic applications.						
9. Course Objectives						
1. To make students understand about the basics of method validation. 2. To familiarize students with elemental analysis of various evidence found at crime scene. 3. To introduce the concept and applicationmolecular and mass spectroscopic techniques. 4. To make students understand the forensic relevance of all the techniques.						
10. Course Outcomes (COs)						
Upon successful completion of this course, the students will be able to: 1. Describe the basics of method validation. 2. Describe and use various elemental analytical techniques 3. Explain molecular and mass spectroscopic techniques. 4. Demonstrate and utilize the techniques with respect to their forensic relevance.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 10**		**Title of the unit:** Basic concepts of method validation			
Introduction to measurement and instrumentation, methods of measurement. Performance characteristics of Instruments: static characteristics- accuracy, precision, sensitivity, linearity, reproducibility, repeatability, resolution, threshold, drift, stability, tolerance, range or span & dynamic characteristics -speed of response, measuring lag, fidelity, dynamic error, Limit of Detection, Limit of Quantitation. Signal and Data: signal-to-noise ratio, source of noise, signal-to- noise enhancement.						
Unit – 2	**Number of lectures = 10**		**Title of the unit:** Elemental Analysis			
Atomic Absorption Spectrometry: Introduction, Basic principles, Theory, Instrumentation and Techniques, FAAS and GFAAS, Interference in AAS-Background correction methods, Forensic applications. **AtomicEmissionSpectroscopy:** Introduction, Basic principles, Theory, Instrumentation and Techniques and forensic applications. **Introduction toX-rays, X-ray Diffraction (XRD):** Basic Principle, Theory, Instrumentation and Forensic applications. **X-RayFluorescence (XRF):** Basic Principle, Theory, Instrumentation and Forensic applications.						

Elements of X-ray spectrometry: X-ray absorption and fluorescence, Energy Dispersive X-ray Analysis (EDX), wavelength Dispersive X-ray analysis (WDX), X-ray diffraction, Auger emission spectroscopy and applications.

Unit – 3	**Number of lectures = 10**	**Title of the unit:** Molecular spectroscopy

Infrared Spectroscopy: Introduction, Review of IR spectroscopy, Basic principle, components, Dispersive and Non-dispersive IR spectrophotometers, Fourier Transform Infrared Spectroscopy, Instrumentation and Techniques, Analytical Protocols, Interpretation of IR spectra and Forensic applications. **RamanSpectroscopy:** Basic principles, Instrumentation, sample handling and illumination, structural analysis, polarisation measurements and Dispersive & FT analysis and Applications in Forensic Science. Advantage of Raman over IR and vice versa.

Unit 4	**No. of Lectures = 10**	**Title of the unit:** Mass spectroscopy

Mass Spectrometry: Basic Principle and Theory, Instrumentations. Techniques: Resolution, Resolving power and Mass Accuracy, Vacuum systems, Ionization types (CI-MS, EI-MS, ECNI, FI,APCI), Mass analyzers (Transmission Quadrupole, Quadrupole Ion trap, Time of Flight & Double Focusing), Scanning modes (SIM and SCAN), Tandem Mass Spectrometry and MALDI-TOF. **Hyphenated techniques:** Gas Chromatography coupled with FTIR, Gas Chromatography coupled with mass spectrometry (GC-MS), Liquid Chromatography coupled with mass spectrometry (LC-MS), Fourier transform mass spectrometry (FTIR-MS), Inductively coupled plasma MS (ICP-MS), High Performance Thin Layer Chromatography coupled with Mass spectrometry (HPTLC-MS) Applications of Hyphenated techniques in Forensic science.

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

1. https://www.youtube.com/watch?v=g5voLRKi4fA
2. https://www.youtube.com/watch?v=DB7Cyr4lzR8
3. https://www.youtube.com/watch?v=NyaDkwMINT0
4. https://www.youtube.com/watch?v=PSJTBwh35jk
5. https://www.youtube.com/watch?v=FX-NiPVsYPM
6. https://www.youtube.com/watch?v=45hjG3QwTNQ
7. https://www.youtube.com/watch?v=AWDWamCH_ls
8. https://www.youtube.com/watch?v=wXvET5RTMxQ
9. https://www.youtube.com/watch?v=wXvET5RTMxQ
10. https://www.youtube.com/watch?v=XJ1TvPR_c7g
11. https://www.youtube.com/watch?v=gYIfiE52wUw
12. https://www.youtube.com/watch?v=DVv2F0KiD8w
13. https://www.youtube.com/watch?v=Qt-Ab5lxp-A
14. https://www.youtube.com/watch?v=ppYgHtlrRmc
15. https://www.youtube.com/watch?v=N_V_2FAs9r8
16. https://www.youtube.com/watch?v=guqjF_DQu0s
17. https://www.youtube.com/watch?v=ZVJFF2Uk8xU
18. https://www.youtube.com/watch?v=FX-NiPVsYPM

1. https://www.youtube.com/watch?v=wJF_Cxkw4ok
2. https://www.youtube.com/watch?v=x38hseArkdw
3. https://www.youtube.com/watch?v=_7hIMJiAiUg
4. https://www.youtube.com/watch?v=76rLqg9BJro
5. https://www.youtube.com/watch?v=1hGiptAhSr4

13. Books Recommended

1. James W. Robinson, Eileen Skelly Frame, George M. Frame II. Undergraduate Instrumental Analysis (7thEdn). CRC Press, 2014.
2. Settle FA. Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.
3. Sue Jickells, Adam Negrusz. Clarke's Analytical Forensic Toxicology. Pharmaceutical Press, 2008.
4. Robinson JW. Atomic Spectroscopy (2ndEdn). Marcel Dekkar, Inc, New York, 1996.
5. Workman J. Art Springsteen; Applied Spectroscopy- A compact reference for Practitioners. Academic Press, London, 1997.
6. Willard HH, Lynne L. Merrett, J. Dean, A. Frank, A. Settle. Instrumental Methods of Analysis (7thEdn). CBS pub. & Distributors, New Delhi, 1988.
7. Khandpur RS. Handbook of Analytical Instruments, Tata McGraw Hill Pub. Co. New Delhi, 2004.
8. Thomson KC, Renolds RJ. Atomic Absorption Fluorescence & Flame Emission Spectroscopy: A Practical Approach (2ndEdn). Charles Griffith & Company, New South Wales, 1978.
9. Dudley H. Williams, Fleming I. Spectroscopic Methods in Organic Chemistry (4thEdn). Tata McGraw- Hill Publishing Company, New Delhi, 1994.
10. Hobart Willard. Instrumental Methods of Analysis. Wadsworth Publishing Company, 1988.
11. Douglas Skoog, James Holler, Stanley Crouch. Principles of Instrumental Analysis (7thEdn). Cengage Learning, 2017.
12. V.B Patania. Spectroscopy. Campus Books International, 2004.
13. R.S Khandpur. Handbook of Analytical Instruments. Tata Mac Graw Hill Publ. Co., 2004.
14. G.R Chatwal, S.K Anand. Instrumental Methods of Chemical Analysis. Himalaya Publ. House, 2004.
15. Silverstein RM, Webster FX. Spectrometric Identification of Organic Compounds (6thEdn). John Wiley & Sons, Inc. 1997.
16. G.R Chatwal. Analytical Spectroscopy (2nd Edition). Himalaya Publishing House, 2002

1. Name of the Department: Forensic Science						
2. Course Name	Proactive and Reactive Forensics		**L**	**T**	**P**	
3. Course Code	t7050203		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

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

9. Course Objectives

The objectives of this course are:

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

10. Course Outcomes (COs)

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

1. Know about the basic requirements and implications of Proactive Forensics.
2. Know the difference between the Proactive and the Reactive Forensics.
3. Apply the knowledge of Proactive Forensics in the current scenario to combat criminal and crime issues.
4. Know the various edge cutting tools and techniques used in Proactive Forensics.

11. Unit wise detailed content

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

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

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

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

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

Introduction: Definition, scope, role and responsibilities, types of forensic nurses. Documentation and their appearance in the court of law. Introduction to forensic psychiatry, role in forensic investigation, testimony in court room, legal and ethical issues.		
Unit – 4	**Number of lectures = 10**	**Title of the unit: Forensic Auditing and Cyber Forensics**
Introduction to forensic auditing, scope and role of forensic auditors, statuary and investigative auditing, role of forensic auditing in preventive forensics. Proactive cyber forensics, search and seizers, Anti-forensic methods, preventive evidence collection, court presentation.		
12. Brief Description of self-learning / E-learning component		
1. https://www.youtube.com/watch?v=cxyJRGxWN0k 2. https://www.youtube.com/watch?v=I3i19qRjSSg 3. https://www.youtube.com/watch?v=QVjFjw8uYRc 4. https://www.youtube.com/watch?v=530Xv_EKnKs 5. https://www.researchgate.net/publication/220849931_The_Proactive_and_Reactive_Digital_Forensics_Investigation_Process_A_Systematic_Literature_Review 6. https://link.springer.com/chapter/10.1007/978-3-642-23141-4_9 7. https://www.digitalforensicsmagazine.com/index.php?option=com_content&view=article&id=573		
13. Books Recommended		
1. Alharbi, S. Proactive System for Digital Forensic Investigation. 2. Gritzalis, D., Furnell, S., &Theoharidou, M. (2012). Information Security and Privacy Research. Berlin, Heidelberg: Springer Berlin Heidelberg. 3. Bruchey, W. (2003). Suppression of material failure modes in titanium armors. Aberdeen Proving Ground, MD: Army Research Laboratory. 4. Lynch, V., & Duval, J. (2006). Forensic nursing. St. Louis, MO: Elsevier Mosby. 5. Taylor, J. (2011). Forensic accounting. New York: Financial Times Prentice Hall.		

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Physical Anthropology and Medicine		**L**	**T**	**P**	
3. Course Code	17050204		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This core course highlights the general aspects of physical anthropology along with use of skeletal remains for personal identification. It also includes aspects of forensic medicine, forensic pathology, types of injuries, types of sexual offences and types of asphyxial deaths.

9. Course Objectives

1. To make students understand the determination of age, sex, race and stature of deceased from bone.
2. To introduce the basic concepts of forensic odontology.
3. To understand about Portrait Parle/Bertillon system, Somatoscopy/ Somatometry and Forensic Facial Reconstruction.
4. To describe the role of bite marks analysis in criminal investigation.

10. Course Outcomes (COs)

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

1. Identify and classify human bones and their forensic significance in determining age, sex, race and stature of deceased.
2. Make use of Portrait Parle/Bertillon system, somatoscopy and somatometry, forensic facial reconstruction in elucidating the personal identification of humans.
3. Compare bites marks and understand the practicability of forensic odontology
4. Describe injuries, sexual offences, asphyxial deaths, infanticide, forensic pathology.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Forensic Physical Anthropology

Forensic Physical Anthropology: Definition and Scope within the medical-legal context of personal identification of human remains as in cases of homicides or mass disasters, Brief introduction to Forensic Archeology and Anthropometry. **Human skeletal system:** Nature and formation of bones, introduction to Human skeleton, Classification of human bones. Determination of Age and sex from human bones. Determination of Race and estimation of stature from skeletal remains. **Personal Identification:** Portrait Parle/Bertillon system, Somatoscopy and Somatometry.

Unit – 2	**Number of lectures = 10**	**Title of the unit:**Forensic Odontology

Forensic Facial Reconstruction: Two Dimensional and 3 Dimensional Methods, Importance of tissue depth to reconstruct various facial features. **Forensic Odontology:** Development and scope,

role in mass disaster and anthropology, structural variation in teeth (human and non-human), types of teeth and their functions. **Determination of age from teeth**: Eruption sequence, Gustafson's method, dental anomalies, their significance in personal identification. **Bites marks**: Forensic significance, collection and preservation of bite marks, photography of bite marks, and evaluation of bite marks, Legal aspects of bite marks.

Unit – 3	**Number of lectures = 10**	**Title of the unit:**Forensic Medicine

Forensic Medicine: Definition of Forensic Medicine and Medical Jurisprudence, Dying declaration, Death: Definition, types; somatic, cellular and brain-death, Sudden natural and unnatural deaths. **Identification**: Definition, Identification of unknown person, dead bodies and remains of a person by age, sex, stature, dental examination, scars, moles, tattoos, dactylography, DNA typing and personal belonging including photographs. **Medicolegal Death Investigation:** Aspects of death scene analysis by a medical examiner, including autopsy procedures, unidentified remains, child death investigations and mass disaster investigations. **Determination of Time Since Death:** Immediate changes, Livor, Rigor and Algor mortis, cadaveric spasm, cold stiffening and heat stiffening. Putrefaction, mummification, adipocere and maceration Postmortem artifacts. Virtual Autopsy.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Injuries/ Forensic Pathology

Injuries: Wounds, Bruises Abrasions, Lacerations, Incised wounds, Stab wounds, Bone damage, Burns and scalds, ante-mortem and post-mortem injuries, aging of injuries, artificial injuries.

Sexual Offences: Medico-legal investigation of Sexual offences, including examination of victim and suspect. **Asphyxial deaths**: Definition, causes, types, post-mortem appearances and medico legal significance of hanging, strangulation, suffocation and drowning. **Infanticide**: Definition and related issues. **Forensic Pathology:** Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

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

1. https://www.youtube.com/watch?v=DU7M59qeQP8&list=PL_a1TI5CC9RGgLogyQ_X-qDvYduore_rw
2. https://www.youtube.com/watch?v=wW5dA-ly64o
3. https://www.youtube.com/watch?v=4zTi4dlytCM
4. https://www.youtube.com/watch?v=Jr-dbWGouvw&list=PL_a1TI5CC9RGKVmVna3AkEQrdoYcAwJ9j
5. https://www.youtube.com/watch?v=3GtNH-TflyM&list=PL_a1TI5CC9RFwmRiaZtnTaZGqB50xLJkE
6. https://www.youtube.com/watch?v=-vzFpkiAdu8
7. https://www.youtube.com/watch?v=Z34Xvqd3LjE
8. https://www.youtube.com/watch?v=Z6qreL9eQ9s
9. https://www.youtube.com/watch?v=7_P5rCdge3o
10. https://www.youtube.com/watch?v=JYUeeVJqE2s
11. https://www.youtube.com/watch?v=qaUQx_G8IeA
12. https://www.youtube.com/watch?v=kp5IAK1XjFo

13. https://www.youtube.com/watch?v=wr2IlwNkQzE
14. https://www.youtube.com/watch?v=b8pxI4Qqb7I
15. https://www.youtube.com/watch?v=d0Icxmto824
16. https://www.youtube.com/watch?v=0_1jNGiQeY4
17. https://www.youtube.com/watch?v=5L0cBAoV-6M
18. https://www.youtube.com/watch?v=S8c4KyydffE
19. https://www.youtube.com/watch?v=rdSAUVpeok4
20. https://www.youtube.com/watch?v=kbFMk-J7hPk

13. Books Recommended

1. Forensic Dentisty. Paul G. Stimson, Curtis A. Mertz; CRC Press, LLC, 1999.
2. John. G Clement and David. L. Ranso: Craniofacial Identification in forensic Medicine; Oxiford University, Press; 1998.
3. Beals RL, Hozier H. An Introduction to Anthropology, Macmillan, New Delhi, 1985.
4. Krogman, WM, Iscan M. Human Skeleton in Forensic Medicine, Charles & Thomas, U.S.A.
5. Gray's Anatomy. Churchill Livingston, Edinburgh., 1987.
6. Modi, J.K.. Medical Jurisprudence & Toxicology, N.M. Tripathi Pvt. Ltd., 1988.
7. Singh, I.P, Bhasin MK: Anthropometery, Kamla-Raj Publications, Delhi., 1968.
8. Beals RL, Hoizer H. An introduction to Anthropology, Macmillan, New Delhi., 1985.
9. Krishan Vij. Text book of Forensic Medicine; B.I. Churchill Livingstone Pvt. Ltd. 2001.
10. John. G Clement and David. L. Ranso. Craniofacial Identification in forensic Medicine. Oxiford University, Press; 1998.
11. Wouldiam D. Haglernd, Marculla H. Sorg. Forensic Taphonomy. CRC Press, LLC, 1997.
12. Glaister Anatomy (Ed)—Rentoul& Smith. Forensic Medicine & Toxicology, Churchill Livingston, Edinburgh., 1973.

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Proactive & Reactive Forensics)		L	T	P	
3. Course Code	17050205		0	0	3	
4. Type of Course (use tick mark)		Core (✓)	DSE ( )		SEC ( )	
5. Pre-requisite (if any)	B. Sc.	6. Frequency (use tick marks)	Even (✓)	Odd ()	Either Sem ( )	Every Sem ()
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		Tutorials = 0		Practical = 0		

8. Course Description

This course provides students with practical knowledge and applications of proactive forensics in the current scenario along with tools and techniques in proactive forensics. This course will also emphasize on need for proactive security systems to prevent and detect crime.

9. Course Objectives

1. To make students understand the basics of Proactive Forensics.
2. To make students understand the need and scope of proactive forensics practically.
3. To familiarize with different types of proactive and preventive techniques and tools and their applications.
4. To understand the current status of proactive forensics in the country, further requirements and application.

10. Course Outcomes (COs)

1. Upon successful completion of this course, the students will be able to:
2. Know about the basic requirements and implications of Proactive Forensics.
3. Know different types of proactive and preventive techniques and tools along with their applications.
4. Apply the knowledge of Proactive Forensics in the current scenario to combat criminal and crime issues.
5. Understand the working and functions of various proactive tools used in security systems, cyber forensics, and policing.

11. List of Experiments

1. Study and analyze the manufacturing, working and functions of the various types of body armors.
2. Study the cases of limitations of body armors and prepare a comprehensive report.
3. Study the types, working, and applications of CCTV cameras.
4. Prepare a case report of MMW body scanners.
5. Establish the legal and ethical issues regarding the body scanners.
6. Study roles and responsibilities of the SANE along with case examples.
7. Identify the limitations and ethical issues associate with medical examiners and SANE.
8. Study the case report of cyber forensics related to phishing and hacking.
9. Study investigative auditing case report along with the procedural requirement.
10. Conduct the experiment on preventive data collection in cases of cyber-crime.

12. Books Recommended

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

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Forensic Physical Anthropology and Medicine)		**L**	**T**	**P**	
3. Course Code	17050206		0	0	3	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ( )**		**SEC ()**	
5. Pre-requisite . (if any)	B .Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

This course provides practical training to the students to classify different types of bones, determine age, sex and race from skull, teeth and pelvis, somatometric measurements on living subjects and comparative analysis of bite marks on different substrates.

9. Course Objectives

1. To classify human bones and their forensic significance in determining age, sex and race.
2. To determine age, sex and race from skull, teeth and Pelvis.
3. To perform somatometric measurements on living subjects.
4. To perform comparative analysis of bite marks on different substrates.

10. Course Outcomes (COs)

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

1. Identify human bones and their forensic significance in determining age, sex, race and stature of deceased.
2. Appreciate the practicability of Forensic Odontology and Medicine.
3. Compare Bites marks in solving crime cases.
4. Perform somatometric measurements on living subjects.

11. List of Experiments

1. To determine age and race from skull and teeth.
2. To determine sex from skull.
3. To determine sex from pelvis.
4. To study identification and description of bones and their measurements.
5. To estimate stature from long bone length.
6. To perform somatometric measurements on living subjects.
7. Palmer's & Binomial notation systems.
8. To determine the age of the injury.
9. Comparative analysis of bite marks on different substrates.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science						
2. Course Name	Research Methodology		**L**	**T**	**P**	
3. Course Code	17050207		2	0	0	
4. Type of Course (use tick mark)		**Core ( )**	**DSE ( )**	**AECC(✓)**	**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 26		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
In this ability enhancement course, the components of Research Methodology, research design, hypothesis formulation, scientific research, statistics in scientific research and report writing will be explained.						
9. Course Objectives						
1. To introduce the understanding of research process, conceiving, designing, conducting and analyzing. 2. To make students understand the ethical issues in the research. 3. To make students understand various graphical representation of the data. 4. To make students capable of applying statistics in academics and research.						
10. Course Outcomes (COs)						
Upon successful completion of this course, the students will be able to 1. Understand and apply the knowledge of research methodology in idea formulation, and research designing. 2. Differentiate various research theories, methodologies, and research processes. 3. Recognize the need of ethical behavior while conducting research. 4. Collect, analyze and interpret the data.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 4**	**Title of the unit:** Introduction to Research Methodology				
Defining Research Methodology, need and scope of research, concept of research design, independent, dependable & extraneous variables.						
Unit-2	**Number of lectures = 8**	**Title of the unit:** Research Design and Data Collection				
Research hypothesis, case study method, descriptive & diagnostic studies, analytic studies, experimental designs- CRD, RBD, LSD & Factorial designs. **Sampling design:** sample & population surveys, probability & non-probability sampling, complex random sampling design etc.Observations, questionnaires, interviews, and schedules.						
Unit-3	**Number of lectures = 6**	**Title of the unit:** Introduction to statistics				
Introduction to statistics; graphical presentation of Data, parametric and non-parametric statistics. Measures of central tendency; Measures of dispersion; simple correlation methods.						
Unit-4	**Number of lectures = 8**	**Title of the unit:** Components of Research Report				

Title, Authors and addresses, Abstract, Summary, Synopsis, key words. Introduction, Review of Literature: Research Reading, Critical Reading. Hypothesis: Test of hypothesis, Null hypothesis, alternative hypothesis, Materials and Methods, Sampling methodologies, Results, Discussion, Conclusions, Acknowledgements, and Appendixes. References: Different types of Citing References.

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

1. https://www.youtube.com/watch?v=Pztlk97hf0o
2. https://www.youtube.com/watch?v=tBXznU_TPJo
3. https://www.youtube.com/watch?v=xy9_oWpWEGo
4. https://www.youtube.com/watch?v=dOew5987Gvg
5. https://www.youtube.com/watch?v=LZi0pAu186o
6. https://www.youtube.com/watch?v=PnHaca_08vY
7. https://www.youtube.com/watch?v=g-OwCpoGXxg
8. https://www.youtube.com/watch?v=PnHaca_08vY
9. https://www.youtube.com/watch?v=d5O1Iu1ZINA
10. https://www.youtube.com/watch?v=b5ZrDy0l5wk

13. Books Recommended

1. KS Yogesh. Fundamental of Research Methodology and Statistics, 2006.
2. Broota, K.D., Experimental Design in Behavioural Research, Wiley eastern, New York, 1992.
3. Guilford, Statistics in Psychology and Education, McGraw hill, New York, 1986.
4. Kerlinger, F., Foundations of Behavioural Research, Surjeet Publications, Delhi, 1983.
5. Rajamanickam, M., Statistical Methods in Psychological and Educational Research, Concept Publishing Co. New Delhi, India, 1983.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Photography		**L**	**T**	**P**	
3. Course Code	17050208		2	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE ( )**		**SEC (✓)**	
5. Pre-requisite (if any)	B.Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ( )

7. Total Number of Lectures, Tutorials, Practical

Lectures = 26	Tutorials = 0	Practical = 0

8. Course Description

This course will give an excellent opportunity to study forensic photography, crime scene photography, evidence photography, basic camera functions, equipments, and software. The use of photography in the field of Forensic Science will also be explained.

9. Course Objectives

The objectives of this course are to:

1. Describe the working and functions of different types of cameras used in crime scene and evidence photography.
2. To understand the basic laws and precautionary measures of forensic photography.
3. To understand the admissibility of visual evidences in court of law.
4. To learn different tools and techniques used in photography.

10. Course Outcomes (COs)

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

1. Describe the working components and functioning of the camera.
2. Explain the basics of photography, shutter speed, aperture, high speed and other photographic techniques.
3. Describe the use of Photography in the field of Forensic Science.
4. Use of software in enhancement of the images and their legal issues.

11. Unit wise detailed content

Unit-1	**Number of lectures = 5**	**Title of the unit:Basics of Photography**

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

Unit – 2	**Number of lectures = 6**	**Title of the unit:Forensic Photography - 1**

Introduction, need and scope, admissibility in court of law, rules of forensic photography. Steps of photographic documentation, Alternative light sources (UV/IR/Obliques)

Unit – 3	**Number of lectures = 10**	**Title of the unit:Forensic Photography - 2**

Surveillance photography and Videography– uses, Cameras, and Types. Photography in indoor and outdoor scene of crime; aerial photography. Use of photography in reconstruction the scene of crime (Indoor and Outdoor) and its presentation in the court of law, Photography of Arti factual

evidences, High-speed photography, legal aspects of visual evidence.		
Unit – 4	**Number of lectures = 5**	**Title of the unit: Enhancement & Imaging**
Processing of photographs, enlargement process, image enhancing, legal issues of enhancing, **Photoshop:** Development- digital images processing and manipulation- determination of authenticity and genuineness- forensic application.		

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

1. https://www.youtube.com/watch?v=-tJH24PvaUo
2. https://www.youtube.com/watch?v=9KuDkJOR31U
3. https://www.youtube.com/watch?v=P_XLY8mHeNQ
4. https://www.youtube.com/watch?v=p_2vN5emm_o
5. https://www.youtube.com/watch?v=qe3KtkKLoJ0
6. https://www.youtube.com/watch?v=3bXFuccJqko
7. https://www.youtube.com/watch?v=Kg3fbQRI9o0

13. Books Recommended

1. Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Press, London, 1994.
2. Henry Horeustein; Colour Photography -A working Manual, Little Brown Co. Boston (1995)
3. Herbert L. Blitzer and Jack Jacobia: Forensic Digital Imaging and Photography, 2001.
4. Christopher D Duncan: Advanced Crime Scene Photography, 2010.
5. Di Maio: Gunshot Wounds: Forensic Ballistics in Criminal Justice, 1987.
6. Brian J Heard: Handbook of Firearms and Ballistics, Examining and Interpreting Forensic Evidence, John Wiley, England, 1997.

SEMESTER III

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Chemistry		**L**	**T**	**P**	
3. Course Code	17050301		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description:

This course highlights the general aspects of Forensic Chemistry, sampling of chemical evidences, presumptive, screening of chemical evidences. Introductory aspects of fire/arson and explosives, types of chemical warfare agents/ metals and alloys will also be explained.

9. Course Objectives

1. To make students learn about the general aspects of Forensic Chemistry.
2. To introduce about Petroleum products and their adulterations.
3. To make students differentiate between Alcoholic and Non- Alcoholic Beverages.
4. To make students explain Fire/Arson and Explosives.

10. Course Outcomes (COs)

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

1. Reconstruct arson related crime scenes.
2. Analyze adulteration in petroleum products.
3. Identify illicit and licit liquors and phenolphthalein in trap case.
4. Examine and identify chemical warfare agents and adulteration in metals and alloys

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Forensic Chemistry

Introduction to Forensic chemistry, sampling of chemical evidences, presumptive, screening (colour/ spot test), inorganic analysis. Trap Cases: Collection, and Preliminary analysis of evidence in trap cases. Arson Chemistry of fire, searching of fire scene, collection, preservation and examination of arson evidences.

Unit – 2	**Number of lectures = 10**	**Title of the unit:** Petroleum products/ Alcoholic Beverages

Petroleum products and their adulterations: Chemical composition of various fractions of Petroleum Products, Analysis of petrol, kerosene, diesel. Examination procedures involving standard methods and instrumental techniques, **Alcoholic Beverages:** Types of alcohols, country made liquor, illicit liquor, denatured spirits, Indian made foreign alcoholic and non-alcoholic beverages. Significance of alcohol in breath and breath screening devices. Forensic analysis of Fertilizers/ insecticides/ pesticides/ biocides.

Unit – 3	**Number of lectures = 10**	**Title of the unit:** Fire/Arson and Explosives

Fire: Firefighting operations, preservation of fire scene, collection of evidences, Seat of fire, cause of fire, motives, Analysis of fire debris, Case studies related to fire and Arson. **Explosive and Explosion:** Scope & significance of explosive analysis in forensic science, Classification of explosives, synthesis and characteristics of Tri-nitro toluene (TNT), Pentaerythritol tetranitrate (PETN) and Research and Development Explosives (RDX), deflagration and detonation, explosive trains, collection, preservation and forwarding of exhibits, preliminary analysis of explosives.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Chemical warfare agents/ Metals and Alloys

Chemical warfare agents: Classification, physical and chemical properties, toxic effects, detections and protection. **Metals and Alloys:** Scope & Significance of metal and alloy analysis in forensic science. Identification & composition of metals and alloys, purity of metals including precious metals such as gold, silver and platinum. Different types of metals and alloys commonly encountered for forensic analysis. Hall marking of precious metal according to BIS.

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

1. https://www.youtube.com/watch?v=EUrRpTJyHsg&list=PL_a1TI5CC9RGWNkPEF5CMfMgin9FaVESN
2. https://www.youtube.com/watch?v=EUrRpTJyHsg
3. https://www.youtube.com/watch?v=5QoxLfhFJRA
4. https://www.youtube.com/watch?v=gDIn2UXlq_Q
5. https://www.youtube.com/watch?v=8-tKbnMzB4o
6. https://www.youtube.com/watch?v=Yx67Vs5_00U
7. https://www.youtube.com/watch?v=KALRTh4EfLc
8. https://www.youtube.com/watch?v=DXBdK7WCzVQ
9. https://www.youtube.com/watch?v=Qks73F5VhE0

13. Books Recommended

1. Bureau of Indian Standard Specifications related to Alcohols and Petroleum Products.
2. Chadha PV. Handbook of Forensic Medicine & Toxicology. Jaypee Brothers, New Delhi, 2004.
3. Feigl F. Spot Test in Inorganic Analysis. Elsevier Publ., 2005.
4. Finar IL. Organic Chemistry: Vol. I Fundamental Principle, Pearson Education, Singapore, 1967.
5. Jacqueline Akhavan. The chemistry of explosives. Royal Society of Chemistry, UK, 1998.
6. Laboratory Procedure Manual: Petroleum Products. Directorate of Forensic Science, MHA, Govt. of India, 2005.
7. Modi JP. Textbook of Medical Jurisprudence & Toxicology. N.M. Tripathi Pub, 2001.
8. Morrison RT, Boyd RN. Organic Chemistry (6th Edition). Prentice Hall, 2003.
9. Narayanan TV. Modern Techniques of Bomb Detection and Disposal. R. A. Security system, 1995.
10. Parikh CK. Text Book of Medical Jurisprudence, Forensic Medicine & Toxicology. CBS

Pub. New Delhi, 1999.

11. Pearson D. Chemical Analysis of Food. Chemical Publ. Co. New York, 1971.
12. Watson CA. Official and Standardized Methods of Analysis. Royal Society of Chemistry, UK, 1994.
13. Welcher Frank. Standard Methods of Chemical Analysis (6th Edition). Van Nostrand Reinhold, 1969.
14. Working Procedure Manual- Chemistry, Explosives and Narcotics. BPR&D, 2000.
15. Working Procedure Manual on Chemistry. Directorate of Forensic Science MHA Govt. of India, 2005.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Toxicology		**L**	**T**	**P**	
3. Course Code	17050302		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course highlights the general aspects, areas and elements of Forensic Toxicology, poison and classification of poisons, extraction of poison from human body. Introductory aspects of types and trends of poisoning, types of drugs of abuse will also be explained in this course.

9. Course Objectives

1. To introduce the students about basics of forensic toxicology.
2. To demonstrate various forensic methods of extraction of poison from human body.
3. To describe types and trends of poisoning in India.
4. To familiarize withdrugs of abuse, club drugs and to differentiate Toxicants, toxins and poisons.

10. Course Outcomes (COs)

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

1. Understandbasics of forensic toxicology.
2. Understand in detail aboutpoisons andtheir classification
3. Apply various forensic methods of extraction of poison from human body.
4. Understand types and trends of poisoning in India.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:**Basics of Forensic Toxicology

Forensic Toxicology: Definition, Areas of Forensic Toxicology: Forensic Postmortem Toxicology, Endotoxicology, Human Performance Toxicology, Forensic Drug testing or Workplace Toxicology/Drug Tests, Elements of Forensic Toxicology, Nature of cases, Role of the Forensic Toxicologists, Laws related to Forensic Toxicology including different sections of Indian Penal Code, 1860 related with the Toxicology, Various section of Code of Criminal Procedure Code, 1973 related with the toxicology, The Poison Act, 1919, Drugs and Cosmetics Act, 1940, The Pharmacy Act, 1948, The Drug Control Act, 1950, The Drug and Magic Remedies (Objectionable Advertisement) Act, 1954; The Medicinal and Toilet preparation (Excise Duty) Act and Rules, 1955; Narcotics Drugs and Psychotropic Substance Act, 1985.

Unit – 2	Number of lectures = 13	Title of the unit: Poisons andtheir Types

Poisons: Definition of Poison, Toxin and Toxicant, Ideal Poison. Classification of poisons based ontheirorigin and chemical nature and mode of action. Major vesicants used as chemical-warfare agents, Acute and chronic poisoning, Accidental, homicidal and suicidal poisoning, Common

causes of poisoning, Dosage, Frequency, Route of administration, Absorption, distribution and metabolism and Factors affecting the poisoning, Preservation of viscera, blood, urine, vomit etc for toxicological analysis.

Unit – 3	Number of lectures = 10	**Title of the unit:** Trends of Poisoning, extraction and identification of poisons

Types and Trends of Poisoning: Animals and Human poisoning in India with special reference to

Suicidal, Homicidal and accidental poisons, Different methods of poison/drug extraction from viscera, blood, urine and vomit including volatile organic poisons (acidic and alkaline steam distillation), Non-volatile organic poisons (Stass Otto Method, Acid digestion method, Sodium Tungstate method or Valov Method, Ammonium Sulphate method and solvent extraction), Inorganic poisons (Dialysis method, Dry Ashing method, Wet digestion method), Extraction of insecticide, General account (General name, family, active principle, fatal dose and period, sign and symptoms, postmortem findings, medicolegal aspects) of irritants (like Abrusprecatorius, Calotropis, etc. and inorganic irritants), corrosive including (strong acids and strong alkalis, including sulphuric acid, nitric acid, hydrochloric acid; oxalic acid, carbolic acid, and NaOH, KOH) and systemic poisons including opioids, alcohols, anaesthetics, sedatives and hypnotics, agrochemical compounds, dhatura, belladonna, cannabis indica, Stychinusnux vomica, gelsemium, curare and conium, digitalis, oleander, Kaner, Ergot, aconite and nicotine, irrespirable gases such as carbon monoxide, carbon dioxide, sewer gases, some war gases and their identification by colour test, TLC and other instrumental methods.

Unit – 4	Number of lectures = 10	**Title of the unit:** Drugs of Abuse

Drugs of Abuse: Introduction and classification of Drugs of Abuse (Narcotics, Stimulants, Depressant and hallucinogens), Status of Drug abused in India. Introduction to Club drugs and Drug abuse in Sports, Drugs as Evidence. Field and laboratory tests of drugs of abuse. Instrumental methods of analysis, collection, preservation and transportation of drug evidences.

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

1. https://www.youtube.com/watch?v=lbWHGxUdDD8
2. https://www.youtube.com/watch?v=VF3-V4buOvs
3. https://www.youtube.com/watch?v=i1s0wvQfVuo
4. https://www.youtube.com/watch?v=gOaoueVSZpM
5. https://www.youtube.com/watch?v=2V2HMYOIwvI
6. https://www.youtube.com/watch?v=l85ItdU-o_o
7. https://www.youtube.com/watch?v=__LIPm4hN-U
8. https://www.youtube.com/watch?v=aMWBB2Hxcbo
9. https://www.youtube.com/watch?v=abTAqmK8bIM

13. Books Recommended

1. Curry AS. Analytical Methods in Human Toxicology: Part II. CRC Press Ohio, 1986.
2. Curry AS. Poison Detection in Human Organs. C Thomas Spring field CRC Press, 1976.
3. Clark EGC; Isolation and Identification of drugs. Academic Press, 1986.
4. Niesink RJM. Toxicology - Principle and Application. CRC Press, 1996.

5. Sunshine I. Handbook of Analytical Toxicology. CRC Press, 1969.
6. Parikh CK. Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology. CBS Publ. New Delhi, 1999.
7. Laboratory Procedure Manual, Forensic Toxicology. Directorate of Forensic Science. MHA Govt, 2005.
8. Michel JD. Handbook of toxicology. CRC Press, USA, 1995.
9. Casarett LJ, Doul John. Toxicology: The Basic Science of Poison. Macmillan Publishing Co. New York, 1975.
10. Carvey RH, Baselt RC. Introduction to Forensic Toxicology and Biochemicals. Publ. Davis CA, 1981.
11. Chadha PV. Handbook of Forensic Medicine and Toxicology. Jaypee Brothers, New Delhi, 2004.
12. Modi JP. Textbook of Medical Jurisprudence and Toxicology. MM Tripathy Publications, 2001.
13. Moffat AC, Osselton DM, Widdop B. Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material (3rd edition). Pharmaceutical Press, 2004.

1. Name of the Department: Forensic Science						
2. Course Name	Pharmacology & Pharmacokinetics		**L**	**T**	**P**	
3. Course Code	17050303		3	0	0	
4. Type of Course (use tick mark)		**Core ( )**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course provides students the knowledge of basic pharmacodynamics, pharmacokinetics and toxicological principles underlying the actions of the various poisons encountered in forensic toxicology. It is also to ensure that the student understand nature of the pharmacological and toxicological investigations undertaken in forensic laboratories.

9. Course Objectives

1. To make students understand the basics of pharmacology and pharmacokinetics.
2. To make students understand common antiseptics, disinfectants and insecticides.
3. To make students understand drug acting on various systems of human body
4. To familiarize the students with the types and trends of poisoning.

10. Course Outcomes (COs)

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

1. Describe pharmacodynamics, pharmacokinetics, classification and the principles of drug administration
2. Describe antiseptics, disinfectants, insecticides with respect to forensic science.
3. Explain mechanism, metabolism and action of drugs on human body
4. Describe toxicity of commonly used drugs and drugs of abuse.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:Introduction to Pharmacology and Pharmacokinetics**

Introduction to Pharmacology: Definitions, Sources, Terminology used, Types: Classification. Pharmacodynamics: Actions, therapeutic, Adverse, toxic effects.

Pharmacokinetics: Absorption, distribution, metabolism, interaction, excretion, Routes and principles of administration of drugs, Legal issues, Calculation of drugs dosage, and Principles of therapeutics

Unit-2	**Number of lectures = 10**	**Mechanism, Metabolism and Action of Drugs**

Sites and mechanisms of action of drugs. Dose-effect relationships; agonists, partial agonists and antagonists. Factor that modify drug actions; side effects, overdose, idiosyncratic and allergic reactions; teratogenesis and fetal toxicity. Drug interactions.

The movement of drug molecules across cell membranes, the blood-brain barrier and the placental filter. Routes of administration and drug adsorption. Binding to plasma proteins. Drug distribution,

metabolism and elimination. Drug bioavailability and half-life.		
Unit - 3	**Number of lectures = 10**	**Title of the unit: Antiseptics, disinfectants, insecticides**
Pharmacology of commonly used antiseptics, disinfectants and insecticides. Antiseptics: Composition, action, dosage, route, indications, contraindications, drug interactions, side-effects, adverse effects, toxicity Composition and toxicity of Disinfectants, and Insecticides		
Unit - 4	**Number of lectures = 10**	**Title of the unit: Commonly used drugs**
Composition, action, dosage, route, indications, contraindications, drug interactions, side effects, adverse effects, toxicity of Anti-emetics, Antacids, cholinergic, anti-cholinergic, Decongestants, Antitussives, bronchodilators, antihistamines, Analgesics (NSAID's, Antipyretics, etc.		

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

1. https://www.youtube.com/watch?v=EjhJJRQW4Yo
2. https://www.youtube.com/watch?v=lJRx4mn7g-w
3. https://www.youtube.com/watch?v=AcbgYSyIwVc
4. https://www.youtube.com/watch?v=lJRx4mn7g-w
5. https://www.youtube.com/watch?v=W9P0RlQ3ec4
6. https://www.youtube.com/watch?v=VF3-V4buOvs
7. https://www.youtube.com/watch?v=i1s0wvQfVuo
8. https://www.youtube.com/watch?v=gOaoueVSZpM
9. https://www.youtube.com/watch?v=2V2HMYOIwvI
10. https://www.youtube.com/watch?v=l85ItdU-o_o
11. https://www.youtube.com/watch?v=__LIPm4hN-U
12. https://www.youtube.com/watch?v=aMWBB2Hxcbo
13. https://www.youtube.com/watch?v=abTAqmK8bIM

13. Books Recommended

1. Satoskar, Bhandarkar, Ainapure: Pharmacology and Pharmacotherapeutics, 18 Edition Popular Prakashan Mumbai.
2. M M Das: Pharmacology, Books & Allied (p) Ltd, 4 Edition 2001.
3. Linda, Skidmore Roth: Mosby's 2000 Nursing Drug Reference, Mosby Inc, Harcourt Health Sciences Company, Missouri 2000.
4. Ramesh Karmegan: First aid to Pharmacology for undergraduates, Paras Medical publishers, Hyderabad, India, 1 Edition 2003.
5. Sunshine I. Handbook of Analytical Toxicology. CRC Press, 1969.
6. Parikh CK. Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology. CBS Publ. New Delhi, 1999.
7. Laboratory Procedure Manual, Forensic Toxicology. Directorate of Forensic Science, MHA Govt, 2005.

8. Saferstein R. Forensic Science Hand Book, Vol I, II and III, Pretince Hall, NI., 1982
9. Curry AS. Poison Detection in Human Organs., 1976.
10. Mathew E. Johll. Investigating Chemistry: A Forensic Science Perspective, 2009
11. Suzanne Bell. Drugs, Poisons, and Chemistry, 2009
12. DFS Manuals of Forensic Chemistry and Narcotics.

1. Name of the Department: Forensic Science						
2. Course Name	Analytical Forensic Toxicology		**L**	**T**	**P**	
3. Course Code	17050304		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course highlights the general aspectsand elements of analytical forensic toxicology. Various extraction methods and traditional and modern extraction methods of poison from various body fluids.

9. Course Objectives

1. To introduce the students about basics of analytical forensic toxicology.
2. To understand the metabolic pathways of major abused drugs.
3. To explain various traditional and modified methods of extraction of poison from human body.
4. To demonstrate various modern and instrumental techniques for analysis of poisons.

10. Course Outcomes (COs)

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

1. Describe basics of analytical forensic toxicology.
2. Apply various extraction methods for the extraction of various poison from human body fluids.
3. Analyze and purify the poisons using various analytical techniques.
4. Demonstrate and use various instrumental techniques for analysis of poisons.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:Pharmacokinetics and metabolism**

Pharmacology of Forensic Drugs & Poisons: Studies on absorption, distribution, pharmacokinetics, metabolism pathways of common drugs and poisons, Drug toxicity, excretion of drugs and poisons.

Study of Metabolites of methanol and ethanol, acetyl salicylate, DDT, Parathion, Pentothal, carbaryl, phenobarbitone, diazepam, amphetamine and heroin, ketamine. Identification of the drugs & their metabolites by GC-Mass & LC- Mass.

Unit –2	**Number of lectures = 10**	**Title of the unit: Analysis and purification of poison**

Basic steps in analytical toxicology: Extraction of active constituent i.e poison in matrices of interest, Stripping or purification of active constituent, Rapid Screening and Identification, Quantitation, Interpretation and Conclusion.

Term related to extraction: Matrix, Active Constituent and Stripping.
Classification of matrices: Biological, Non-Biological matrices, and Visceral.
Extraction methods- Solvent Extraction, Distillation (Steam Distillation, Fractional Distillation, Distillation Under Vacuum), Micro-diffusion and Microwave Digestion.

Unit – 3	Number of lectures = 10	Title of the unit: Modern methods of extraction

Modern methods of extraction- Head Space Technique, Solid Phase Extraction (SPE), Solid Phase Micro Extraction (SPME), Micellar Extraction and Super Critical Fluid Extraction (SFC). Extraction of poison from viscera, blood, urine, stomach wash and vomit, cold drink, food material and from other matrices of forensic importance.
Clean up procedures: Clean-up using Alumina and Silica Column, Preparative TLC Method, Solid Phase Extraction (SPE) Cartridges, Simple Column Chromatographic method and Solid Phase Extraction (SPE) Cartridges.

Unit – 4	Number of lectures = 10	Title of the unit: Instrumental Analysis

Confirmation of drugs through instrumental techniques: Analysis of Narcotic drugs, depressants, tranquillizers, stimulants, hallucinogens, club drugs & other drugs of abuse through High Performance Thin Layer Chromatography, Gas liquid chromatography, High Pressure liquid chromatography, , UV-visible spectrometry, IR/FTIR and Raman spectroscopy, Mass Spectrometry, GC- Mass and LC-Mass, HPTLC-Mass. Method validation and calibration of instruments.
Detection of adulterants in drugs and their commonly encountered adulterant, determination of nature of adulterant, diluent, and additives.

Percentage purity determination: Estimation of % purity of the drugand detection in seized samples such as opium charas, amphetamine, cocaine, and tranquilizers in seized sample

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

10. https://www.youtube.com/watch?v=lbWHGxUdDD8
11. https://www.youtube.com/watch?v=VF3-V4buOvs
12. https://www.youtube.com/watch?v=i1s0wvQfVuo
13. https://www.youtube.com/watch?v=gOaoueVSZpM
14. https://www.youtube.com/watch?v=2V2HMYOIwvI
15. https://www.youtube.com/watch?v=l85ItdU-o_o
16. https://www.youtube.com/watch?v=__LIPm4hN-U
17. https://www.youtube.com/watch?v=aMWBB2Hxcbo
18. https://www.youtube.com/watch?v=abTAqmK8bIM

13. Books Recommended

14. Curry AS. Analytical Methods in Human Toxicology: Part II. CRC Press Ohio, 1986.
15. Curry AS. Poison Detection in Human Organs. C Thomas Spring field CRC Press, 1976.
16. Clark EGC; Isolation and Identification of drugs. Academic Press, 1986.
17. Niesink RJM. Toxicology - Principle and Application. CRC Press, 1996.

18. Sunshine I. Handbook of Analytical Toxicology. CRC Press, 1969.
19. Parikh CK. Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology. CBS Publ. New Delhi, 1999.
20. Laboratory Procedure Manual, Forensic Toxicology. Directorate of Forensic Science. MHA Govt, 2005.
21. Michel JD. Handbook of toxicology. CRC Press, USA, 1995.
22. Casarett LJ, Doul John. Toxicology: The Basic Science of Poison. Macmillan Publishing Co. New York, 1975.
23. Carvey RH, Baselt RC. Introduction to Forensic Toxicology and Biochemicals. Publ. Davis CA, 1981.
24. Chadha PV. Handbook of Forensic Medicine and Toxicology. Jaypee Brothers, New Delhi, 2004.
25. Modi JP. Textbook of Medical Jurisprudence and Toxicology. MM Tripathy Publications, 2001.
26. Moffat AC, Osselton DM, Widdop B. Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material (3rd edition). Pharmaceutical Press, 2004.

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Forensic Chemistry)		**L**	**T**	**P**	
3. Course Code	17050305		0	0	3	
4. Type of Course (use tick mark)		**Core ( )**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

This course provides students with practical experience of the techniques of analysis of Chemical evidences. It is addressed to students who have little or no experience of analysis of chemical testing. It aims to enable students to develop an understanding and the ability to use these methods.

9. Course Objectives

1. To understand about the general aspects of forensic chemistry.
2. To introduce about Petroleum products and their adulterations.
3. To make students capable of differentiating between alcoholic and non- alcoholic beverages.
4. To make students understand about fire/arson and explosives.

10. Course Outcomes (COs)

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

1. Analyze petrol, kerosene and diesel by physical and chemical methods.
2. Identify metal and alloys by chemical method and instrumental techniques.
3. Analyze organic and inorganic explosives by color test and instrumental techniques.
4. Examine alcohol, its poisoning and adulteration using various physical and chemical tests.

11. List of experiments

1. Detection and identification of phenolphthalein in trap cases by color test and TLC.
2. Analysis of petrol, kerosene and diesel by physical and chemical methods.
3. Analysis of adulteration of petrol and diesel with kerosene by TLC and instrumental methods.
4. General analysis and identification of metal and alloys by chemical method and instrumental techniques.
5. Analysis of organic and inorganic explosives by color test and instrumental techniques.
6. Chemical analysis of ethanol
7. Chemical analysis of methanol
8. Forensic analysis of residue material in fire and arson cases.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Forensic Toxicology)		**L**	**T**	**P**	
3. Course Code	17050306		0	0	3	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

This course provides students with practical experience of the techniques used for analysis of toxicological evidence. It is addressed to students who have little or no experience of analysis of chemical testing. It aims to enable students to develop an understanding and the ability to use these methods.

9. Course Objectives

1. To make students understand general aspects of Forensic Toxicology.
2. To make students gain knowledge about the extraction and examination of poisons from viscera/blood and urine samples.
3. To demonstrate estimation of alcohol in Blood.
4. To demonstrate detection of metallic poisons by using various Test.

10. Course Outcomes (COs)

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

1. Extract poisons from viscera/blood and urine samples.
2. Estimate alcohol in Blood.
3. Analyze metallic poisons by using various chemical tests
4. Categorize and analyze different categories of poisons.

11. List of experiments

1. Extracting poisons from viscera/blood and urine samples.
2. Analysis of different plant poisons
3. Analysis of Aluminum Phosphide (Phosphine gas).
4. Estimation alcohol in Blood.
5. Identification of Gaseous Poisoning (Carbon Monoxide and HCN).
6. Detection of metallic poisons using various tests.
7. Extraction and analysis of different categories of poisons.
8. Detection and analysis of poisons in food articles.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science						
2. Course Name	Elements of Forensic Biology and Serology		L	T	P	
3. Course Code	17050307		3	0	0	
4. Type of Course (use tick mark)		Core ()	DSE (✓)		SEC ()	
5. Pre-requisite (if any)	B. Sc.	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40	Tutorials = 0		Practical = 0			

8. Course Description

This course provides students the knowledge of biological evidences as well as hair along with their forensic significance. Concepts of immunology and blood grouping will also be explained.

9. Course Objectives

1. To make students understand biological evidences along with their forensic significance.
2. To describe the Forensic significance of Hair as evidence.
3. To explain blood grouping and its significance in forensic science.
4. To understand the concepts of immunology and its relevance with forensic investigation.

10. Course Outcomes (COs)

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

1. Understand the importance of biological fluids (blood, semen, saliva and other body fluids) in crime investigations.
2. Describe the importance, nature, collection and preservation of Hair evidence.
3. Understand Blood grouping of different biological stains and its forensic relevance
4. Apply knowledge of immunology and serology for examination of various evidence.

11. Unit wise detailed content

Unit-1	Number of lectures = 10	Title of the unit: Blood and Semen

Blood: Composition and functions, Human Blood groups: General Principles, theory of their inheritance, Blood group determination from fresh blood, titer, Rouleaux formation and Bombay blood group. Forensic Characterization of Bloodstains, Stain Patterns of Blood.

Forensic Characterization of Semen: Formation, Composition, Morphology of spermatozoa, forensic significance, Presumptive and Confirmatory tests (including Azoospermic semen stains) Individualization (Blood Grouping, seminal fluid isozymes typing, forensic significance, Collection and analysis of evidences in Rape cases.

Unit – 2	Number of lectures = 10	Title of the unit: Other body fluids and Hair

Body fluids: Forensic significance of other body fluids as Saliva, Sweat and fecal matters, their collection and identification. **Hair:** Introduction, types, location, collection evaluation and forensic significance of Hair. Morphological and microscopic examination of human and animal hair. Hair growth and development, determination of origin, race, sex, site from hair.

Unit – 3	Number of lectures = 10	Title of the unit: Immunology and forensic serology

Immunology: Immune system, immune response, innate and acquired immunity and antigens,

Haptanes and adjuvants. Immunoglobulin: Types, physio-chemical properties and function, raising of antisera. Lectins: Forensic significance, buffers and serological reagents, methods of sterilization employed for serological work. Antigen-Antibody Reactions: Precipitation, agglutination, complement, neutralization, immunofluorescence. HLA system: Its applications in paternity testing, pitfalls of HLA system. **Forensic Serology**: Introduction, basic concepts- antigens, antibodies (Polyclonal and monoclonal), Affinity, avidity, Antigen-antibody binding reactions- primary and secondary. Introduction to Tools and techniques involving analysis of Biology and serology.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Blood grouping from body fluids

Blood grouping: Blood grouping from stains of blood, semen, saliva and other body fluids by Absorption-inhibition, Absorption-elution and mixed agglutination techniques, determination of secretor/non-secretor status.

New approaches in bloodstain grouping. Blood group specific ABH substances. Secretors and non- secretors. Blood groups that make racial distinctions. Lewis antigen. Bombay Blood groups. HLA antigens and HLA typing. Role of sero-genetic markers in individualization and paternity disputes. Pitfalls in red cell typing.

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

1. https://www.youtube.com/watch?v=wJJMmiu_ZKQ
2. https://www.youtube.com/watch?v=tzBwcDSqPwg
3. https://www.youtube.com/watch?v=49gSR3GSZxk
4. https://www.youtube.com/watch?v=IeJM9DLaiMc
5. https://www.youtube.com/watch?v=22G58sDSRPA
6. https://www.youtube.com/watch?v=8iqqw96bFlI
7. https://swayam.gov.in/courses/264-forensic-biology-and-serology
8. http://www.forensicpage.com/new26.htm
9. https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf/view

13. Books Recommended

1. Robertson. Forensic examination of Hair. Francis & Taylor, USA, 1999.
2. Gilblet E. Markers in Human Blood, Davis, Pensylvania, 1969.
3. Culliford BE. The Examination and Typing of Blood Stains, US Deptt. of Justice, Washingron, 1971.
4. Dunsford I, Bowley C. Blood Grouping Techniques, Oliver & Boyd, London, 1967.
5. Boorman KE, Dodd BE, Lincoln PJ. Blood group serology, 6th ed. Edinburgh: Churchill Livingstone, 1988.
6. Basin MK. A laboratory Manual for Human Blood analysis. Kamla Raj Enterprises.
7. Li Richard. Forensic Biology, Taylor & Francis Group LLC., 2008.
8. Saferstein R. Science Handbook, Vol. I, II and III, Prentice Hall, New Jersey, 1982.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Botany, microbiology, Entomology, and wildlife forensic		**L**	**T**	**P**	
3. Course Code	17050308		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course provides students the knowledge of botanical evidences along with their forensic significance, forensic analysis of diatoms as evidence in drowning cases. Forensic significance of insects and flies as entomological evidence and wildlife forensic will also be explained.

9. Course Objectives

1. To describe advanced aspects of botanical evidences along with their forensic significance.
2. To understand the forensic significance of entomological evidence in forensic science.
3. Explain the role of diatoms as evidence in drowning cases.
4. Provide knowledge about wildlife in the field of forensic science.

10. Course Outcomes (COs)

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

1. Describe Botanical evidences along with their Forensic significance.
2. Use entomological evidence for estimation of post-mortem interval, manner of death and sometimes the cause of death.
3. Differentiate between ante and post-mortem drowning along with the bearing the diatoms have in the investigation of probable place and time of drowning.
4. Describe the importance of wildlife in the field of forensic science.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Forensic Botany

Forensic Botany: Botanical evidences:- Forensic importance, Introduction, types, location, collection, preservation and evaluation of wood, timber varieties, seeds and leaves with methods of identification and comparison. Types of vegetable fibers and methods of their identification. Pollens: Structure, function, methods of identification and comparison of pollen grains and starch grains. Paper Pulp examination. Forensic Microbiology: Types and identification of microbial organisms of forensic significance.

Unit - 2	**Number of lectures = 10**	**Title of the unit:** Forensic Diatomology

Forensic Diatomology: Nature, location, Structure and life cycle of diatoms, methods of identification and comparison, Diatom Monitoring and D-Mapping of water bodies, Extraction from water samples, Slide preparation and identifying features. Diatom Test: Ante-mortem and Post-mortem drowning, Diatom as a forensic evidence, Forensic significance of Diatom Test, Fate of Diatom inside the body, Extraction methods of diatoms from body, Criterion of Concordance,

Validity of Diatom test and its Limitations.		
Unit – 3	**Number of lectures = 10**	**Title of the unit:** Forensic Entomology
Forensic Entomology: Introduction, General entomology and arthropod biology, Insects of forensic importance, Collection of entomological evidence during death investigations, the role of aquatic insects in forensic investigations. Insect succession on carrion and its relationship to determine time since death, Insect applications to medico-legal entomology, Human decomposition and insect succession, Factors that influence decomposition and succession, Case studies involving insect succession.		
Unit – 4	**Number of lectures = 10**	**Title of the unit:** Wildlife Forensic
Introduction and importance of Wildlife. Protected and endangered species of animals and plants. Sanctuaries and their importance. Wildlife Protection act, relevant provision of wild-life and environmental act. Types of wildlife crimes. Different methods of killing and poaching of wildlife animals. Species Identification through different methods.		

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

1. https://www.youtube.com/watch?v=G03zsVrZBS8
2. https://www.youtube.com/watch?v=taSCtCKVyRs
3. https://www.youtube.com/watch?v=aNsFLFh--vI
4. https://www.youtube.com/watch?v=DCNOeSbqslw
5. https://www.youtube.com/watch?v=wi9ubY76yZY
6. https://www.youtube.com/watch?v=vRj9NafEshQ
7. https://www.youtube.com/watch?v=1-sQBOQOLCM
8. https://www.youtube.com/watch?v=6mNBEdA6LEs
9. https://www.youtube.com/watch?v=dXGAkuUPB98
10. https://www.youtube.com/watch?v=Cp9ym5M0RUc
11. https://www.youtube.com/watch?v=HIVKISCmjTQ
12. https://www.youtube.com/watch?v=VEDsF_rCWYc
13. https://www.youtube.com/watch?v=6_o1AzbrNdA
14. https://www.youtube.com/watch?v=Q1arm_BiCd0
15. https://www.youtube.com/watch?v=FsFtEsjzk_g
16. https://www.youtube.com/watch?v=6NMy14e5SYE
17. https://www.youtube.com/watch?v=h29quaI8kYk
18. https://www.youtube.com/watch?v=1bnBhCsNNps
19. https://www.youtube.com/watch?v=jugwWdU5m94
20. https://www.youtube.com/watch?v=0ShhqU2wjGU
21. https://www.youtube.com/watch?v=a50a8eYE2cw
22. https://www.youtube.com/watch?v=bTvxHnCRhAs&list=PL_a1TI5CC9RE4fOc_B3Ow2K9ouGfXHYga

23. https://www.youtube.com/watch?v=QoQcAQeqgvQ&list=PL_a1TI5CC9RFR8pJNxrCZhs7o4QDtHbJi

13. Books Recommended

1. Hosetti BB. Concept in Wildlife Management. Daya Publishing House, 2005.
2. Baalu TR. The Wildlife Protection Act, 1972. Nataraj Publication, 2001.
3. Herbert Stone. The Timbers of Commerce. International Book Distributor, 1985.
4. N. Clifford. Timber Identification. Leonard Hill Ltd., 1957.
5. G. Erdtman. Pollen Morphology & Plant Taxonomy: Angiosperms (an introduction to Palynology), Hafner Publishing Co., 1971.
6. Esau Katherine; "Plant Anatomy", Wiley Eastern Ltd., 1965.
7. Heather Miller Coyle. Forensic Botany", CRC Press, 2005.
8. Herbert L. Edlin. A manual of Wood Identification", Viking Press, 1976.
9. HC. Long. The Poisonous Plants. Asiatic Publishing House, 1994.
10. Adrian Linacre. Forensic Science in Wildlife Investigations. CRC Press, 2009.
11. David B. Rivers, Gregory A. Dahlem. The Science of Forensic Entomology (1st Edition). Wiley-Blackwell, 2014.
12. David W. Hall, Jason Byrd. Forensic Botany: A Practical Guide. Wiley-Blackwell, 2012.
13. Dorothy Gennard. Forensic Entomology: An Introduction, 2nd Edition. Wiley-Blackwell, 2012.
14. Jane E. Huffman, John R. Wallace. Wildlife Forensics: Methods and Applications. Wiley, 2011.
15. Jason H. Byrd. Forensic Entomology: The Utility of Arthropods in Legal Investigations (2nd Edition). CRC Press, 2009.

1. Name of the Department: Forensic Science						
2. Course Name	Advanced Forensic biology and serology		**L**	**T**	**P**	
3. Course Code	17050309		3	0	0	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course provides students the knowledge of biological evidences along with their forensic significance. The students will also be made well versed with concepts of species identification and serological techniques.

9. Course Objectives

1. To make students understand biological evidences along with their forensic significance.
2. To describe the Forensic significance of species identification
3. To explain blood grouping and its significance in forensic science.
4. To understand and apply serological techniques for examination of biological evidence.

10. Course Outcomes (COs)

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

1. Understand the importance of biological fluids (blood, semen, saliva and other body fluids) in crime investigations.
2. Describe the importance and procedure of species identification.
3. Understand blood grouping of different biological stains and its forensic relevance
4. Apply serological techniques for examination of body fluids and other biological evidence.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit: Identification of body fluids**

Composition of body fluids - blood, semen, saliva, vaginal fluid, urine, sweat and menstrual blood. Identification of bloodstains, seminal stain, saliva stain, vaginal fluid, urine, sweat and menstrual blood using current and emerging techniques. Distinguishing vaginal acid phosphatase and seminal acid phosphatase using isoelectric focusing technique.

Unit – 2	**Number of lectures = 10**	**Title of the unit: Species identification**

Determination of species of origin-ring test, single diffusion in one dimension and two-dimension, double diffusion in one dimension and two dimensions, immune-electrophoresis, Rocket immune-electrophoresis, Two dimensional electrophoresis, cross-over electrophoresis, Anti-human globulin serum inhibition test, passive heam-agglutination method, precipitin-inhibition test, mixed agglutination method, sensitized latex particle method.

Unit – 3	**Number of lectures = 10**	**Title of the unit: Serological Techniques-I**

Testing Procedures and factor effecting precipitin tests. Raising of Anti-sera, buffers and serological reagents, Lectins and their forensic significance, methods of sterilization employ for serological work

Unit – 4	Number of lectures = 10	Title of the unit: Serological Techniques-II

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

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

1. https://www.youtube.com/watch?v=wJJMmiu_ZKQ
2. https://www.youtube.com/watch?v=tzBwcDSqPwg
3. https://www.youtube.com/watch?v=49gSR3GSZxk
4. https://www.youtube.com/watch?v=IeJM9DLaiMc
5. https://www.youtube.com/watch?v=22G58sDSRPA
6. https://www.youtube.com/watch?v=8iqqw96bFlI
7. https://swayam.gov.in/courses/264-forensic-biology-and-serology
8. http://www.forensicpage.com/new26.htm
9. https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf/view

13. Books Recommended

1. Robertson. Forensic examination of Hair. Francis & Taylor, USA, 1999.
2. Gilblet E. Markers in Human Blood, Davis, Pensylvania, 1969.
3. Culliford BE. The Examination and Typing of Blood Stains, US Deptt. of Justice, Washingron, 1971.
4. Dunsford I, Bowley C. Blood Grouping Techniques, Oliver & Boyd, London, 1967.
5. Boorman KE, Dodd BE, Lincoln PJ. Blood group serology, 6th ed. Edinburgh: Churchill Livingstone, 1988.
6. Basin MK. A laboratory Manual for Human Blood analysis. Kamla Raj Enterprises.
7. Li Richard. Forensic Biology, Taylor & Francis Group LLC., 2008.
8. Saferstein R. Science Handbook, Vol. I, II and III, Prentice Hall, New Jersey, 1982.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Genetics and DNA Profiling		**L**	**T**	**P**	
3. Course Code	17050310		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

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

9. Course Objectives

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

10. Course Outcomes (COs)

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

1. Describe basic concepts of human genetics.
2. Understand the usefulness of genetic markers in forensic investigation along with the interpretation of a DNA profile.
3. Understand the need, progress, forensic significance and the legal importance of DNA profiling in various scenarios in India and abroad.
4. Use DNA statistics for calculations in different types of cases encountered in Forensic Science.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Human Genetics

Genetics: Human genetic variations, Mendelian Inheritance, Hardy Weinberg Equilibrium, Mutation- their types and causes. Relevance of population genetics. Allele frequency, genotype frequency. Polymorphism and heterozygosity. Measures of genetic variations.

Material preferred for DNA profiling, Touch DNA and its recovery from different material.

Unit – 2	**Number of lectures = 10**	**Title of the unit:** DNA Profiling I

DNA Profiling: Introduction, History of DNA Typing, molecular biology of DNA, variations, polymorphism, DNA Extraction-Organic and Inorganic extraction, Comparison of Extraction methods.

Forensic DNA typing system – RFLP, Amp-RFLP. STR. Mini STR. Y-STR, XSTR.

Mitochondrial DNA. Single Nucleotide Polymorphism. Microbial DNA testing, Non-Human DNA testing, Plant DNA testing. STR allele nomenclature. STR loci of Forensic significance. STR kits. STR typing: Manual and Capillary Electrophoresis. Gender identification. Interpretation of the DNA typing results.

Unit – 3	**Number of lectures = 10**	**Title of the unit:** DNA Profiling II

PCR amplification: PCR process, components, controls, advantages and disadvantages, types of PCR, PCR inhibitors, optimization and solution to PCR inhibition. Stochastic effect. PCR Primer designing. **DNA separation methods:** Slab gel and Capillary Electrophoresis. Capillary electrophoresis-Principle and Instrumentation. DNA detection methods: Fluorescent Dyes and Silver-staining.

CODIS, Statistical evaluation of DNA typing results and preparation of reports. RNA and its application in Forensics, Emerging molecular techniques in Forensics.

Human Genome Project: Introduction, History, Goals, Benefits, Social, Ethical and Legal Issues DNA Forensic Databases. Benefits of DNA Databases, Quality control, certification and accreditation.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Forensic applications of DNA profiling and Bioinformatics

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

Introduction to bioinformatics and its application in forensics.

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

1. https://www.youtube.com/watch?v=ffn3eJMoCOk
2. https://www.youtube.com/watch?v=0M8PcgTORwg
3. https://www.youtube.com/watch?v=R1J1m6oMWf4
4. https://www.youtube.com/watch?v=z5OMOKr4pHQ
5. https://www.youtube.com/watch?v=kbU_qkVGIc4
6. https://www.youtube.com/watch?v=W_S-QoS3w98
7. https://www.youtube.com/watch?v=kMBWW6YEBqU
8. https://www.youtube.com/watch?v=j4yhe9ASm6Y
9. https://www.youtube.com/watch?v=YqWfFGEXVJA
10. https://www.youtube.com/watch?v=m5ffwbjWYrM
11. https://www.youtube.com/watch?v=e_ZZh6GGlGY
12. https://www.youtube.com/watch?v=zaMNRhKIeBU
13. https://www.youtube.com/watch?v=eCETaU45ITE
14. https://www.youtube.com/watch?v=sIjgF0Gk-1I

15. https://www.youtube.com/watch?v=RZh0R1OscOc
16. https://www.youtube.com/watch?v=ZN3lLuQVAV0
17. https://www.youtube.com/watch?v=iARKkEpsdjc
18. https://www.youtube.com/watch?v=JX2NzSdHD_M
19. https://www.youtube.com/watch?v=CNqGkYsTufo
20. https://www.youtube.com/watch?v=_tKIvJ8UHrg
21. https://www.youtube.com/watch?v=39hancFek0Q

13. Books Recommended

1. Rudin Norah. An Introduction to Forensic DNA Analysis. CRC Press Publishers, 2002.
2. Inman Keith. An Introduction to Forensic DNA Analysis. CRC Press, 1997.
3. Vij Krishan. Basics of DNA and Evidentiary Issues. Jaypee Brothers, 2004.
4. EastealSimon.DNA Profiling. Harwood Academic Publishers, 1993.
5. EpplenJorg T. DNA Profiling and DNA Fingerprinting. Birkhauser Verlage, 1999.
6. Lorne Kirby. DNA Fingerprinting. W H Freeman and Co., 1992.
7. Singh, Yashpal. DNA Tests in Criminal Investigation Trial & Paternity Disputes. Asia Law Agency, 2006.
8. JM Butler. Forensic DNA Typing. Elsevier Academic Press, 2005.
9. Mark A. Farley, James J. Harrington. Forensic DNA Technology. CRC Press, 1991.
10. SC Rastogi, N. Mendiratta, P. Rastogi. Bio-informatics – Methods and Applications. PHI learning Pvt. Ltd., 2009.
11. DNA Technology in Forensic Sciences", National Research Council, National Academy Press, 1997.
12. Alcamo I Edward. DNA Technology. Harcourt Academic Press, 1999.
13. T. Burke, Terry. DNA Fingerprinting: Approaches and Applications. BirkhauserVerlage, 1999.
14. J. Thomas Mcclintock. Forensic DNA Analysis. Lewis Publications, 2008.

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Forensic Botany, Microbiology and Entomology)		**L**	**T**	**P**	
3. Course Code	17050311		0	0	3	
4. Type of Course (use tick mark)		**Core (✓)**	**DSE ()**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

This course provides students the practical knowledge of botanical evidence along with their forensic significance, Forensic analysis of Diatoms as evidence in Drowning cases, study of microbes and identification/ comparison of Pug marks of various animals will also be performed.

9. Course Objectives

1. To perform microscopic identification of Pollen grains.
2. To extract and observe diatoms from different waterbodies.
3. To Study and compare hair of human and various wild animals.
4. To understand life cycle of entomologically important insects along with Pug marks of various animals.

10. Course Outcomes (COs)

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

1. Extract and observe Diatoms from different waterbodies.
2. Perform microscopic identification of Pollen grains.
3. Examine and compare hair samples and pug marksof various animals.
4. Studythe life cycle of blow fly and other insects of forensic relevance.

11. List of experiments

1. Forensic analysis of botanical evidences.
2. Extraction of Diatoms from different water samples.
3. Comparative analysis of Diatoms.
4. Microscopic identification of Pollen grains.
5. To study life cycle of blowfly.
6. Study of general microbes.
7. Study hair of wild animals.
8. Identification of Pug marks of various animals.

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Forensic Biology and Serology		**L**	**T**	**P**	
3. Course Code	17050312		0	0	3	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ()**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 0		**Tutorials = 0**		**Practical = 40**		

8. Course Description

This course provides students the practical knowledge of various biological evidences along with their forensic significance. The students will also be able to perform blood grouping of body fluids and use various serological techniques for examination of evidence.

9. Course Objectives

1. To observe and compare human hair with animal hair
2. To perform various tests on blood along with blood grouping an
3. To perform various tests used for analysis of various other body fluids.
4. To gain practical knowledge about various serological techniques.

10. Course Outcomes (COs)

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

1. Observe and compare human hair with animal hairExamine human hair.
2. Identify blood stains and other body fluids.
3. Determine blood group from stains of blood and other body fluids.
4. Perform precipitin test for species of origin determination.

11. List of experiments

1. To prepare slides of scale patterns of human hair.
2. To examine human hair for cortex and medulla.
3. To determine blood group from fresh blood and blood stains.
4. To identify blood stains.
5. To identify semen stains.
6. To identify saliva stains.
7. To perform precipitin test for species of origin determination.
8. To perform Immunodiffusion test for species of origin.
9. To determine blood group from stains of blood and various body fluids with Absorption-inhibition, mixed agglutination and absorption-elution technique

12. Books Recommended

1. DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Ballistics		**L**	**T**	**P**	
3. Course Code	17050313		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This course provides students the knowledge of Ballistic evidence (Firearms and Ammunition) along with their forensic significance. Core concepts of internal, external, terminal ballistics and instrumental techniques used in in forensic ballistics will also be discussed.

9. Course Objectives

1. To understand about the working of different firearms and composition of ammunition.
2. To understand concept of Internal, External and terminal Ballistics.
3. To understand the concept and principles of determination of direction and range of fire.
4. To learn use of comparison microscope in Forensic Ballistics.

10. Course Outcomes (COs)

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

1. Understand the working of different firearms and composition of ammunition and bullet trajectory.
2. Explain Internal, External and terminal Ballistics.
3. Determine direction and range of fire.
4. Use comparison microscope for analysis of evidence related to Forensic Ballistics.

11. Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Firearms and Ammunition

Firearms: Definition, Breech Loader and Muzzle loader (Match lock, Wheel lock, Snaphaunce, Flint lock, Percussion), Smooth bore (Shotgun) and Rifled firearms, (Revolver, Pistol and Rifles), Briefs of Indian Arms Act, Country Made/Improvised Firearms, Illegal firearms: AK-47, SKS and M16/AR15 Assault Rifles 47, SKS and M16/AR15 Assault Rifles, Proof Marks of weapons.

Ammunition: A Brief History of Ammunition, Types of ammunition- classification and constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, velocity and pressure characteristics under different conditions, various types of bullet and compositional aspects.

Unit - 2	**Number of lectures = 10**	**Title of the unit:** Internal Ballistics/External Ballistics

Internal Ballistics: Definition, Ignition of the propellant, Shapes of Propellants, Manner of the propellant burning, Piobert's law, Pressure space curve, Shot Start Pressure, All Burnt Point, Velocity, Le Du's formula, Muzzle velocity, various factors affecting the internal ballistics: lock time, barrel time, erosion, corrosion and gas cutting, equation of motion of projectile, Density of loading, Heat problems, Vibration & jump, Measurement of strength of firearm, projectile velocity

determination, theory of recoil, methods for measurement of recoil.

External Ballistics: Bullet Drop in the flight, Use of sight to compensate for bullet drop, Influence of Earth on Trajectory, Angle of Fall, Ballistic Coefficient and Air resistance base drag, Sectional Density, Brief introduction to Terminal velocity, Maximum effective range, Drift, Yaw, Precession, Nutation, Terminal velocity, Ballistics tables, measurements of trajectory parameters, Escape velocity & Ricochet.

Unit – 3	**Number of lectures = 10**	**Title of the unit:** Terminal Ballistics and Determination of Range of Fire

Terminal Ballistics: Definition, Effect of projectile on hitting the target: function of Bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, Brief introduction to Cavitations (Temporary and Permanent), Ricochet and its effects, stopping power. **Wound Ballistics** (Firearm injuries): Ballistic aspect of firearm injuries, Mechanism of firearm injuries (Lacerations and Shockwaves etc.), Threshold velocity for penetration of skin/flesh/bones, preparation of gel block, penetrative in gel block and other targets, Bullet Entry/Exit Hole Identification, Evaluation of Accident, Suicide, murder and self-defense firearm injuries, explosive wounds, evaluation of injuries caused due to shot-gun, rifle, handguns and country made firearms, methods of measurements of wound ballistics parameters, post-mortem and anti-mortem firearm injuries.

Determination of Range of Fire: burning, scorching, blackening, tattooing and metal fouling shots dispersion and GSR distribution, time offering different method employed, and their limitations, Bullet recovery, time of firing. Gunshot Residues/ Powder Residues: Composition of GSR depending upon propellants & primer mixtures, GSR Distribution, Mechanism of formation of GSR, Location, source and collection of GSR, Analysis of GSR: spot test, chemical test, identification of shooter and instrumental techniques involved of GSR Analysis, Practical problems related with GSR detections.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Instrumental techniques

Identification of origin: ammunition and their components, different types of marks produced during firing process on cartridge- firing pin marks, breech face marks, chamber marks, extractor and ejector marks band on bullet- number/ direction of lands and grooves, striation marks on lands and grooves, identification of various parts of firearms, techniques for obtaining test material from various types of weapons and their linkage with fired ammunition, class and individual characteristics.

Instrumental techniques used for ballistic evidence analysis: Boroscope, Comparison Microscope, Stereo microscope, traveling microscope, Neutron Activation analysis, Flameless AAS, Scanning Electron microscope, EDXRF. Introduction to automated system of trajectory computation **(Ballistic Data Acquisition system)**: Operating system & its concepts, Universal Receiver, ICM, Target Frame. Automated management of ballistics data **(**NIBIN and IBIS), History of establishment, Brass Trax, Bullet Trax& Match Point, Limitation & Advantages, Applications.

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

1. https://www.youtube.com/watch?v=DdJp4pNCCGc&list=PL_a1TI5CC9RG-FKGJjudKGGC6CZWPnCht
2. https://www.youtube.com/watch?v=FR3aZZvl4zQ

3. https://www.youtube.com/watch?v=Jd3o1nuvcrI
4. https://www.youtube.com/watch?v=cLFXlk0kheg
5. https://www.youtube.com/watch?v=n48YDEFTUw0
6. https://www.youtube.com/watch?v=rUelXd2j2pM
7. https://www.youtube.com/watch?v=vCcgkJf6DoA
8. https://www.youtube.com/watch?v=cKrQoDWpVgU
9. https://www.youtube.com/watch?v=R9oeWjgI8hE
10. https://www.youtube.com/watch?v=JjiT4zrQnzw

13. Books Recommended

1. Hatcher Jury & Weller. Firearm Investigation Identification and Evidence. The University Book Agency, Allahabad, 1987.
2. Jauhri, M. Monograpnh on Forensic Ballistics. Govt. of India Publication, New Delhi, 1980.
3. Sharma, B.R. Firearms in Criminal Investigation and Trails, 1990.
4. Dimado. Gunshot Wounds, 1987.
5. Kumar. Forensic Ballistics in Criminal Justice, 1987.
6. Brian J. Handbook of Firearm and Ballistics Examination and Interpretation Forensic Evidence, 2008.
7. James Smyth Wallace. Chemical Analysis of Firearms, Ammunition, and Gunshot Residue, 2008.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Physics		**L**	**T**	**P**	
3. Course Code	17050314		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
This course provides students the knowledge about basic concepts of forensic physics, various physical evidence encountered at the crime scene. It will also deal with the concept and importance of voice as evidence, voice and tape authentication.						
9. Course Objectives						
1. To understand the basics of Forensic Physics. 2. To understand about the role of Physical Evidences in Forensic Physics. 3. To understand the characterization and examination of Voice. 4. To demonstrate the procedure of authentication of voice/tape evidence.						
10. Course Outcomes (COs)						
Upon successful completion of this course, students will be able to: 1. Describe the basics of Forensic Physics. 2. Understand the role of physical evidence in Forensic Physics. 3. Characterization and examination of voice as evidence. 4. Analyze and establish the authenticity of voice/tape evidence						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 10**	**Title of the unit:** Introduction to Forensic Physics				
Introduction to Forensic Physics: Nature, collection, preservation & forwarding of physical evidence for scientific examinations. **Forensic Engineering:** Forensic engineering, Fire investigation, Industrial accidents, Traffic accident reconstruction, Transportation disaster investigation, Civil engineering investigation, Investigation report. **Building Materials**: Types of cement and their composition, Determination of adulterants, Analysis of Bitumen and road material, Analysis of cement mortar and cement concrete and stones. Forensic examination of electrical appliances/installations. **Road Accidents**: Examination of scene, Filaments examination, Examination of skid marks.						
Unit - 2	**Number of lectures =10**	**Title of the unit:** Physical Evidences I				
Glass: Types of glass and their composition, Glass fracture analysis, Laboratory exercises include refractive index measurements using immersion methods and classical chemical and physical methods of analysis. **Soil**: Formation and types of soil, Composition and color of soil, Forensic examination of soil, Interpretation of soil evidence. **Paints:** Types of paint and their composition, Forensic examination of paints, Interpretation of paint evidence.						
Unit – 3	**Number of lectures = 10**	**Title of the unit:** Physical Evidences II				
Tool Marks: Types of tool marks, Class characteristics and individual characteristics, Lifting of tool marks, Examination. **Resuscitation of Obliterated Numbers in Metal Surfaces:** Theoretical and practical aspects of resuscitation. **Fiber analysis:** Forensic significance, Classification, Textile Fibers, Yarns, Fabric construction, Fabric characteristics, Microscopy characteristic,						

Birefringence, Fluorescence Microscopy, Colors in textile, Color Assessment, Chemical properties, **Miscellaneous Clue Materials-** Examination of strings/ropes, Wires/cables, Seals, Counterfeit coins.		
Unit – 4	**Number of lectures = 10**	**Title of the unit:** Voice/Tape Authentication
Voice/Tape Authentication: Introduction to human Voice, Nature of voice and production of speech, perception of voice and speech, speech signal processing & pattern recognition basic factor of sound in speech acoustic characteristics of speech signal, **Voice as Evidence:** Collection of evidence, Quality of evidence, type of evidence, speaker variability and simulation, Transmission and channel distortion, admissibility. Analysis of audio & video signal for authenticity, Introduction to the technique of pattern recognition and comparison. Speaker recognition and types of speaker recognition, procedures and methods, feature extraction and comparison, Speaker recognition by Listening (SRL), speaker recognition by visual comparison of spectrograms (SRS), Automatic speaker recognition (ASR), Interpretation of results. Recent Development of Computerized Speech Laboratory, Legal Aspects. Speaker profiling, Intelligibility Enhancement of audio recording, Transcription and analysis of disputed utterances, Authenticity and integrity examination of audio recordings. Difficulties in Forensic Voice comparison. Preparation of Forensic Voice comparison reports.		

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

1. https://www.youtube.com/watch?v=_6WWV500q9E
2. https://www.youtube.com/watch?v=PKMib2ekIB0&list=PL_a1TI5CC9RGSHyj3rX2HsQtkmYMdMgmQ
3. https://www.youtube.com/watch?v=scP7L6rgovk
4. https://www.youtube.com/watch?v=I0drf6ZGxXQ
5. https://www.youtube.com/watch?v=lZSbczLjoc8
6. https://www.youtube.com/watch?v=4eSC1ss649E
7. https://www.youtube.com/watch?v=vIKzKuy8Duo
8. https://www.youtube.com/watch?v=vVpli5vWo74
9. https://www.youtube.com/watch?v=P_XLY8mHeNQ

13. Books Recommended

1. Robertson J, Roux C, Wiggin GK, Grieve M Forensic Examination of Fibres (2nd Edn). CRC Press, 1999.
2. Noon RK. Forensic Engineering Investigation (2nd Edn). CRC Press, 2000.
3. Van Kirk DJ. Vehicular Accident investigation and reconstruction. CRC Press, 2000.
4. JA Siegel, P.J Saukko. Encyclopedia of Forensic Sciences (Vol. I, II and III). Academic Press, 2000.
5. Sharma BR. Forensic Science in Criminal Investigation and Trials. Central Law Agency, Allahabad, 1974.
6. Saferstein R. Criminalistics, Prentice Hall Inc. USA, 2000.

1. Name of the Department: Forensic Science						
2. Course Name	Advanced Fingerprint and Questioned Document Examination		**L**	**T**	**P**	
3. Course Code	17050315		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course will explain various terminologies, history and various classification system used in fingerprinting. It also focuses on observation of different ridge characteristics, its examination, comparison of handwriting and signature specimens as well as paper and ink examination.

9. Course Objectives

1. To introduce students about the various terminologies, history and various classification system used in fingerprinting.
2. To identify and compare the fingerprints on the basis of different ridge characteristics.
3. To gain knowledge of questioned document examination.
4. To understand the concept of paper and ink examination.

10. Course Outcomes (COs)

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

1. Utilize various terminologies, history and various classification system used in fingerprinting.
2. Identify and compare the fingerprints on the basis of different ridge characteristics.
3. Compare and handwriting and signature specimens.
4. Analyze paper and ink samples

11.Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** Fingerprint Detection Techniques

Optical Detection Techniques- Absorption, Luminescence, Diffused Reflection, Ultraviolet Imaging.
Detection Techniques for Porous Surfaces: Ninhydrin, Ninhydrin Analogs, Diazafluorenone (DFO), Physical Developer, Multimetal Deposition (MMD), Recommended Detection Sequence.
Detection Techniques for Nonporous Surfaces: Fingerprint Powders, Small-Particle Reagent, Cyanoacrylate Fuming, Vacuum Metal Deposition (VMD).
Miscellaneous Techniques for Latent Fingermark Detection: Iodine/Benzoflavone, Dimethylaminocinnamaldehyde (DMAC), Osmium Tetroxide (OsO) and Ruthenium Tetroxide (RTX), Silver Nitrate.
Fingermark Detection on Semi porous Surfaces: Fingermark Detection on Human Skin, Powdering, Transfer Techniques, Physio-Chemical Methods.
Fingermark Detection on Adhesive Surfaces: Gentian Violet, Sticky-Side Powder, Cyanoacrylate Fuming.

Fingermark Detection on Firearms and Cartridge Cases, Enhancement of Fingermarks in Blood, Optical Techniques, Protein Stains, Diaminobenzidine (DAB), AFIS: Introduction, Importance, Structure and Techniques, Search possibilities, Live scan, worldwide Status and Networking.		
Unit – 2	**Number of lectures = 10**	**Title of the unit:** The purpose and complexities of Handwriting examination
The Purposes and complexities in Examination: Comparison of Handwriting, Consideration of Similarities, The Possibility of Chance Match, The Possibility of Simulation, Subjectivity, Identification, Qualified Conclusions, Limited Populations, Consideration of Differences, Consistent Differences, Other Reasons for Differences, Similarities with Differences, Disguise, Simulation, Identification of the Writer of Simulations, Inconclusive Examinations, Complexities of Handwriting Comparisons, Inconsistent Known Writings, Multiple Suspects, Reproduced Writing, Unfamiliar Scripts, Statements, Expressing Conclusions, Qualified Conclusions, Scales of Conclusions, Clarity of Expression, Quality Assurance, Variety of Forms in Handwriting.		
Unit – 3	**Number of lectures = 10**	**Title of the unit:** Handwriting Examination
Handwriting Analysis: Accidental Variation of Handwriting, Writing Instruments, Writing Position, Effect of Health of Writer, Guided Hand Signatures, Effect of Drugs and Alcohol on handwriting , Deliberate Variation of Handwriting, Disguised Writings, Difficulties of Disguising Writing, Disguised Signatures, Simulated Writings, Freehand Simulation, Slowly Made Simulations, Simulations of Poorly Made Signatures, Rapidly Made Simulations, Traced Signatures, Introduction of Features of the Copier, Digital signature/writings and examination: Forensic stylistics, Forensic linguistics, e-documents, digital signatures, Examination of fake rubber stamps and seals, Examination of printed and photocopied documents		
Unit 4	**No. of Lectures = 10**	**Title of the unit:** Examination of paper and ink
Examination of Paper: Types of Paper, Manufacture of Paper, Paper gsm, Testing of Paper, Nondestructive Tests, Destructive Tests, Comparison of Paper, Mechanical Fits, Watermarks, Dating of Paper, Envelopes, Writing Materials, Pencils, Inks, Liquid Inks, Ball-Point Inks, Fiber Tipped, Roller Ball, and Gel Pens. Examination of Inks: Visual Examination, Examination of Color, Absorption Spectra and the Examination of Inks, Ultraviolet and Infrared Radiation, Detection of Infrared Radiation, Infrared Absorption, Ultraviolet Fluorescence, Infrared Luminescence, Comparison of Inks Using Infrared Luminescence, Erasures, Obliterations, Other Luminescence Effects, Destructive Techniques, Chromatography, Thin-Layer Chromatography, High-Performance Liquid Chromatography, Chemical Tests, Other Components of Ink, Further Techniques, Relative Aging of Ball-Point Inks, Dating of Inks.		

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

1. https://www.youtube.com/watch?v=oMrsXZAOSbA
2. https://www.youtube.com/watch?v=D6_SxRDs3Bg
3. https://www.youtube.com/watch?v=MBMVKv12zNQ
4. https://www.youtube.com/watch?v=Zc0yGQbL9qY
5. https://www.youtube.com/watch?v=tIZTScph0lM
6. https://www.youtube.com/watch?v=NNZCN5e2rD0
7. https://www.youtube.com/watch?v=AxubbuQJ9LU
8. https://www.youtube.com/watch?v=emCPoUKNQ0E

9. https://www.youtube.com/watch?v=4iCBLgMEoNM
10. https://www.youtube.com/watch?v=Wxc-ike51k0
11. https://www.youtube.com/watch?v=34JxLDoF6kM
12. https://www.youtube.com/watch?v=-x5S4X9mhMM
13. https://www.youtube.com/watch?v=p9bmGt1_Pxo

13.Books Recommended

1. Saferstein R. Criminalistics, Prentice Hall, New York, 1990.
2. David R. Ashbaugh. Quantitative and Qualitative Friction Ridge Analysis, CRC Press, 1999.
3. Roland Menzel. Fingerprint Detection with Lasers, 2nd Ed., Marcel Dekker, Inc. USA, 1999.
4. James F. Cowger. Friction Ridge skin, CRC Press London, 1993.
5. Mehta MK. Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi Pub. Bombay, 1980.
6. Chatterjee SK. Speculation in Finger Print Identification, Jantralekha Printing Works, Kolkata, 1981.
7. Cowger James F. Friction ridge skin- Comparison and Identification of fingerprints, CRC Press, NY, 1993.
8. JA Siegel, PJ Saukko. Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press, 2000.
9. Huber AR. and Headrick, A.M. Handwriting Identification: Facts and Fundamentals CRC LLC, 1999.
10. Ellen D. The scientific examination of Documents, Methods and techniques. 2nd ed., Taylor & Francis Ltd., 1997.
11. Morris. Forensic Handwriting Identification (fundamental concepts and Principles), 2000.
12. Harrison W.R Suspect Documents & their Scientific Examination, Sweet & Maxwell Ltd., London, 1966.
13. Hilton O. The Scientific Examination of Questioned Document, Elsevier North Holland Inc., New York, 1982.
14. Mehta MK. The identification of Handwriting & Cross Examination of Experts, N.M. Tripathi, Allahabad., 1970.
15. Saxena BL. Saxena's Law & Techniques Relating to Finger Prints, Foot Prints & Detection of Forgery, Central Law Agency, Allahabad, 1968.
16. Osborn AS. Questioned Documents, Boyd Printing Co., Chicago, 1929

1. Name of the Department: Forensic Science						
2. Course Name	Computer and Cyber Forensics		**L**	**T**	**P**	
3. Course Code	17050316		3	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even (✓)	Odd ( )	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		
8. Course Description						
This course will explain about the advance aspects of Digital Evidence, forensic tools like EnCase, SIMMI and FTK for retrieval of digital data from laptops, PCs and other storage devices. It will also describe the concept of cyberspace, encryption, and the process of Seizure of computers.						
9. Course Objectives						
1. To introduce about the aspects of Digital Evidence, collection and preservation of retrieved data. 2. To explain forensic tools like EnCase, SIMMI and FTK for retrieval of digital data from laptops, PCs and other storage devices etc. 3. To describe the concept of cyberspace, cryptography, encryption and their breakdown. 4. To learn about the process of Seizure of computers.						
10. Course Outcomes (COs)						
Upon successful completion of this course, the students will be able to: 1. Know the aspects of Digital Evidence and to apply the knowledge in the proper collection, preservation of electronic data. 2. Understand the working of cyber forensic tools like EnCase, SIMMI and FTK for retrieval of digital data from laptops, PCs and other storage devices etc. 3. Explain and apply the concept of cyberspace, cryptography, encryption and their breakdown. 4. Learn the process of seizure of computers.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 10**	**Title of the unit:** Digital Evidence & Cryptography				
Digital Evidence: Introduction to digital evidence, computer image verification and authentication, digital image watermarking and its application in forensic science, Various techniques for digital watermarking, Recovery of deleted files, The significance and determination of the creation date and time. **Security using Cryptography:** Introduction, types of Cryptography, different types of ciphers like caeser cipher, mono alphabetic cipher, polyalphabetic cipher etc.						
Unit - 2	**Number of lectures = 10**	**Title of the unit:** Seizure of computers& Investigative Techniques				
Seizure of computers: Preparations before seizure, Actions at the scene, Treatment of exhibits, bitstream (exact copies) of the original media, establishing a case in computer forensics,						

Computer forensic analysis within the forensic tradition.

Extraction of information from electronic devices. Instruction on the acquisition, collection and seizure of magnetic media.

Unit – 3	**Number of lectures = 10**	**Title of the unit:** Computer Forensic Procedures

Secure boot, write blockers and forensic platforms. Disk file organization, Disk and file imaging and analysis, File deletion, media sanitization, Mobile telephones, PDAs, Discovery of electronic evidence, Forensic tools, EnCase. ILook Investigator, CFIT, Emerging procedures and standards, Seizure and analysis of electronic evidence.

Unit – 4	**Number of lectures = 10**	**Title of the unit:** Cyber-crimes

Cyber-crimes and related offences and penalties: Introduction to Cybercrimes, Classification of cybercrimes, Distinction between cyber-crime and conventional crimes, Reasons for commission of cyber-crime, Kinds of cyber-crimes – cyber stalking; cyber pornography; forgery and fraud; crime related to IPRs; Cyber terrorism; Spamming, Phishing, Privacy and National Security in Cyberspace, Cyber Defamation and hate speech, computer vandalism etc. Relevant provisions under Information Technology Act, 2000, Indian Penal Code, 1860. Jurisdictional challenges in cyberspace, Investigation challenges in cyberspace, Emerging trends in Information Technology Act, 2000, Need to regulate internet, country specific cyber laws, Legal recognition of electronic records and digital signature, measures to adapt electronic governance, inadequacy in IT act.

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

1. https://www.youtube.com/watch?v=taladDGFgKM
2. https://www.youtube.com/watch?v=23oYYMrvAsk
3. https://www.youtube.com/watch?v=3HlBMkbpy08
4. https://www.youtube.com/watch?v=znMfR9-gh00
5. https://www.youtube.com/watch?v=Ru40McibYps
6. https://www.youtube.com/watch?v=1jSskncNBg4
7. https://www.youtube.com/watch?v=Tc1DkPJ8Z5g
8. https://www.youtube.com/watch?v=dnobtsHaSvI
9. https://www.youtube.com/watch?v=BOW27J30SBI
10. https://www.youtube.com/watch?v=7TiQmxww32I
11. https://www.youtube.com/watch?v=QHYg7iRD4M8
12. https://www.youtube.com/watch?v=YnremD-FXoA&list=PL_a1TI5CC9RHnkphHgvbRM8zfGijpLe8L

13. Books Recommended

1. Nathan Clarke. Computer Forensics: A Pocket Guide (1st edn). IT Governance Publishing, 2010.
2. Eoghan Casey. Handbook of Computer Crime Investigation: Forensic Tools and Technology (1st edn). Academic Press, 2001.

3. Marjie T. Britz. Computer Forensics and Cyber Crime: An Introduction. Prentice Hall, 2003.
4. Linda Volonino, Reynaldo Anzaldua. Computer Forensics for Dummies. For Dummies, 2008.
5. Eoghan Casey. Handbook of Digital Forensics and Investigation (1st edn). Academic Press, 2009.
6. Warren G. Kruse II, Jay G. Heiser. Computer Forensics: Incident Response Essentials (1st edn). Addison-Wesley Professional, 2001
7. Robert C. Newman. Computer Forensics: Evidence, Collection and Management (1st edn). Auerbach Publications, 2007.
8. Michael A. Caloyannides. Computer Forensics and Privacy. Artech House Publishers, 2001.
9. Tewari RK, Sastry PK Ravikumar KV. Computer Crime & Computer Forensics. Selected Publisher, 2003.
10. **Britz.** Computer Forensics and Cyber Crime: An Introduction (2nd edn). Pearson Education India, 2011.

1. Name of the Department: Forensic Science						
2. Course Name	Practical – Elements of Forensic Ballistics and Physics		**L**	**T**	**P**	
3. Course Code	17050317		0	0	3	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ()**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ()
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 40		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course provides practical training to the students to identify and compare ballistics evidences. Mechanism of common firearms, and country made firearms. It also offers the students a practical knowledge of Physical examination of paint chips, Soil and Glass along with the study of Blood stain patterns, and examination of Voices.

9. Course Objectives

The objectives of this course are:

1. To study, identify and compare various ballistics evidences.
2. To explain the mechanism of common firearms.
3. To determine the soil density, and to study the physical examination of paint chips, and glass evidence.
4. To Study of Bloodstain patterns and their forensic significances.
5. Examination of Voice by using of Instrumental techniques.

10. Course Outcomes (COs)

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

1. Identify, examine, and compare different types of ballistic evidences including cartridge cases and bullets.
2. Understand the working and functioning of modern firearms.
3. Apply the practical knowledge of Forensic Physics for the examination of various evidences like soil, glass, and paint as evidence on crime scene.
4. To analyze and interpret various types blood spatters at the scene of crime practically.
5. Examine the voice prints using various software and techniques.

11. List of Experiments

1. Study the characteristic features of identification of modern firearms (Revolver, Pistol and Rifles).
2. Examine and identify the bullets and the cartridge cases.
3. Study the shotgun ammunition and certain types of propellant charges.
4. Determine the range of firing on the basis of GSR and other parameters.
5. Chemical test for GSR.

6. Determination of soil density by density gradient tube techniques.
7. Comparison of paint chips.
8. Examination and Comparison of glass evidence.
9. Bloodstain pattern analysis.
10. Voice examination by using of Instrumental techniques.

12. Books Recommended

1. Hatcher Jury & Weller: Firearm Investigation Identification and Evidence, The University Book Agency, Allahabad, 1987.
2. Jauhri M: Monograpnh on Forensic Ballistics, Govt. of India Publication, New Delhi, 1980.
3. Burrad: The Identification of Firearms and Forensic Ballistics.
4. Saferstein R. Criminalistics, Prentice Hall Inc. USA, 2000.
5. DFSS, CFSL and SFSL Manuals.

1. Name of the Department: Forensic Science						
2. Course Name	Practical (Advanced Fingerprints and Questioned Document Examination/Computer and Cyber Forensic		L	T	P	
3. Course Code	17050318		0	0	3	
4. Type of Course (use tick mark)		Core ( )	DSE (✓)		SEC ( )	
5. Pre-requisite (if any)	B. Sc.	6. Frequency (use tick marks)	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 0		Tutorials = 0		Practical = 52		

8. Course Description

The practical course emphasizes on learning of basic skills helpful during document and cyber related evidence analysis. It includes comparison of handwriting found on different surfaces, Finger mark detection on Porous/non-porous/adhesive surfaces, Examination of Paper, Examination of Inks, Comparison of Inks and Examination of scripts. This course also focuses on Acquisition and Preservation of Volatile data from standalone computer, Imaging of data storage media devices, Recovery of deleted files and folders, Password recovery of encrypted files and folders and Collection of evidences from mobile devices.

9. Course Objectives

1. To understand the collection, developments and comparison of Fingerprints
2. To compare Handwriting, ink and paper samples using various tools and techniques
3. To perform data and password recovery
4. To perform collect and analyse various evidence related to computer and cyber forensics.

10. Course Outcomes (COs)

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

1. Collect, develop and compare fingerprints
2. Examine and compare Handwriting, ink and paper samples using various tools and techniques
3. Perform data and password recovery
4. To perform collect and analyse various evidence related to computer and cyber forensics.

11. List of experiments

1. Finger mark detection on Porous/non-porous/adhesive surfaces.
2. Comparison of Handwriting written on different surfaces.
3. Examination and comparison of Paper.
4. Examination and comparison of Inks.
5. Recovery of deleted files and folders.
6. Password recovery of encrypted files and folders.
7. Tracking the source of emails.
8. Collection of evidences from mobile devices.
9. Collection and analysis of evidences from Social Media.

12. Books Recommended

DFSS, CFSL and SFSL Manuals.

1. Name of the Department : Forensic science						
2. Course Name	Forensic Psychology		**L**	**T**	**P**	
3. Course Code	17050319		2	0	0	
4. Type of Course (use tick mark)		**Core ()**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practicals						
Lectures = 26		**Tutorials = Nil**		**Practical = Nil**		

8. Course Description

This course provides an excellent opportunity to learn about basic principles of different instrumentation used in Forensic Psychology lab. This course also emphasizes on applications and functioning of Polygraph, Brain Mapping and Narco test, legal aspects and ethics of forensic psychology.

9. Course Objectives

1. To understand the basic principles of different instrumentation used in Forensic Psychology lab.
2. To demonstrate the use of psychological assessment in criminal behavior.
3. To describe functioning of Polygraph, Brain Mapping and Narco test.
4. To understand the legal aspects and ethics of forensic psychology.

10. Course Outcomes (COs)

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

1. Explore their expertise in forensic psychology.
2. Use psychological assessment in understanding the criminal behavior.
3. Describe functioning of Polygraph, BEOS and Narco test.
4. Create awareness about the legal aspects and ethics of forensic psychology.

11. Unit wise detailed content

Unit-1	**Number of lectures = 7**	**Title of the unit:** Basics of Forensic Psychology

Basics: Forensic Psychology and the Law, Ethical Issues in Forensic Psychology, Civil and criminal case assessment, Assessing mental competency, Mental disorders and Forensic Psychology, Eye witness testimony, Criminal profiling- need and types, Forensic Scientific evidence, Crime and Psychopathology, Genetics and Crime, Serial murders, Modus Operandi

Unit-2	**Number of lectures = 7**	**Title of the unit:** Narco-Analysis/ Brain Mapping

Narco-Analysis: Historical aspects, Principle and Theory, General Procedure –Legal and Ethical aspects, Human rights of individual. **Brain Electrical Oscillation Signature (BEOS) Profiling:** Principle and Theory, General Procedure –Legal and Ethical aspects, Human rights of individual

Unit – 3	**Number of lectures = 6**	**Title of the unit:** Polygraph

Polygraph: Historical aspects of Polygraph, Principles of polygraph, psycho physiological aspects, operational aspects, Question formulation techniques, Interviewing technique

procedure, The Art-Polygraph, Legal and Ethical aspects, Human rights of individual		
Unit – 4	**Number of lectures = 6**	**Title of the unit:** Psychological Assessment
Psychological Assessment: Psychological Assessment Tools, Detection of deception, Various methods for detection of deception, Interview, Non-verbal detection, statement assessment, Hypnosis, Psychological assessment, voice stress analyzer, Polygraph, thermal imaging, Brain Electrical Oscillation Signature Profiling, Functional Magnetic Resonance study, Current research in detection of deception/truth finding mechanisms.		

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

1. https://www.youtube.com/watch?v=PJS-dXzBthQ
2. https://www.youtube.com/watch?v=TtalCPxPY3Y
3. https://www.youtube.com/watch?v=0yqLGILVUKA
4. https://www.youtube.com/watch?v=p6HTdF6DcWg
5. https://www.youtube.com/watch?v=33tPtKKAsFY
6. https://www.youtube.com/watch?v=m3freAae6lw&list=PL_a1TI5CC9RGtlqwm2AbTi7IWpeENpJ__
7. https://www.youtube.com/watch?v=6UJAQTd21mc
8. https://www.youtube.com/watch?v=yrEPFUbLcOY
9. https://www.studocu.com/en/document/university-of-sydney/psychology-1001/lecture-notes/lecture-notes-lectures-all-forensic-psychology/309791/view
10. https://shodhganga.inflibnet.ac.in/bitstream/10603/102549/9/09_chapter%202.pdf
11. http://www.legalserviceindia.com/article/l410-Narco-Analysis.html

13. Books Recommended

1. AldertVrij. Detecting Lies and Deceit: Pitfalls and Opportunities (2nd ed). Wiley, 2008.
2. Brent Turvey. Criminal profiling: An Introduction to Behavioral Evidence Analysis. Academic Press, 2011.
3. C.R. Mukundan. Brain Experience: Neuroexperiential Perspectives of Brain-Mind. Atlantic Publishers & Distributors (P) Ltd., 2007.
4. David A. Crighton& Graham J. Towl. Forensic Psychology (2nd ed).. Wiley, 2015.
5. Irving B. Weiner & Randy K. Otto. The Handbook of Forensic Psychology (4th ed). Wiley, 2013.
6. Murray Kleiner. Handbook of Polygraph testing (1st ed). Academic Press, 2001.
7. Nathan J. Gordon. Essentials of Polygraph and Polygraph testing (1st ed). CRC Press, 2016.
8. Sandie Taylor. Forensic PsychologyThe Basics. Routledge, 2015.
9. William O' Donohue & Eric Levensky. Handbook of Forensic Psychology (1st ed). Academic Press, 2003.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic Biology and Serology		**L**	**T**	**P**	
3. Course Code	17050320		2	0	0	
4. Type of Course (use tick mark)		**Core ( )**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 26		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course provides students the knowledge of biological evidences (body fluids) along with their forensic significance. basic concepts of forensic entomology, wildlife in the field of forensic science, blood grouping and serological techniques will also be discussed.

9. Course Objectives

1. To understand the concept of biological evidences along with their forensic significance.
2. To understand the Forensic significance of Entomological evidence
3. To understand the relevance wildlife and related evidence in the field of Forensic Science.
4. To demonstrate the importance and procedure of various tests and DNA analysis for different biological evidence.

10. Course Outcomes (COs)

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

1. Understand the importance of biological fluids (blood, semen, saliva and other body fluids) in crime investigations.
2. Explain the Forensic significance of Entomological evidence in Forensic Science.
3. Describe the importance of wildlife in the field of Forensic Science.
4. Perform and demonstrate various tests and DNA analysis for biological evidence.

11. Unit wise detailed content

Unit-1	**Number of lectures = 7**	**Title of the unit:** Biological Evidences: Hair

Biological evidence. Importance, nature, location, collection and evaluation of biological evidence, **Forensic Hair characterization**: Morphology and types, their importance, nature, location, collection, evaluation and tests for their identification: Species of origin, variation in different major population groups, somatic origin.

Unit-2	**Number of lectures = 7**	**Title of the unit:** Biological Evidences: Body fluids

Blood and blood groups. Forensic characterization of bloodstains. Bloodstain patterns. Forensic significance of semen, saliva, sweat, milk and urine. Methods of Individualization: Blood grouping and DNA typing. Scientific basis of DNA typing. Collection of DNA evidence. Applications of DNA typing in criminal and civil cases

Unit –3	**Number of lectures = 6**	**Title of the unit:** Forensic entomology

Forensic entomology: Insects of forensic importance. Collection of entomological evidence during death investigations. Forensic application of Entomology and Entomotoxicological evidences

Unit –4	**Number of lectures = 6**	**Title of the unit: W**ildlife forensic

WildLife Forensics: Introduction, importance, protected and endangered species of Animals

and Plants. Identification of wildlife materials such as skin, fur, bones, nails, horn, teeth by conventional and modern methods

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

1. https://www.youtube.com/watch?v=wJJMmiu_ZKQ
2. https://www.youtube.com/watch?v=tzBwcDSqPwg
3. https://www.youtube.com/watch?v=49gSR3GSZxk
4. https://www.youtube.com/watch?v=IeJM9DLaiMc
5. https://www.youtube.com/watch?v=22G58sDSRPA
6. https://www.youtube.com/watch?v=8iqqw96bFlI
7. https://swayam.gov.in/courses/264-forensic-biology-and-serology
8. http://www.forensicpage.com/new26.htm
9. https://www.fbi.gov/file-repository/handbook-of-forensic-services-pdf.pdf/view

13. Books Recommended

1. Robertson J. Forensic Examination of Hair. Taylor and Francis, USA, 1996.
2. Jeffery Keith Tomberlin, M. Eric Benbow. Forensic Entomology: International Dimensions and Frontiers (1st Edn) CRC Press, 2015.
3. Jason H. Byrd. Forensic Entomology: The Utility of Arthropods in Legal Investigations (2nd Edn). CRC Press, 2009.
4. David B. Rivers, Gregory A. Dahlem. The Science of Forensic Entomology (1st Edn). Wiley-Blackwell, 2014.
5. Dorothy Gennard. Forensic Entomology: An Introduction (2nd Edn). Wiley-Blackwell, 2012.
6. J. E. Cooper, Margaret E. Cooper. Wildlife Forensic Investigation: Principles and Practice. CRC Press, 2013.

1. Name of the Department: Forensic Science						
2. Course Name	Forensic chemistry and Toxicology		**L**	**T**	**P**	
3. Course Code	17050321		2	0	0	
4. Type of Course (use tick mark)		**Core ( )**	**DSE (✓)**		**SEC ( )**	
5. Pre-requisite (if any)	B. Sc.	**6. Frequency (use tick marks)**	Even ( )	Odd (✓)	Either Sem ( )	Every Sem ( )
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 26		**Tutorials = 0**		**Practical = 0**		

8. Course Description

This course provides students the knowledge of Forensic Chemistry along with cases associated with Forensic chemistry, Presumptive and confirmatory testing of chemical evidences. Basic concepts of Forensic Toxicology, Drugs of Abuse, Club drugs, Poisons types and trends of Poisoning.

9. Course Objectives

The objectives of this course are to:

1. Learn the basic of Forensic Chemistry.
2. Introduce about Drugs of abuse, petroleum products, liquors and explosives.
3. Know about the Forensic Toxicology and different Poisons.
4. Describe the Drugs of Abuse, Club drugs and to differentiate Toxicants, Toxins and Poisons.
5. Understand about the types and trends of Poisoning.

10. Course Outcomes (COs)

Upon successful completion of this course:

1. Students would be able to know about the basic of Forensic Chemistry.
2. Students would be able to describe Drugs of abuse, petroleum products, liquors and explosives.
3. Students would be able to know about the Forensic Toxicology and different Poisons.
4. Students would be able to know about the Drugs of Abuse, Club drugs, Toxins and Poisons.
5. They would be able to understand types and trends of Poisoning.

11. Unit wise detailed content

Unit-1	**Number of lectures = 7**	**Title of the unit:**Forensic Chemistry

Forensic Chemistry: Definition, Important cases associated with Forensic chemistry, Types of cases which require chemical analysis, Presumptive and confirmatory testing of chemical evidences. Introduction and brief analysis of Phenolphthalein in Trap case, Petroleum adulteration. A brief Study of Illicit liquors, Arson and Explosives with related case studies.

Unit-2	**Number of lectures- 7**	**Drugs of Abuse**

Drugs of Abuse: Introduction and classification of Drugs of Abuse (Narcotics, Stimulants, Depressant and hallucinogens),Introduction to Club drugs and Drug abuse in Sports, Drugs as

Evidence.		
Unit - 3	**Number of lectures = 7**	**Title of the unit:** Forensic Toxicology
Forensic Toxicology: Definition, Areas of Forensic Toxicology, Elements of Forensic Toxicology Nature of cases, Role of the Forensic Toxicologists, **Poisons:** Definition of Poison, Toxin and Toxicant, Ideal Poison, Classification of poisons based on their origin and Chemical nature, mode of action.		
Unit-2	**Number of lectures- 5**	**Title of the unit:** Types and Trends of Poisoning
Types and Trends of Poisoning: Animals and Human poisoning in India with special reference to Suicidal, Homicidal and accidental poisons, Major vesicants used as chemical-warfare agents. Factors affecting the poisoning, methods of administration. Extraction methods of some important poisons and their forensic identification.		

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

1. https://www.youtube.com/watch?v=EUrRpTJyHsg
2. https://www.youtube.com/watch?v=5QoxLfhFJRA
3. https://www.youtube.com/watch?v=gDIn2UXlq_Q
4. https://www.youtube.com/watch?v=8-tKbnMzB4o
5. https://www.youtube.com/watch?v=Yx67Vs5_00U
6. https://www.youtube.com/watch?v=KALRTh4EfLc
7. https://www.youtube.com/watch?v=DXBdK7WCzVQ
8. https://www.youtube.com/watch?v=Qks73F5VhE0
9. https://www.youtube.com/watch?v=lbWHGxUdDD8
10. https://www.youtube.com/watch?v=VF3-V4buOvs
11. https://www.youtube.com/watch?v=i1s0wvQfVuo
12. https://www.youtube.com/watch?v=gOaoueVSZpM
13. https://www.youtube.com/watch?v=2V2HMYOIwvI
14. https://www.youtube.com/watch?v=l85ItdU-o_o
15. https://www.youtube.com/watch?v=__LIPm4hN-U
16. https://www.youtube.com/watch?v=aMWBB2Hxcbo
17. https://www.youtube.com/watch?v=abTAqmK8bIM

13. Books Recommended

1. Sunshine I. Handbook of Analytical Toxicology. CRC Press, 1969.
2. Parikh CK. Text Book of Medical Jurisprudence, Forensic Medicine and Toxicology. CBS Publ. New Delhi, 1999.
3. Laboratory Procedure Manual, Forensic Toxicology. Directorate of Forensic Science. MHA Govt, 2005.

4. Michel JD. Handbook of toxicology. CRC Press, USA, 1995.
5. Casarett LJ, Doul John. Toxicology: The Basic Science of Poison. Macmillan Publishing Co. New York, 1975.
6. Carvey RH, Baselt RC. Introduction to Forensic Toxicology and Biochemicals. Publ. Davis CA, 1981.
7. Chadha PV. Handbook of Forensic Medicine and Toxicology. Jaypee Brothers, New Delhi, 2004.
8. Modi JP. Textbook of Medical Jurisprudence and Toxicology. MM Tripathy Publications, 2001.
9. Modi's. Medical Jurisprudence & Toxicology, M. M. Trirathi Press Ltd. Allahabd, 1988.
10. Saferstein R. Forensic Science Hand Book, Vol I, II and III, Pretince Hall, NI., 1982
11. Curry AS. Poison Detection in Human Organs., 1976.
12. Mathew E. Johll. Investigating Chemistry: A Forensic Science Perspective, 2009
13. Suzanne Bell. Drugs, Poisons, and Chemistry, 2009
14. DFS Manuals of Forensic Chemistry and Narcotics.