YENEPOYA

(DEEMED TO BE UNIVERSITY)
Recognized under Sec 3(A) of the UGC Act 1956
Accredited by NAAC with 'A' Grade

YENEPOYA (DEEMED TO BE UNIVERSITY)

Deralakatte, Mangaluru -575018

REGULATIONS AND CURRICULUM GOVERNING

UNDERGRADUATE PROGRAM

BACHELOR OF SCIENCE (HONOURS) FORENSIC SCIENCE

(CURRICULUM - EFFECTIVE FROM 2019-20)

Structure of the program clearly indicating courses, credits/Electives **Click Here**

ATTESTED

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NOTIFICATION – 35-ACM/22/2019 dtd.27.05.2019

Sub: Starting of B.Sc.(Honors) in Forensic Science

Ref: Resolution of the Academic Council at its 35th meeting held on 24.05.2019, vide Agenda -24

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The Academic Council at its 35th meeting held on 24.05.2019 & subsequently the Board of Management at its 46th meeting have resolved to approve the proposal to start B.Sc.(Honors) Forensic Science with the annual intake of 75 candidates per year under the Yenepoya Institute of Arts, Science, Commerce & Management.

This notification issued for implementation with effect from the academic year 2019-20.

REGISTRAR
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To:

The Principal, Yenepoya Institute of Arts, Science, Commerce & Management

B.Sc. (Hons) in Forensic Science

Goals:

To providing students with the skills, knowledge and values to have successful career and lead the organisations they work with into the future. The program is designed to provide a competitive edge to the students to solve global challenges and provide justice to the society. The curriculum framework and content of this course will facilitate students to conveniently pursue a career in the field of Forensic Science and Criminal justice system.

Objectives

The Universal Declaration of Human Rights directs the member nations to create such conditions under which the ideals of free human beings, enjoying civil and political freedom from fear and want, can be achieved. The Constitution of India, through its various articles, strives to ensure security and safety of citizens in accordance with the principles of Universal Declaration of Human Rights. However, crime is a violation of these principles. In a country like India, where majority of population is uneducated, social set up is heterogeneous, public-police relations are not very cordial, poverty is rampant and unemployment widespread, it is not surprising that crime rate is increasing exponentially.

If we have to create conditions conducive to harmonious development, we must mitigate the crime rate. This can best be achieved by relying on the support of forensic science system. Unfortunately, in our country, forensic science is not viewed as a core investigative skill in crime detection. In fact, there is a lack of understanding of the forensic process itself. It is for this reason that less than 10% of the police cases are, at present, being referred for forensic examination. Less than 5% are solved by the application of forensic science. The rest are solved by third degree method – a practice which the human rights organizations will not allow in days to come.

In majority of serious crime cases, hi-tech measures are being adopted by perpetrators of crime. The counter measures have to be more sophisticated to surpass them. This calls for strengthening the foundations of forensic science at national level. It is with this aim that we wish to initiate a B.Sc. (Hons) Course in Forensic Science.

The following are the objectives of this course.

1. To emphasize the importance of scientific methods in crime detection.
2. To disseminate information on the advancements in the field of forensic science.
3. To highlight the importance of forensic science for perseverance of the society.
4. To review the steps necessary for achieving highest excellence in forensic science.
5. To generate talented human resource, commiserating with latest requirements of forensic science.
6. To provide a platform for students and forensic scientists to exchange views, chalk- out collaborative programs and work in a holistic manner for the advancement of forensic science.

Duration of the Course

The duration of the course shall be three years. Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year, the third and fourth semesters, and the third academic year as the fifth and sixth semesters.

Eligibility

A candidate who has passed the two years Pre-University Examination conducted by the Pre-University Education Board in the State of Karnataka or any other examination considered as equivalent thereto by University is eligible for admission to these programmes.

* Passed Class XII from a recognized Board in science stream.
* The admission will be done on merit basis taking into consideration the aggregate marks obtained in the following three subjects:
  (i) Physics
  (ii) Chemistry
  (iii) Any one out of Mathematics or Biology in whichever subject the candidate has scored higher marks.

Selection Process

Application forms will be available in the official website of Yenepoya University (www.yenepoya.edu.in) and the college office for the applicants. A merit list will be prepared of selected candidates based on the 12th class marks /PUC marks. Reservation of seats will be followed as per the university bye laws.

Total Intake of Students

75 students will be registered per year for the course.

Medium of Instruction

The medium of instruction and examination shall be English.

Minimum Course Curriculum for Undergraduate Courses under Choice Based Credit System

Ministry of Human Resource Development (HRD), Govt. of India, has already initiated the process for developing New Education Policy (NEP) in our country to bring out reforms in Indian education system. University Grants Commission (UGC) participates more actively in developing National Education Policy, its execution and promotion of higher education in our country. The UGC has already initiated several steps to bring equity, efficiency and academic excellence in National Higher Education System. The important ones include innovation and improvement in course- curricula, introduction of paradigm shift in learning and teaching pedagogy, examination and education system.

The education plays enormously significant role in building of a nation. There are quite a large number of educational institutions, engaged in imparting education in our country. Majority of them have entered recently into semester system to match with international educational pattern. However, our present education system produces young minds lacking knowledge, confidence, values and skills. It could be because of complete lack of relationship between education, employment and skill development in conventional education system. The present alarming situation necessitates transformation and/or redesigning of education system, not only by introducing innovations but developing "learner-centric approach in the entire education delivery mechanism and globally followed evaluation system as well.

Majority of Indian higher education institutions have been following marks or percentage based evaluation system, which obstructs the flexibility for the students to study the subjects/courses of their choice and their mobility to different institutions. There is need to allow the flexibility in education system, so that students depending upon their interests and aims can choose inter-disciplinary, intra-disciplinary and skill-based courses. This can only be possible when choice based credit system (CBCS), an internationally acknowledged system, is adopted. The choice based credit system not only offers opportunities and avenues to learn core subjects but also exploring additional avenues of learning beyond the core subjects for holistic development of an individual. The CBCS will undoubtedly facilitate us bench mark our courses with best international academic practices. The CBCS has more advantages than disadvantages.

Advantages of the choice-based credit system

Shift in focus from the teacher-centric to student-centric education.

Student may undertake as many credits as they can cope with (without repeating all courses in a given semester if they fail in one/more courses).

CBCS allows students to choose inter-disciplinary, intra-disciplinary courses, skill-oriented papers (even from other disciplines according to their learning needs, interests and aptitude) and more flexibility for students).

CBCS makes education broad-based and at par with global standards. One can take credits by combining unique combinations. For example, Physics with Economics, Microbiology with Chemistry or Environment Science etc.

CBCS offers flexibility for students to study at different times and at different institutions to complete one course (ease mobility of students). Credits earned at one institution can be transferred.

Choice Based Credit System (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based 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.

1. Outline of Choice Based Credit System

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

2. 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.

2.1 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).

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

2.3 Generic Elective (GE) Course An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.

P.S. A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. Ability Enhancement Compulsory Courses (AECC) The Ability Enhancement (AE) Courses may be of two kinds Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; i. Environmental Science and ii. English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

3.1 Ability Enhancement Compulsory Courses (AECC) Environmental Science, English Communication/MIL Communication.

3.2 Skill Enhancement Courses (SEC) These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. Introducing Research Component in Under-Graduate Courses.

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analysing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

4. Implementation

The CBCS may be implemented in Central/State Universities subject to the condition that all the stakeholders agree to common minimum syllabi of the core papers and at least follow common minimum curriculum as fixed by the UGC. The allowed deviation from the syllabi is 20 % at the maximum.

The universities may be allowed to finally design their own syllabi for the core and elective papers subject to point no. 1. UGC may prepare a list of elective papers but the universities may further add to the list of elective papers they want to offer as per the facilities available.

Number of Core papers for all Universities has to be same for both UG Honours as well as UG Program.

Credit score earned by a student for any elective paper has to be included in the student's overall score tally irrespective of whether the paper is offered by the parent university (degree awarding university/institute) or not.

For the introduction of AE Courses, they may be divided into two categories

AE Compulsory Courses the universities participating in CBCS system may have common curriculum for these papers. There may be one paper each in the 1st two semesters viz. (i) English/MIL Communication, (ii) Environmental Science.

Skill Enhancement Courses The universities may decide the papers they may want to offer from a common pool of papers decided by UGC or the universities may choose such papers themselves in addition to the list suggested by UGC. The universities may offer one paper per semester for these courses. The university/Institute may plan the number of seats per elective paper as per the facility and infrastructure available.

An undergraduate degree with Honours in a discipline may be awarded if a student completes 14 core papers in that discipline, 2 Ability Enhancement Compulsory Courses (AECC), minimum 2 Skill Enhancement Courses (SEC) and 4 papers each from a list of Discipline Specific Elective and Generic Elective papers respectively.

An undergraduate Program degree in Science disciplines may be awarded if a student completes 4 core papers each in three disciplines of choice, 2 Ability Enhancement Compulsory Courses (AECC), minimum 4 Skill Enhancement Courses (SEC) and 2 papers each from a list of Discipline Specific Elective papers based on three disciplines of choice selected above, respectively.

An Undergraduate program degree in Humanities/ Social Sciences/ Commerce may be awarded if a student completes 4 core papers each in two disciplines of choice, 2 core papers each in English and MIL respectively, 2 Ability Enhancement Compulsory Courses (AECC), minimum 4 Skill Enhancement Courses (SEC), 2 papers each from a list of Discipline Specific Elective papers based on the two disciplines of choice selected above, respectively, and two papers from the list of Generic Electives papers.

The credit(s) for each theory paper/practical/tutorial/project/dissertation will be as per the details given in A, B, C, D for B.Sc. Honours, B.A./B.Com. Honours, B.Sc. Program and B.A./B.Com. Program, respectively.

Wherever a University requires that an applicant for a particular M.A./M.Sc. /Technical/Professional course should have studied a specific discipline at the undergraduate level, it is suggested that obtaining 24 credits in the concerned discipline at the undergraduate level may be deemed sufficient to satisfy such a requirement for admission to the M.A./M.Sc./Technical/Professional course.

Proposed Scheme for Choice Based Credit System

	CORE COURSE (14)	Ability Enhancement Compulsory Course (AECC) (2)	Skill Enhancement Course (SEC) (2)	Elective Discipline Specific DSE (4)	Elective Generic (GE) (4)
I	C 1	(English/ MIL Communication)/			GE-1
	C 2	Environmental Science			
II	C 3	Environmental Science/(English/			GE-2
	C 4	MIL Communication)			
III	C 5		SEC -1		GE-3
	C 6				
	C 7				
IV	C 8		SEC -2		GE-4
	C 9				
	C 10				
V	C 11			DSE-1	
	C 12			DSE -2	
VI	C 13			DSE -3	
	C 14			DSE -4	

Details of courses under B.Sc. (Hons.)

Course	Theory+ Practical	Theory + Tutorial	*Credits
I. Core Course (14 Papers)		14X4= 56	14X5=70
Core Course Practical / Tutorial* (14 Papers)		14X2=28	14X1=14
II. Elective Course (8 Papers)			
A.1. Discipline Specific Elective (4 Papers)		4X4=16	4X5=20
A.2. Discipline Specific Elective Practical / Tutorials* (4 Papers)		4 X 2=8	4X1=4
B.1. Generic Elective/ Interdisciplinary (4 Papers)		4X4=16	4X5=20
B.2. Generic Elective Practical / Tutorials* (4 Papers)		4 X 2=8	4X1=4

***Optional Dissertation or project work in place of one Discipline Specific elective paper (6 credits) in 6th Semester**

III. Ability Enhancement Courses			
1. Ability Enhancement Compulsory Courses (AECC) (2 Papers of 2 credits each)	Environmental Science English Communication/MIL	2 X 2=4	2 X 2=4
2. Skill Enhancement Courses (SEC) (Minimum 2, Max. 4) (2 Papers of 2 credits each)		2 X 2=4	2 X 2=4
		Total credit= 140	**Total credit= 140**

Institute should evolve a system/policy about ECA

General Interest/Hobby/Sports/NCC/NSS/related courses on its own. *wherever there is a practical there will be no tutorial and vice-versa.

5. Co-Curricular and Extra Curricular Activities

A student shall opt for any one of the following activities in the first four semesters offered in the college
A) N.S.S.
B) Sports and Games
C) Other Co-Curricular and Extra-Curricular Activities as prescribed by the university Evaluation of Co- and Extra Curricular Activities is as per the procedure evolved by the university from time to time.

6. Attendance and Change of Subjects

A candidate shall be considered to have satisfied the requirement of attendance for a semester if he/she attends not less than 75% of the number of classes held including EC & CC.
A candidate who does not satisfy the requirement of attendance even in one subject shall not be permitted to take the whole University examination of that semester and he/she shall seek re-admission to that Semester in a subsequent year.
Whenever a change in a subject is permitted the attendance in the changed subject shall be calculated by taking into consideration the attendance in the previous subject studied by the candidate.
If a candidate represents his/her Institution/University/ Karnataka State/ Nation in Sports/ NSS/ Cultural or any officially sponsored activities he/she may be permitted to claim attendance for actual number of days participated, based on the recommendation of the Head of the Institution concerned. If a candidate is selected to participate in national level events such as Republic Day Parade etc., he/she may be permitted to claim attendance for actual number of days participation based on the recommendation of the head of the Institution concerned.

7. Teaching Learning Methodology

The instructors will choose the pedagogy according to the course content and its applications from the methods provided below.

Lectures, Class discussions, reading assignments, Discussion groups. Lecture-demonstration, Student Presentation, Panel discussion by student panels from the class. Student reports by individuals, Student-group reports. Debate (informal) on current issues by students Forums Bulletin boards, Small groups such as task oriented, discussion, Textbook assignment. Reading assignments in journals, monographs, Assignment to outline portions of the textbook, Assignment to outline certain supplementary readings, Debates (formal) . Crossword puzzles Maintaining Portfolios / Diaries. Reports on published research studies, Library research on topics or problems .Written book reports by students , Interviews, Audio-tutorial lessons , Open textbook study ,Committee projects--small groups ,Individual projects , Quiz, Use of dramatization, skits, plays(street plays) ,Student construction of diagrams, charts, or graphs, Making of posters by students , Problem solving or case studies. Use of flip chart board by instructor as aid in teaching, Use of diagrams, tables, graphs, and charts by instructor in teaching. Use of displays by instructor, Use of slides, Use of motion pictures, educational films, videotapes. Use of recordings (Ted Talks). Role playing, peer teaching. Coaching: special assistance provided for students having difficulty in the course .VIVA, filling out forms (income tax, checks). Visit an "ethnic" locations or commercial establishments or community. On the job training, specialize in other countries and in India Visit an employment agency. Campaigning, Volunteering, Prepare mock newspaper on specific topic or era, an entrepreneurial activity. Writing reports or project proposals.

8. Examination Structure for Written exam

	Marks
Internal Assessment	25
Final Examination	75
	100

9. Continuous Internal Assessment (CIA)
Internal Assessment for each course is continuous, and details for each test are notified well in advance. CIA consists of the following

SN	**Internal Assessment for 25 marks**	**Weightage**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/ Class Participation /Attitude	10
	Total	25

10. The marks of the internal assessment shall be published on the notice board of the college for information of the students.

11. Registration for Examinations
A candidate shall register for all the papers of a semester when he/she appears for the examination of that semester for the first time.

12. Conduct of Examinations
There shall be examinations at the end of each semester, ordinarily during November/December for odd semesters and during April/May for even semesters, as prescribed in the Scheme of Examinations.

13. Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

14. Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

Question paper pattern

Duration: 3 Hours **Maxi. Marks:75**

Section A

Answer the following Questions **(1X15=15)**

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.
13.
14.
15.

Section B

Answer any THREE of the Questions **(10 X3=30)**

16.
17.
18.
19.
20.

Section C

Answer any TWO Questions **(15 X2=30)**

21.
22.
23.
24.

15. Minimum for a Pass

No candidate shall be declared to have passed the Semester Examination (except in Co-curricular and extracurricular activities) unless he/she obtains not less than 40% marks in the aggregate of written examination and internal assessment put together in each of the subjects. There is no minimum mark in Internal Assessment, but Candidate should get minimum 40% in external examination.

If a candidate fails in any subjects, he/she shall appear for that subject only at any subsequent regular examination, within the maximum 6 years from date of registration prescribed for completing the programme.

16. Re-totalling

All theory examination papers will be evaluated by two examiners (one internal and one external).

There will not be any revaluation of the papers. However, the students can apply for re-totalling after submitting the application and necessary fees.

17. With Holding of Results

Results will be withheld when a student has not paid his/her dues or there is a case of disciplinary action pending against him/her.

18. Carry Over

A candidate who fails in a lower semester examination may go to the higher semester and take the examination.

19. Classification of Successful Candidates

Grading System For Choice Based Credit System (CBCS) - The College adopts a ten point grading system.

Conversion of credit(s) into grade(s) The following illustrations could be taken as an example for computing SGPA and CGPA from credits for Honours courses in all disciplines, degree Program courses in Science subjects and degree Program courses in Humanities, Social Sciences and Commerce subjects.

20. Grades and Grade Points

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B (above average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

For non-credit courses 'Satisfactory' or "Unsatisfactory' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

The Universities can decide on the grade or percentage of marks required to pass in a course and also the CGPA required to qualify for a degree taking into consideration the recommendations of the statutory professional councils such as AICTE, MCI, BCI, NCTE etc.

21. Illustration of Computation of SGPA and CGPA and Format for Transcripts Honours Course

Course Course	**Credit**	**Grade Letter**	**Grade Point**	**Credit Point (Credit X Grade)**	**SGPA (Credit Point/Credit)**
Semester I					
C-1	06	A	8	48	
C-2	06	B+	7	42	
AECC-1	02	B	6	12	
GE-1	06	B	6	36	
Total	**20**			**138**	**6.9 (138/20)**
Semester II					
C-3	06	B	6	36	
C-4	06	C	5	30	
AECC -2	02	B+	7	14	
GE-2	06	A+	9	54	
Total	**20**			**134**	**6.7 (134/20)**
Semester III					
C-5	06	A+	9	54	
C-6	06	0	10	60	
C-7	06	A	8	48	
SEC -1	02	A	8	16	
GE-3	06	0	10	60	
Total	**26**			**238**	**9.15 (238/26)**
Semester IV					
C-8	06	B	6	36	
C-9	06	A+	9	54	
C-10	06	B	6	36	

SEC -2	02	A+	9	18	
GE-4	06	A	8	48	
Total	**26**			**192**	**7.38 (192/26)**
Semester V					
C-11	06	B	6	36	
C-12	06	B+	7	42	
DSE-1	06	0	10	60	
DSE-2	06	A	8	48	
Total	**24**			**186**	**7.75 (186/24)**

Semester VI					
C-13	06	A+	9	54	
C-14	06	A	8	48	
DSE-3	06	B+	7	42	
DSE-4	06	A	8	48	
Total	**24**			**192**	**8.0 (192/24)**
CGPA					
Grand Total	**140**			**1080**	**7.71 (1080/144)**

Semester 1	**Semester 2**	**Semester 3**	**Semester 4**
Credit: 20; SGPA: 6.9	Credit: 20; SGPA: 6.7	Credit: 26; SGPA: 9.15	Credit: 26; SGPA: 7.38

Semester 5	Semester 6
Credit: 24; SGPA: 7.75	Credit: 24; SGPA: 8.0

Thus, CGPA = (20 x 6.9 + 20 x 6.7 + 26 x 9.15 + 26 x 7.38 + 24 x 7.75 + 24 x 8.0)/ 140 = 7.71

22. Rejection of Results

A candidate may be permitted to reject the result of the whole examination of any semester. Rejection of result paper-wise/subject-wise shall not be permitted. A candidate who has rejected the result shall appear for the immediately following regular examination.

The rejection shall be exercised only once in each semester and the rejection once exercised cannot be revoked.

Application for rejection along with the payment of the prescribed fee shall be submitted together to the controller of examination of university through the College with the original statement of marks within 30 days from the date of publication of the result.

A candidate who rejects the result is eligible for only class and not for ranking.

23. Transfer of Admission

Transfer of admissions to other university is permissible only on mutual agreement with the other university. A candidate migrating from any other university may be permitted to join III/V Semester of the degree programme provided he/she has passed all the subjects of previous semesters/years as the case may be. Such candidates must satisfy all other conditions of eligibility stipulated in the regulations of Yenepoya University. Conditions for transfer of admission of students of other universities

He/she shall fulfil the attendance requirements as per the Yenepoya University Regulations.

His / Her transfer of admission shall be within the intake permitted to the college.

The candidate who is migrating from other universities is eligible for overall class and not for ranking. He / She shall complete the programme as per the regulation governing the maximum duration of completing the programme.

I. Core Course- Details of Course Structure and Assessment

Year	Sem	Course Code	Course Name	Credits		Total Credits	Marks		Total Marks	
				T	P		Internal	External	Theory	Practical
One	**I**	DC01FS- 1C1	C-1: Introduction to Forensic Science	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 1C2	C-2: Crime and Society	**4**	**2**	**6**	**25**	**75**	**100**	**100**
	II	DC01FS- 2C1	C-3: Criminal Law	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 2C2	C-4: Forensic Psychology	**4**	**2**	**6**	**25**	**75**	**100**	**100**
Two	**III**	DC01FS- 3C1	C-5: Forensic Dermatoglyphics	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 3C2	C-6: Technological Methods in Forensic Science	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 3C3	C-7: Criminalistics	**4**	**2**	**6**	**25**	**75**	**100**	**100**
	IV	DC01FS- 4C1	C-8: Forensic Chemistry	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 4C2	C-9: Questioned Documents	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 4C3	C-10: Forensic Biology	**4**	**2**	**6**	**25**	**75**	**100**	**100**
Three	**V**	DC01FS- 5C1	C-11: Forensic Ballistics	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 5C2	C-12: Forensic Toxicology	**4**	**2**	**6**	**25**	**75**	**100**	**100**
	VI	DC01FS- 6C1	C-13: Forensic Anthropology	**4**	**2**	**6**	**25**	**75**	**100**	**100**
		DC01FS- 6C2	C-14: Forensic Medicine	**4**	**2**	**6**	**25**	**75**	**100**	**100**
				56	**28**	**84**			**1400**	**1400**

II. ELECTIVE COURSE

A. Discipline Specific	B. Generic Elective/Interdisciplinary
Two each in Semester V and VI. To be chosen from the following. DSE-1: Digital Forensics DSE-2: Economic Offences DSE-3: Accident Investigations DSE-4: Forensic Serology DSE-5: DNA Typing DSE-6: Dissertation (in Semester VI only)	One each in Semester I, II, III and IV. To be chosen from the following. GE-1: Physics GE-2: Chemistry GE-3: Botany GE-4: Zoology GE-5: Anthropology GE-6: Computer Science GE-7: Economics GE-8: Psychology

Course Code	Course Name	Credits	Marks		Total Marks
			Internal	External	
DC01FS- 5D1	DSE-1: Digital Forensics	**6**	**25**	**75**	**100**
DC01FS- 5D2	DSE-2: Forensic Serology	**6**	**25**	**75**	**100**
DC01FS- 6D1	DSE-3: DNA Forensics	**6**	**25**	**75**	**100**
	DSE-4: Dissertation	**6**	**25**	**75**	**100**
Total Credits		**24**			
From the above choose any two in semester V and VI.					
Total Marks400					

Course Code	Course Name	Credits		Marks		Total Marks	
		Theory	Practical	Internal	External	Theory	Practical
DC01FS-1G1	GE-1: Physics	4	2	25	75	100	100
DC01FS-2G1	GE-2: Chemistry	4	2	25	75	100	100
DC01FS-3G1	GE-3: Computer Science	4	2	25	75	100	100
DC01FS-4G1	GE-4: Psychology	4	2	25	75	100	100
Total Credits		**2 4**					
From the above choose any one in each semester I, II, III and IV.							
Total Marks(Since only 4 courses are required)						**400**	**400**
Grand Total							**800**

III. ABILITY ENHANCEMENT COURSE

1. Ability Enhancement Compulsory	2. Ability Enhancement Elective (Skill Based)
One each in Semester I and II. AECC-1: EnvironmentalScience AECC-2: English/MIL Communication *The College will have an option to take either of the two papers in a particular Semester (I or II), while the students have to appear in both thepapers.*	One each in Semester III and IV. To be chosen from the following. AEEC-1: Introduction to Biometry AEEC-2: Handwriting Identification and Recognition AEEC-3: Forensic Science and Society

Note: All Theory Papers are of 4 Credits and all practical papers are of 2 Credits.

1. Ability Enhancement Compulsory	Credits	2. Ability Enhancement Elective (Skill Based)	Credits
One each in Semester I and II. DC01FS- 1A1: AECC-1: Environmental Science DC01FS- 2A2: AECC-2: English/MIL Communication *The College will have an option to take either of the two papers in a particular Semester (I or II), while the students have to appear in both thepapers.*	2 2	One each in Semester III and IV. DC01FS- 3A1: AEEC-1: Introduction to Biometry DC01FS- 4A1: AEEC-2: Handwriting Identification and Recognition	2 2
Total Credits	4		4
Total Marks	200		200
Grand Total	400		

Credits and Marks

	Total Credits	Total Marks
I	**84**	**2800**
II	**48**	**1200**
III	**8**	**400**
Grand Total	**140**	**4400**

24. The Details of Course Structure and Assessment

Semester	Course Code	Course Name	Credits		Total Credits	Marks		Total Marks	
			T	P		Internal	External	T	P
I	DC01FS- 1C1	C-1: Introduction to Forensic Science	4	2	6	25	75	100	100
	DC01FS- 1C2	C-2: Crime and Society	4	2	6	25	75	100	100
	DC01FS- 1A1	AECC-1: Environmental Science	2	-	2	25	75	100	-
	DC01FS- 1G1	GE-1: Physics	4	2	6	25	75	100	100
II	DC01FS- 2C1	C-3: Criminal Law	4	2	6	25	75	100	100
	DC01FS- 2C2	C-4: Forensic Psychology	4	2	6	25	75	100	100
	DC01FS- 2A1 DC01FS- 2A2 DC01FS- 2A3	AECC-2: English/MIL Communication Any ONE of the following a) English b) Hindi c) Kannada	2	-	2	25	75	100	-
	DC01FS-2G1	GE-2: Chemistry	4	2	6	25	75	100	100
	Total				**20**			**400**	**300**
	DC01FS- 3C1	C-5: Forensic Dermatoglyphics	4	2	6	25	75	100	100
	DC01FS- 3C2	C-6: Technological Methods in Forensic Science	4	2	6	25	75	100	100
	DC01FS- 3C3	C-7: Criminalistics	4	2	6	25	75	100	100

III	DC01FS- 3A1	AEEC-1: Introduction to Biometry	2	-	2	25	75	100	-
	DC01FS- 3G1	GE-3: Computer Science	4	2	6	25	75	100	100
	DC01FS- 3G2	GE-4: Botany	4	2	6	25	75	100	100
	Total				**32**			**600**	**500**
IV	DC01FS- 4C1	C-8: Forensic Chemistry	4	2	6	25	75	100	100
	DC01FS- 4C2	C-9: Questioned Documents	4	2	6	25	75	100	100
	DC01FS- 4C3	C-10: Forensic Biology	4	2	6	25	75	100	100
	DC01FS- 4A1	AECC-2: Handwriting Identification and Recognition	2	-	2	25	75	100	-
	DC01FS- 4G1	GE-5: Psychology	4	2	6	25	75	100	100
	DC01FS- 4G2	GE-6: Zoology	4	2	6	25	75	100	100
	Total				**32**			**600**	**500**
V	DC01FS- 5C1	C-11: Forensic Ballistics	4	2	6	25	75	100	100
	DC01FS- 5C2	C-12: Forensic Toxicology	4	2	6	25	75	100	100
	DC01FS- 5D1	DSE-1: Digital Forensics	4	2	6	25	75	50	50
	DC01FS- 5D2	DSE-2: Forensic Serology	4	2	6	25	75	50	50
	Total				**24**			**300**	**300**
	DC01FS- 6C1	C-13: Forensic Anthropology&	4	2	6	25	75	100	100

VI	DC01FS- 6C2	C-14: Forensic Medicine& Microbial	4	2	6	25	75	100	100
	DC01FS- 6D1	DSE-3: DNA Forensics	4	2	6	25	75	50	50
	DC01FS- 6D2	DSE-4: Research Project (including Research Methodology and Bio-statistics)	4	2	6	25	75	50	50
	Total				**24**			**300**	**300**
Grand total credits of (I,II,III,IV,V and VI Semester)					**140**			**2400**	**2000**

* SWAYAM courses may be undertaken as choice for any of the four and two credit modules.

25. SWAYAM COURSE GUIDELINES (For Students) Minimum 8 credits and a maximum of 20 credits of MOOC credits is permitted.)

Guidelines for opting MOOC subjects as elective or open elective (Any of the 4 credit or 2 credit subjects) Core 6 credit courses are not electives.

25.1. At the time of selecting any Elective or Open Elective, student can opt for a MOOC subject of same credit or one credit less.

25.2. Process for opting MOOC subject by the student:

Student identifies a MOOC subject on SWAYAM portal (https://swayam.gov.in).

Student informs Departmental Swayam Coordinator (DSC) about it.

DSC gives the code of the subject to the student.

Students will apply online through SMS or mobile app.

After the process the student enrolls/registers in the subject on SWAYAM portal (https://swayam.gov.in).

Student will inform DSC after registering and enrolling on SWAYAM portal.

25.3. After the completion of the subject, a copy of the certificate of completion with the marks obtained is to be submitted to the DSC.

25.4. Credit Conversion:

If credit for MOOC subject taken by the student matches with the credit of Departmental elective or Open elective then no conversion is needed and same breakup for CA (online assignments) and ESE (Proctored exam) will be taken.

Conversion of 3 credit MOOC subject to 4 credit subject or 2 credits MOOC subject to 3 credit subject:

End Semester Exam (ESE) 50 Marks	**Continuous Assessment (CA) 50 Marks**			
	Proctored Exam (as per MOOC mark sheet scaled to 50)	Online Assignments (as per MOOC mark sheet)	Presentation 1 (to be conducted by departmental committee)	Presentation 2 (to be conducted by departmental committee)
Marks distribution	50	25	10	15
Marks required to Pass	ESE(out of 50) + Online assignment (out of 25)=30 marks		P1+P2=11 marks	

I. CORE COURSE

FIRST YEAR

SEMESTER-I
PAPER: DC01FS- 1C1

C-1: Introduction to Forensic Science **Credits: 4**

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

a. The significance of forensic science to humansociety.
b. The fundamental principles and functions of forensicscience.
c. The divisions in a forensic sciencelaboratory.
d. The working of the forensic establishments in India andabroad.

Unit 1: History of Development of Forensic Science in India
Functions of forensic science. Historical aspects of forensic science.
Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science.
Frye case and Daubert standard.

Unit 2: Tools and Techniques in Forensic Science
Branches of forensic science. Forensic science in international perspectives, including set up of INTERPOL and FBI.
Duties of forensic scientists. Code of conduct for forensic scientists. Qualifications of forensicscientists.
Data depiction. Report writing.

Unit 3: Organizational set up of Forensic Science Laboratories in India
Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories. Police Academies. Police dogs. Services of crime laboratories. Basic services and optional services.

Unit 4: Role of Forensic Evidence in the Legal System
Physical Evidence - definition, types, significance, collection, preservation, packing and forwarding of different evidence to the forensic laboratory.
Bloodstain Pattern Analysis - terminology, Blood physics, Spatter patterns, Motion and directionality, point of origin and point of convergence, preservation of blood evidence, procedures and precautions
Presentation of Expert Evidence, Evidence in The Court of Law, Report writing & Evidence presentation, Components of reports and report format (according to ISO/IEC17025:2005).

Practicals **Credits:2**

1. To study the history of crime cases from forensic scienceperspective.
2. To cite examples of crime cases in which apprehensions arose because of Daubert standards.
3. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements ifany.
4. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smartart/templates.
5. To write report on different type of crimecases.
6. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
7. To examine the hierarchical set up of different forensic science establishments and suggestimprovements.
8. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in PoliceScience.
9. To compare and contrast the role of a Police Academy and a Police TrainingSchool.
10. To compare the code of conduct prescribed by different establishments for forensic scientists.

Suggested Readings

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

Teaching Learning Methodology

Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions and field visits.

The exhaustive list of methodologies is listed in point no.7. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course.

Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	Internal Assessment for 25 marks	Marks
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 1C2

C-2: Crime and Society **Credits: 4**

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

a. The importance ofcriminology.
b. The causes of criminalbehavior.
c. The significance of criminal profiling to mitigatecrime.
d. The consequences of crime insociety.
e. The elements of criminal justicesystem.

Unit 1: Basics of Criminology
Definition, aims and scope. Theories of criminal behavior – classical, positivist, sociological.
Criminal anthropology.
Criminal profiling. Understanding modus operandi. Investigativestrategy.
Role ofmedia.

Unit 2:Crime
Elements, nature, causes and consequences of crime. Deviant behavior. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence.
White collar crimes
Victimology. Juvenile delinquency. Social change and crime.
Psychological Disorders and Criminality. Situational crime prevention.

Unit 3: Criminal Justice System
Broad components of criminal justice system. Policing styles and principles. Police's power of investigation.
Filing of criminal charges. Community policing. Policing a heterogeneous society.
Correctional measures and rehabilitation of offenders.
Human rights and criminal justice system in India.

Unit 4: Penology and Prison Administration
Meaning, aims and philosophy of punishment; Types of punishment and objectives of punishment.
Sentencing: Principles, policies and procedures.
Evolution and development of prison system in India. Classification of Correctional Institution in India: Central Jails, Sub- jails and Juvenile Institutions.
Probation: Concept and scope, Historical development in India, Probation procedures: Pre-sentence investigation report, supervision and revocation. Parole: Provisions, rules and supervision. Pre-release and Pre-mature release.

Practicals **Credits:2**

1. To review past criminal cases and elucidate which theory best explains the criminal behavior of theaccused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressuregroup.
4. To evaluate the post-trauma stress amongst victims of racialdiscrimination.
5. To correlate deviant behavior of the accused with criminality (take a specific example).
6. To evaluate victimology in a heinouscrime.
7. To examine a case of juvenile delinquency and suggest remedialmeasures.

8. To evaluate how rising standards of living affect crimerate.
9. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different policestations.
10. To visit a 'Model Police Station' and examine the amenities vis-à-vis conventional policestations.
11. To examine steps being taken for rehabilitation of former convicts and suggest improvements.
12. To prepare a report on interrogation cells and suggestimprovements.

Suggested Readings

1. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton(2005).
2. D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton(2002).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
4. J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester(1997).
5. R. Gupta, *Sexual Harassment at Workplace*, LexisNexis, Gurgaon(2014).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

DC01FS- 1A1–AECC-1: Environmental Science

Credits: 2

Objectives: :the main objective is to Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

Learning outcome:

The Environmental Studies major prepares students for careers as leaders in understanding and addressing complex environmental issues from a problem- oriented, interdisciplinary perspective

Course content:

Unit 1 : Introduction to environmental studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

Unit 2 : Ecosystems

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems:
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 3 : Natural Resources : Renewable and Non---renewable Resources

1. Land resources and landuse change; Land degradation, soil erosion and desertification.
2. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
3. Water : Use and over---exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter---state).
4. Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4 : Biodiversity and Conservation

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega---biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man---wildlife conflicts, Biological invasions; Conservation of biodiversity: In---situ and Ex---situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5 : Environmental Pollution

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

Unit 6 : Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit 7 : Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Unit 8 : Field work

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site---Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems---pond, river, Delhi Ridge, etc.

Suggested Readings:

- Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
- Gadgil, M., & Guha, R.1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999.*Global Ethics and Environment*, London, Routledge.
- Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll.*Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science,* 339: 36---37.
- McCully, P. 1996. *Rivers no more: the environmental effects of dams*(pp. 29---64). Zed Books.
- McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

- Odum, E.P., Odum, H.T. & Andrews, J. 1971.*Fundamentals of Ecology*. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
- Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012.*Environment*. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
- Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology*: *Voices from the Tropics*. John Wiley & Sons.
- Thapar, V. 1998. *Land of the Tiger*: *A Natural History of the Indian Subcontinent*.
- Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
- Wilson, E. O. 2006.*The Creation: An appeal to save life on earth*. New York: Norton.
- World Commission on Environment and Development. 1987.*Our Common Future*. Oxford University Press.

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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 1G1

GE-1:Physics **Credits: 4**

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

a. Properties of waves including electromagnetic waves andsound waves.
b. Properties of Light
c. Uncertainty Principle
d. Bohr atom and Quantum Mechanical model of atom
e. Elasticity and Thermal conductivity

*****Only the theoretical concepts will be covered.

Unit-1:

- Wave Motion, General Equation of Wave Motion and Plane Progressive Harmonic Wave,
- Energy Density for a Plane Progressive Wave, Intensity of a Wave.
- Transverse Waves inStretched Strings, Modes of Transverse Vibrations of Strings and Longitudinal Waves in Rods and Gases,
- Fourier's Theorem, Wave Velocity and Group Velocity

Unit-2:

- Intensity of Sound- Decibel and Bell, Loudness of Sound, Noise Pollution.
- Ultrasonics:Production of Ultrasonic Waves – Piezo- Electric Crystal Method.
- Determination of Velocityof Ultrasonic Waves in a Liquid - Acoustic Grating and Application of Ultrasonic Waves.
- Reverberation, Sabine's Formula (Derivation not required) and Absorption Coefficient.
- Acoustics of Buildings

Unit-3:

- Waves in one dimension, The wave equation and sinusoidal waves
- Boundary conditions :reflection and transmission and Polarization
- Electromagnetic waves in vacuum, Waveequation for E and B, monochromatic plane waves in vacuum, energy and momentum of Electromagnetic waves.
- Pointing vector - Electromagnetic waves in matter, Propagation throughlinear media, reflection and transmission at normal incidence.

Unit-4:

- Electromagnetic waves, black body radiation, ultraviolet catastrophe.
- Photoelectriceffect, nature of light, wave particle duality, Compton Effect.
- De Broglie waves, waves of probability, phase velocity &group velocity and particle diffraction.
- Uncertainty principle I, Uncertainty principle II, Application of the uncertainty principle, Energy and time uncertainty.
- The Bohr atom-energy levels and spectra, correspondence principle, nuclear motion and atomic excitation.
- Quantum mechanical model of atom.

Unit-5:

- Elasticity: Hooke's law - Relationship between three moduli of elasticity (qualitative) and stress -strain diagram.
- Poisson's ratio –Factors affecting elasticity, Bending moment and depression of a cantilever.
- Young's modulus by uniform bending.
- Modes of heat transfer- thermal conductivity, Newton's law of cooling and Linear heat flow, Lee's disc method, Radial heat flow and Rubber tube method.
- Conduction through compound media

Practicals **Credits: 2**

1. Measurement of diameter using Vernier Caliper
2. Determination of Spring Constant
3. Measurement of diameter/thickness using Screw Gauge
4. Refractive Index of a prism
5. Dispersion by a prism.
6. Spring mass oscillator
7. Coefficient of damping, relaxation time, quality factor of a damped SHM using simple pendulum
8. Viscosity of liquid by damping torsional oscillation method.
9. Surface tension and interfacial tension by drop-weight method
10. Damping of liquid by torsional oscillation method.
11. Capacitance of a capacitor using ballistic galvanometer
12. Black box experiment.

Suggested readings:

1. P.K.Srivatsava, *Mechanics*, New Age International (P) Ltd. - 1997.
2. B. Saraf et al. *Physics through experiments Vol. I & I,* Vikas Publishers, India, 1992
3. Halliday and Resnick, *Fundamentals of Physics*, sixth edition, John Wiley and son, 2005.
4. A.K.Ghatak and K.Thyagarajan, *Contemporary Optics* –MacMillan India Ltd., 1984.
5. A.K.Ghatak and K.Thyagarajan, *Optical Electronics* - Cambridge University Press, 1989.
6. Subramanyam and Brijlal, *Optics*, S Chand & Company, New Delhi, 1983.
7. AjoyGhatak, *Optics*, Tata McGraw Hill Publishing Company Ltd., III Edition, 2009,New Delhi.
8. D.P. Khandelwal, *Optics and Atomic Physics* – Himalaya Publishing House, Mumbai.2003.
9. Halliday and Resnick, Wiley, *Fundamentals of Physics* sixth edition – 2001
10. Young and Fredmann, Addison Wiley, *University Physics*– ninth edition
11. H C verma, *Concepts of Physics Vol I & II* Bharathi Bhavan, 2002
12. Mathur, S. Chand &Co Ltd., *Mechanics* 1994
13. S. Hans, S. P. Puri, *Mechanics.* TMH publications, 1984
14. K. Bhattacharjee. *Text book of Sound.*
15. P.K. Chakraborty and S. B. Choudhury. *Sound.*
16. D. Chattopadhyay and P.C. Rakshit, *Vibrations, Waves and Acoustics*
17. B. Ghosh, S. Chand & Co. Ltd. *Principles of Acoustics.*
18. Sahlgal R L, S. Chand & Co. Ltd., *Text book on sound,* 1982
19. David J Griffiths, *Introduction to Electrodynamics.* Pentice hall of India, New Delhi, 1993.
20. B. B. Laud, *Electrostatics and Magnetostatic.* Wiley Eastern Ltd, second edition, 1993.

Teaching Learning Methodology

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The exhaustive list of methodologies is listed in point no.7. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course.

Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

SEMESTER-II
PAPER: DC01FS- 2C1

C-3: Criminal Law **Credits:4**

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

a. Elements of Criminal Procedure Code related to forensicscience.
b. Acts and provisions of the Constitution of India related to forensicscience.
c. Acts governing socio-economiccrimes.
d. Acts governing environmentalcrimes.

Unit 1: Law to Combat Crime

Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts.
Criminal Procedure Code. Cognizable and non-cognizable offences.
Bailable and non-bailable offences.
Sentences which the court of Chief Judicial Magistrate may pass.
Summary trials – Section 260(2).
Judgements in abridged forms – Section 355.
Indian Penal Code pertaining to offences against persons – Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362.
Sections 375 & 377 and their amendments.
Indian Penal Code pertaining to offences against property Sections – 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497, 499, 503, 511.
Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination ofwitnesses.
Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141.
Section 293 in the code of criminal procedure.

Unit 2: Constitution of India

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

Unit 3: Acts Pertaining to Socio-economic and Environmental Crimes

Narcotic, Drugs and Psychotropic Substances Act. Essential Commodity Act.
Drugs and Cosmetics Act. Explosive Substances Act. Arms Act.

Dowry Prohibition Act.
Prevention of Food Adulteration Act. Prevention of Corruption Act.
Wildlife Protection Act. I.T. Act. Environment Protection Act. Untouchability Offences Act

Practicals **Credits:2**

1. To prepare a schedule of five cognizable and five non-cognizableoffences.
2. To study the powers and limitations of the Court of Judicial Magistrate of FirstClass.
3. To prepare a schedule of the offences which may be tried under Section 260(2) of Criminal ProcedureCode.
4. To study a crime case in which an accused was punished on charge of murder under Section302.
5. To study a crime case in which an accused was punished on charge of rape under Section375.

6. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian EvidenceAct.
7. To cite a case wherein a person was detained under Article 22(5) of the Indian Constitution. Express your views whether the rights of the person as enlisted in this Article were taken careof.
8. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedlyviolated.
9. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
10. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which theybelonged.
11. To study a case in which Drugs and Cosmetic Act wasinvoked.
12. To study a case in which Explosive Substances Act wasinvoked.
13. To study a case in which Arms Act wasinvoked.
14. In light of Section 304B of the Indian Penal Code, cite a case involving dowrydeath.
15. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution ofIndia.

Suggested Readings

1. D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton(1999).
2. Vipa P. Sarthi, *Law of Evidence*, 6th Edition, Eastern Book Co., Lucknow(2006).
3. A.S. Pillia, *Criminal Law*, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai(1983).
4. R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi(1965).
5. (Chief Justice) M. Monir, *Law of Evidence*, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi(2002).

Teaching Learning Methodology

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 2C2

C-4: Forensic Psychology **Credits: 4**

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

a. The overview of forensic psychology and itsapplications.
b. The legal aspects of forensicpsychology.
c. The significance of criminalprofiling.
d. The importance of psychological assessment in gauging criminal behavior.
e The tools and techniques required for detection ofdeception.
f. The critical assessment of advanced forensic techniques like polygraphy, narco analysis and brain electrical oscillationsignatures.

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Unit 1: Basics of Forensic Psychology
Definition and fundamental concepts of forensic psychology and forensic psychiatry.
Psychology and law. Ethical issues in forensic psychology.
Assessment of mental competency. Mental disorders and forensic psychology.
Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling.
Psychology in the courtroom, with special reference to Section 84 IPC.

Unit 2: Psychology and Criminal Behavior
Psychopathology and personality disorder. Psychological assessment and its importance.
Serial murderers. Psychology of terrorism.
Biological factors and crime – social learning theories, psycho-social factors, abuse.
Juvenile delinquency – theories of offending (social cognition, moral reasoning),
Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Unit 3: Detection of Deception
Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis.
Polygraphy – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test.
Narco analysis and brain electrical oscillation signatures – principle and theory, ethical and legal issues.

Practicals **Credits:2**

1. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.
2. To prepare a report on relationship between mental disorders and forensicpsychology.
3. To review a crime case involving serial murders. Comment on the psychological traits of theaccused.
4. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual asjuvenile.
5. To study a criminal case in which hypnosis was used as a means to detectdeception.
6. To prepare a case report on thematic appreciationtest.
7. To prepare a case report on Minnesota multiphasic personality inventorytest.
8. To prepare a case report on thematic appreciationtest.
9. To prepare a case report on word associationtest.
10. To prepare a case report on Bhatia's battery of performance test ofintelligence.
11. To cite a criminal case in which narco analysis was used as a means to detectdeception.

Suggested Readings

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York(1995).
2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
3. J.C. DeLadurantey and D.R. Sullivan, *Criminal Investigation Standards*, Harper & Row, New York(1980).
4. J. Niehaus, *Investigative Forensic Hypnosis*, CRC Press, Boca Raton(1999).
5. E.Elaadin*EncyclopediaofForensicScience,Volume2*,J.A.Siegel,P.J.Saukkoand G.C. Knupfer (Eds.), Academic Press, London (2000).

Teaching Learning Methodology

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

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	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

DC01FS- 2A2 ENGLISH COMMUNICATION

Credits: 02

Goals:

- To communicate effectively and appropriately in real-life situation.
- To use English effectively for study purpose across the curriculum.
- To develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.

Learning Outcome:

On completion of this course, a student should be able:

- To communicate effectively orally and in writing.
- To identify common errors and rectify them.
- To apply verbal and non-verbal communication techniques in the professional environment

Unit 1: Introduction

- Theory of Communication
- Types and modes of Communication

Unit 2: Language of Communication:

- Verbal and Non-verbal (Spoken and Written)
- Personal, Social and Business
- Barriers and Strategies
- Intra-personal, Inter-personal and Group communication

Unit 3: Speaking Skills

- Monologue
- Dialogue
- Group Discussion
- Effective Communication/ Mis- Communication
- Interview
- Public Speech

Unit 4: Reading and Understanding

- Close Reading
- Comprehension
- Summary Paraphrasing
- Analysis and Interpretation
- Translation (from Indian language to English and vice-versa)
- Literary/Knowledge Texts

Unit 5: Writing Skills

- Documenting
- Report Writing
- Making notes
- Letter writing

Recommended Reading:

- Green, David. (2009). *Contemporary English Grammar: Structure and Composition*. New Delhi: Macmillan.
- Murphy, Raymond. (1994). *Intermediate English Grammar*. Cambridge University Press.
- A.V. Martinet, A.J. Thomson. (1986). *A Practical English Grammar*. Oxford University Press.
- Iyengar, Sreenivasa. K.R. (1984). *Indian Writing in English*. New Delhi: Sterling Publishers.
- Mehrotra, A.K. (2008). *Concise History of Indian Literature in English*. New Delhi: Permanent Black.

Teaching Learning Methodology

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- The exhaustive list of methodologies is listed in point no.7. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course.
- **Examination Scheme/Assessment (Written)**

	Marks
Internal Assessment	25
Final Examination	75
	100

- **Continuous Internal Assessment (CIA)**

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

- **Examination Scheme/Assessment** Question Pattern for the internal exam will be as below

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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

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- **Examination Scheme/Assessment**Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

DC01FS- 2A3: Hindi **Credits 2**

सीखने के उद्देश्य

- बुनियादी सिध्दांत प्रदान करना, भाषा की तकनीकी को समझना ।
- भाषा की योग्यता को संचार रूपी उपयोग मे लाना ।
- मित्रवत संवाद की योग्यता औपचारिक तथा अनौपचारिक के रूप मे ।

Learning outcome: Students, at the end of the course, would be able to unlock the communicator in them by using, national language Hindi appropriately and with confidence for further studies or in professional spheres where these languages are the indispensable tool of communication

UNIT- I

- भाषा का परिचय
- मूल शब्द का अवधारण
- वाक्य की संकल्पना
- भाषा का सही उपयोग (बातचीत)

UNIT- II

- मौखिक रूप से औपचारिक संवाद भाग–I
- मौखिक रूप से अनौपचारिक संवाद भाग–II

UNIT- III

- भाषा की संरचना भाग–I
- भाषा की संरचना भाग–I

UNIT- IV

लिखने की कौशल

- अनुवाद – भाग– I
- अनुवाद – भाग–II
- अनुवाद का वितरण –* अंग्रेज़ी से हिंदी मे अनुवाद ,

  *हिंदी से अंग्रेजी में अनुवाद
- संदर्भ पुस्तकें:

1. Krishna Kumar Agarwal, Teach your selfhindi, 4thedn :Manoj Publications ; New Delhi ; 2018

2. Kavi tha Kumar, Hindi for Non hindi speaking people, 3rdedn : Rupa Publications India Pvt Ltd ; New Delhi ; 2016

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

DC01FS- 2A4: KANNADA

Credit 2

ಕಲಿಕೆಯ ಉಪಯೋಗ :

*** ಕನ್ನಡ ಅಕ್ಷರವನ್ನು ಓದುವುದಕ್ಕೆ ಮತ್ತು ಬರೆಯುವುದಕ್ಕೆ ಸಾಧ್ಯವಾಗುತ್ತದೆ. ಉತ್ತಮ ಸಂವಹನವನ್ನು ನಡೆಸಲು ಸಾಧ್ಯವಾಗುತ್ತದೆ.**

ಪಠ್ಯ ಭಾಗದ ಉದ್ದೇಶ :

*** ಕಚೇರಿಗಳಲ್ಲಿ ವ್ಯವಹರಿಸುವುದಕ್ಕೆ ಸಂಬಂಧಪಟ್ಟ ಹಾಗೆ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಲಾಗಿದೆ. ಜಾಹೀರಾತಿನ ಬಗ್ಗೆ ಉಲ್ಲೇಖವಿದೆ.**

ಘಟಕ–೧	**–**	**ಕನ್ನಡ ಅಕ್ಷರಗಳು** **ಸ್ವರಗಳು, ವ್ಯಂಜನಗಳು**
ಘಟಕ–೨	**–**	**ತಾಂತ್ರಿಕ ಶಬ್ದಗಳು** **ವ್ಯಾಪಾರ ವ್ಯವಹಾರಕ್ಕೆ ಸಂಬಂಧಪಟ್ಟಂತಹ** **ಶಬ್ದಗಳು**
ಘಟಕ–೩	**–**	**ವ್ಯವಹಾರ ಪತ್ರಗಳು, ವಾಣಿಜ್ಯ ಪತ್ರಗಳು** **ಉದ್ಯೋಗಕ್ಕಾಗಿ ಅರ್ಜಿ**
ಘಟಕ–೪	**–**	**ಆಡಳಿತ ಕನ್ನಡ – ಕನ್ನಡ ಶಬ್ದ ಸಂಪತ್ತು** **ವರದಿ, ಎಚ್ಚರಿಕೆ ಪತ್ರ**
ಘಟಕ–೫	**–**	**ಸಂವಹನ ಕನ್ನಡ** **ಸಂವಹನ ನಿರ್ವಹಣಾ ಕೌಶಲ್ಯಗಳು** **ಆಲಿಸುವ ಕೌಶಲ್ಯಗಳು**

ಪರಾಮರ್ಶನ ಗ್ರಂಥಗಳು :

*** ಕನ್ನಡ ಶಬ್ದ ಸಂಪತ್ತು ಸಾತೇನ ಹಳ್ಳಿ ಮಲ್ಲಿಕಾರ್ಜುನ, ತನು–ಮನು ಪ್ರಕಾಶನ, ಮೈಸೂರು – ೨೦೦೩**

*** ಕನ್ನಡ ವ್ಯಾಕರಣ ,ಲೇಖಕರು–ಶುಭ ಟಿ. ನಾರಾಯಣ ಅಯ್ಯಂಗಾರ್ – ೨೦೦೦**

*** ಎನ್ ಗೋಪಾಲಕೃಷ್ಣ ಉಡುಪ, ಕನ್ನಡ ವ್ಯಾಕರಣ ಮತ್ತು ರಚನೆ, ೬ನೇ ಮುದ್ರಣ, ಎಂ.ಸಿ.ಸಿ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು – ೨೦೧೩**

ಬೋಧನಾ ವಿಧಾನ

*** ಗದ್ಯ ಮತ್ತು ಪ್ರಬಂಧವನ್ನು ವಿಮರ್ಶಿಸುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಆಸಕ್ತಿಯನ್ನು ಉಂಟು ಮಾಡಿಸಿ ಅರ್ಥಮಾಡಿಸುವುದು.**

*** ಕೆಲವೊಂದು ವಿಷಯ ಪ್ರೋಜೆಕ್ಟರ್ ಮೂಲಕ ಇನ್ನೂ ಸಮರ್ಪಕವಾಗಿ ತಿಳಿಸಿಕೊಡುವುದು.**

*** ಪ್ರಶ್ನೆ ಕೇಳುವ ಮೂಲಕ ವಿದ್ಯಾರ್ಥಿಗಳ ಜ್ಞಾನವನ್ನು ಪರೀಕ್ಷಿಸಿಕೊಳ್ಳುವುದು.**

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	100

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	Total		50 Marks

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Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
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	Total		75 Marks

PAPER: DC01FS-2G1

GE-2: Chemistry

Credits: 4

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

a. The basic concepts of organic chemistry
b. Stereochemistry
c. Concepts relating to inorganic chemistry
d. Concepts relating to solutions and solvents

Unit 1:

- Basic concepts in organic chemistry, Bond cleavage – homolytic and heterolytic.
- Types of reagents – electrophilic and nucleophilic reagents. Reactive intermediates - generation and relative stabilities of carbocation, carbanion, carbon free radicals and carbenes – explanation for stability and reactivity based on inductive, resonance and hyperconjugation effects.
- Types of reactions - addition, substitution and elimination.
- Concept of isomerism - structural isomerism, stereo isomerism - geometrical and optical isomerism.
- Aliphatic Hydrocarbons: Alkanes, cyclo -alkanes, alkenes and alkynes.
- Aromatic compounds: Stability and general features.

Unit 2:

- Stereochemistry: Elements of symmetry in chiral and achiral molecules, chirality, stereogenic center. Fischer projection formulae.
- Enantiomers: Optical activity; use of +/–, d/l and D/L notations. Properties of enantiomers, chiral and achiral molecules with two stereogenic centers. Meso compounds. Cahn-Ingold-Prelog sequence rules: R, S system of nomenclature.
- Diastereomers: Threo and Erythro isomers. Racemisation and resolution. Relative and absolute configuration.
- Geometric isomerism: Determination of configuration of geometric isomers. Cis & trans, E, Z system of nomenclature.

Unit 3:

- Carbohydrates: Introduction and classification. Monosaccharides: Aldoses, structures of all the D-aldohexoses. Elucidation of open chain structure of D-glucose. Mechanism of mutarotation and anomeric effect. Elucidation of ring structure of D-glucose in detail. Ketoses: Fructose, interconversion of glucose and fructose.
- Disaccharides: Glycosidic bond. Structures of maltose, lactose and sucrose-Haworth and conformational structures.
- Terpenes and terpenoids: Occurrence, classification and isoprene rule. Elucidation of structure and synthesis of citral and zingiberene. Structures of limonene, menthol, □-terpineol, camphor, □- carotene, Vitamins-A and their uses.
- Alkaloids: Introduction, classification and general characteristics. Structural elucidation and synthesis of nicotine.Structures and uses of ephedrine, caffeine, cocaine, atropine, quinine and morphine.

Unit 4:

- Organo-metallic compounds: Definition and Classification with appropriate examples based on nature of metalcarbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p - acceptorbehaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).
- A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na+ , K+ and Mg2+ ions: Na/K pump; Role of Mg2+ ions in energy production and chlorophyll. Role of Ca2+ in blood clotting, stabilization of protein structures and structural role (bones).

Unit 5:

- Errors: Classification, minimization of determinate errors, accuracy and precision. Significant figures and their computations. Equivalent weights of acids, bases, salts, oxidising and reducing agents. Methods of expressing concentration of solutions in terms of Normality and Molarity. Numerical problems.
- Solvent extraction: Distribution law, Determination of distribution ratio Batch extraction, continuous extraction, discontinuous extraction, counter current extraction.

Practicals: **Credits: 2**

1. Preparation of standard solution of potassium dichromate and estimation of Ferrous ammonium sulphate using diphenylamine indicator (internal indicator method)
2. Preparation of standard solution of potassium dichromate and estimation of Ferrous ammonium sulphate using potassium ferricyanide indicator (External indicator method)
3. Preparation of standard solution of sodium oxalate and estimation of potassium permanganate solution.
4. Preparation of standard solution of potassium dichromate and estimation of sodium thiosulphate solution using starch indicator.
5. Preparation of standard solution of Ferrous ammonium sulphate solution and estimation of potassium permanganate solution.
6. Estimation of chloride in a given solution using a standard silver nitrate solution and potassium chromate indicator.
7. Determination of available chlorine present in a given sample of bleaching powder
8. Determination of partition co-efficient of Iodine between water and Carbon tetra chloride.
9. Determination of CST of phenol-water system.
10. Estimation of carbonate and bicarbonate in a given mixture by Warder's method.
11. Estimation of Ferrous and Ferric ions using standard potassium dichromate solution.

Suggested Readings:

1. Organic Chemistry by Morrison and Boyd. 6thEdn. Prentice Hall publication.
2. Advanced Organic Chemistry by Solomon. 8thEdn. Wiley India Pvt. Ltd.
3. Nanotechnology basic science and emerging technology by Mick Wilson, KamaliKannangara, Geoff smith (2002) CRC Press.
4. Nanotechnology-fun and easy way to explore the science of matter, smallest particles by Richard Booker, Earl Boysen. (2005) Wiley Dreamtech.
5. Basic Solid state chemistry by AR West. 2ndEdn. Wiley Publishers.
6. Forensic Science in Criminal Investigations & Trials by Dr. B. R. Sharma, Universal Law Publishing Co. Pvt. Ltd., Delhi (4th Edition 2005).
7. An introduction to Forensic Science by Saferstein, R. 1976
8. Forensic Issues in Alcohol Testing by Steven B. Karch, Edition: Illustrated. Published by CRC Press (2007)
9. Clark, E.G. C. : Isolation and identification Drugs, Vol. I and Vol. II (1986).

Teaching Learning Methodology
Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions and field visits.

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

SECOND YEAR

SEMESTER-III
PAPER: DC01FS- 3C1

C-5: ForensicDermatoglyphics **Credits: 4**

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

a. The fundamental principles on which the science of fingerprinting isbased.
b. Fingerprints are the most infallible means ofidentification.
c. The world's first fingerprint bureau was established inIndia.
d. The method of classifying criminal record by fingerprints was worked out in India, and byIndians.
e. The physical and chemical techniques of developing fingerprints on crime scene evidence.
f. The significance of foot, palm, ear and lipprints.

Unit 1: Basics of Fingerprinting
Introduction and history, with special reference to India.
Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters/minutiae. Plain and rolled fingerprints.
Classification and cataloguing of fingerprint record. Automated Fingerprint Identification System. Significance of poroscopy and edgeoscopy.

Unit 2: Development of Fingerprints
Latent prints. Constituents of sweat residue.
Latent fingerprints' detection by physical and chemical techniques.
Mechanism of detection of fingerprints by different developing reagents.
Application of light sources in fingerprint detection.
Preservation of developed fingerprints. Digital
imaging for fingerprint enhancement.
Fingerprinting the deceased. Developing fingerprints on gloves.

Unit 3: Other Impressions
Importance of footprints. Casting of foot prints, Electrostatic lifting of latent foot prints. Palm prnts.
Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance. Palm prints and their historical importance.

Practicals **Credits:2**

1. To record plain and rolledfingerprints.
2. To carry out ten digit classification offingerprints.
3. To identify different fingerprintpatterns.
4. To identify core anddelta.
5. To carry out ridge tracing and ridgecounting.

6. To investigate physical methods of fingerprintdetection.
7. To investigate chemical methods of fingerprintdetection.
8. To use different light sources for enhancing developedfingerprints.
9. To prepare cast of footprints.

Suggested Readings

1. J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton(1983).
2. D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton(2000).
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton(2004).
4. Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton(2013).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 3C2

C-6: Technological Methods inForensicScience **Credits: 4**

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

a. The importance of chromatographic and spectroscopic techniques in processing crime sceneevidence.
b. The utility of colorimetry, electrophoresis and neutron activation analysis in identifying chemical and biologicalmaterials.
c. The significance of microscopy in visualizing trace evidence and comparing it with controlsamples.
d. The usefulness of photography and videography for recording the crimescenes.

Unit 1: Instrumentation

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

Unit 2: Microscopy

Fundamental principles. Different types of microscopes. Electron microscope. Comparison Microscope. Forensic applications of microscopy.

Unit 3: Forensic photography

Basic principles and applications of photography in forensic science.
3D photography. Photographic evidence. Infrared and ultraviolet photography. Digital photography. Videography. Crime scene and laboratory photography.

Practicals **Credits:2**

1. To determine the concentration of a colored compound by colorimetryanalysis.
2. To carry out thin layer chromatography of inksamples.
3. To carry out separation of organic compounds by paperchromatography.
4. To identify drug samples using UV-Visiblespectroscopy.
5. To take photographs using differentfilters.
6. To take photographs of crime scene exhibits at different angles.
7. To record videography of a crimescene.

Suggested Readings

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

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 3C3

C-7: Criminalistics **Credits:4**

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

a. The methods of securing, searching and documenting crimescenes.
b. The art of collecting, packaging and preserving different types of physical and trace evidence at crimescenes.
c. The legal importance of chain ofcustody.
d. The tools and techniques for analysis of different types of crime sceneevidence.

Unit 1: Crime Scene Management

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

Documentation of crime scenes – photography, videography, sketching and recording notes. Duties of first responders at crime scenes. Coordination between police personnel and forensic scientists at crime scenes. The evaluation of 5Ws (who?, what?, when?, where?, why?) and 1H (how?). Crime scenelogs.

Unit 2: Crime Scene Evidence

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

Unit 3: Forensic Physics

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

Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases.

Fibre evidence – artificial and man-made fibres. Collection of fibre evidence. Identification and comparison of fibres.

Soil evidence – importance, location, collection and comparison of soil samples.

Cloth evidence – importance, collection, analysis of adhering material. Matching of pieces.

Toolmark evidence. Classification of toolmarks. Forensic importance of toolmarks. Collection, preservation and matching of toolmarks. Restoration of erased serial numbers and engraved marks.Forensicgemmology.

Practicals **Credits:2**

1. To prepare a report on evaluation of crimescene.
2. To reconstruct a crime scene (outdoor andindoor).
3. To compare soil samples by density gradientmethod.
4. To compare paint samples by physical matchingmethod.
5. To compare paint samples by thin layer chromatographymethod.
6. To compare glass samples by refractive indexmethod.
7. To identify and compare toolmarks.
8. To compare cloth samples by physicalmatching.

Suggested Readings

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

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 3A1

AEEC-1: IntroductiontoBiometry **Credits: 2**

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

a. The basis ofbiometry.
b. The classification of biometricprocesses.
c. The importance of behavioralbiometry.

Unit 1: Fundamental Aspects
Definition, characteristics and operation of biometric system. Classification of biometric systems – physiological and behavioral. Strength and weakness of physiological and behavioral biometrics. Multimodal biometrics. Key biometric processes – enrollment, identification and verification. Positive and negative identification. Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV. Biometric versus traditional technologies.

Unit 2: Physiological Biometrics
Fingerprints, palm prints, iris, retina, geometry of hand and face.

Unit 3: Behavioral Biometrics
Handwriting, signatures, keystrokes, gait and voice.

Suggested Readings

1. S. Nanavati, M. Thieme and R. Nanavati, *Biometrics*, Wiley India Pvt. Ltd.(2002).
2. P. Reid, *Biometrics for Network Security*, New Delhi(2004).
3. J.R. Vacca, *Biometric Technologies and Verification Systems*, Butterworth-Heinemann, Oxford(2007).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 3G1

GE-3: Computer Science **Credits: 4**

Learning Objectives: After studying this paper the students will –

a. *Identify various devices and their working principles.*
b. *Define various computer applications.*
c. *Able to use the MS office applications.*
d. *Able to understand and solve the problems using python environment.*

Unit 1

Computer Basics: Introduction, Characteristics computers, Evolution computers, Generation of computers, Classification of computers, the computer system, Application of computers.
Computer Architecture: Introduction, Central processing Unit- ALU, Registers, Control Unit, system bus, main memory Unit, cache memory, communication between various Units of a computer system.
Components inside a computer system– System case, Power supply, Mother board, BIOS, Ports and Interfaces, Expansion card, Ribbon cable, Memory chips, Processors.

Unit 2

Computer memory and storage: Introduction, memory representation, memory hierarchy, Random access memory, Types of RAM, Read-only memory, Types of ROM,RAM, ROM and CPU interaction. Secondary Storage: Types of secondary storage device - Magnetic tape, magnetic disk, Floppy disk, Hard disk, Advantages and disadvantages of magnetic disk, Optical disk, Types- CD, DVD, Blu ray disk, Advantages and disadvantages of optical disk, Magneto-optical disk, Memory stick, Universal serial bus, Mass storage devices.Input devices: Introduction, Types of input devices, Keyboard, Mouse, Introduction to Track ball, Joystick light pen, Touch screen and track pad. Speech recognition, digital camera, webcam, flatbed scanner, Optical character recognition, Optical Mark Recognition, Magnetic ink character recognition, Bar code reader.
Output devices: Types of output, Classification of output devices, Printers- Dotmatrix, drum printer, Ink jet, Laser, Hydra, Plotter, Monitor- CRT, displaying graphics on CRT, Colour display on CRT, LCD, Differences between LCD and CRT, Other types of monitors, Voice response, Projector, Electronic white board.

Unit 3

Introduction to Computer software: Introduction, software definition, relationship between software and hardware, software categories, Installing and uninstalling software, software piracy, software terminologies. Word processing software, Spreadsheet software: Excel environment, copying cells using Fill handle, dragging cells, Formulas and functions, Inserting Charts, sorting.Presentation software: Introduction, PowerPoint environment, creating a new presentation, working with different views, using masters, adding animation, adding transition, running slides. Microsoft Access: Access environment, Database objects.

Unit 4

Programming using python, Variables and Types, Lists, Basic Operators, String Formatting, Basic String Operations, Conditions, Loops, Functions, Classes and Objects, Dictionaries, Modules and Packages.

Practicals: **Credit: 2**

1. Python program to find the area of a triangle
2. Python program to swap two variables
3. Python program to convert kilometres to miles
4. Python program to convert Celsius to Fahrenheit
5. Python Program to Check if a Number is Odd or Even
6. Python Program to Check Leap Year
7. Python Program to Check Prime Number
8. Python Program to Find the Factorial of a Number
9. Python Program to Print the Fibonacci sequence
10. Python Program to Convert Decimal to Binary, Octal and Hexadecimal
11. Python Program To Find ASCII value of a character
12. Python Program to Find Factorial of Number Using Recursion
13. Python program to sort the elements of an array in ascending order
14. Python program to sort the elements of an array in descending order
15. Python Program to Calculate the Average of Numbers in a Given List
16. Python Program to Reverse a Given Number
17. Python Program to Take in the Marks of 5 Subjects and Display the Grade
18. Python Program to Print all Numbers in a Range Divisible by a Given Number
19. Python Program to Accept Three Digits and Print all Possible Combinations from the Digits
20. Python Program to Print Odd Numbers Within a Given Range
21. Python Program to Find the Sum of Digits in a Number
22. Python Program to Find the Smallest Divisor of an Integer
23. Python Program to Count the Number of Digits in a Number
24. Python Program to Check if a Number is a Palindrome
25. Python Program to Print all Integers that Aren't Divisible by Either 2 or 3 and Lie between 1 and 50.
26. Python Program to Compute Simple Interest Given all the Required Values
27. Python Program to Check Whether a Given Year is a Leap Year
28. Python Program to Read Height in Centimeters and then Convert the Height to Feet and Inches
29. Python Program to Generate all the Divisors of an Integer
30. Python Program to Print Table of a Given Number
31. Python Program to Print Sum of Negative Numbers, Positive Even Numbers and Positive Odd numbers in a List
32. Python Program to Print Largest Even and Largest Odd Number in a List
33. Python Program to Form an Integer that has the Number of Digits at Ten's Place and
34. the Least Significant Digit of the Entered Integer at One's Place
35. Python Program to Find Those Numbers which are Divisible by 7 and Multiple of 5 in a Given Range of Numbers
36. Python Program to Check if a Number is an Armstrong Number
37. Python Program to Print the Pascal's triangle for n number of rows given by the user
38. Python Program to Find the LCM of Two Numbers
39. Python Program to Find the GCD of Two Numbers
40. Python Program to Find the Sum of First N Natural Numbers
41. Python Program to Determine all Pythagorean Triplets in the Range
42. Python Program to Find Whether a Number is a Power of Two
43. Python Program to Replace all Occurrences of ‘a’ with $ in a String
44. Python Program to Remove the nth Index Character from a Non-Empty String
45. Python Program to Detect if Two Strings are Anagrams

46. Python Program to Form a New String where the First Character and the Last Character have been Exchanged
47. Python Program to Count the Number of Vowels in a String
48. Python Program to Take in a String and Replace Every Blank Space with Hyphen
49. Python Program to Calculate the Length of a String Without Using a Library Function
50. Python Program to Remove the Characters of Odd Index Values in a String
51. Python Program to Calculate the Number of Words and the Number of Characters Present in a String
52. Python Program to Count Number of Lowercase Characters in a String
53. Python Program to Check if a String is a Palindrome or Not
54. Python Program to Calculate the Number of Upper Case Letters and Lower Case Letters in a String
55. Python Program to Check if a String is a Pangram or Not
56. Python Program to Accept a Hyphen Separated Sequence of Words as Input and Print the Words in a Hyphen-Separated Sequence after Sorting them Alphabetically
57. Python Program to Calculate the Number of Digits and Letters in a String
58. Python Program to Form a New String Made of the First 2 and Last 2 characters From a Given String
59. Python Program to Count the Occurrences of Each Word in a Given String Sentence
60. Python Program to Check if a Substring is Present in a Given String

Suggested Reading

- A K Sharma, Computer Fundamentals and Programming in C, Universities Press, 2nd edition, 2018
- Peter Norton, Introduction to Computers, 7th edition, Tata McGraw Hill Publication, 2011
- Anita Goel, Computer Fundamentals, Pearson Education, 2011.
- ITL Education Solution Limited, Introduction to Information Technology, Pearson- Second Edition.
- Hall T, Stacey JP. Python 3 for Absolute Beginners. Apress; 2010 Mar 10.

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	Total		75 Marks

SEMESTER-IV
PAPER: DC01FS- 4C1

C-8: Forensic Chemistry

Credits: 4

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

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.
b. The methods of analyzing contaminants in petroleum products.
c. The method of searching, collecting, preserving and analyzing arsonevidence. d. The classification of explosives, including the synthesis and characterization of representativeanalogs.
e. The significance of bomb scenemanagement. f. The techniques of locating hiddenexplosives.
g. The classification and characteristics of the narcotics, drugs and psychotropic substances.

Unit 1: Petroleum and Petroleum Products
Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products.
Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.

Unit 2: Cases Involving Arson
Chemistry of fire. Conditions for fire. Fire scene patterns. Location of point of ignition. Recognition of type of fire. Searching the fire scene. Collection and preservation of arson evidence.
Analysis of fire debris. Analysis of ignitable liquid residue. Post-flashover burning. Scientific investigation and evaluation of clue materials. Information from smoke staining.

Unit 3: Explosives
Classification of explosives – low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents.
Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Blast waves. Bomb scene management.
Searching the scene of explosion. Mechanism of explosion. Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives.

Practicals **Credits:2**

1. To carry out analysis ofgasoline.
2. To carry out analysis ofdiesel.
3. To carry out analysis of keroseneoil.
4. To analyze arson accelerators.
5. To prepare a case report on a case involvingarson.
6. To carry out analysis of explosivesubstances.
7. To separate explosive substances using thin layerchromatography.
8. To prepare a case report on bomb scene management.

Suggested Readings

1. J.D. DeHaan, *Kirk's Fire Investigation*, 3rd Edition, Prentice Hall, New Jersey(1991).
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York(1995).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton(2013).
5. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in *Forensic Science*, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013).

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	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 4C2

C-9: QuestionedDocuments **Credits: 4**

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

a. The importance of examining questioned documents in crimecases.
b. The tools required for examination of questioneddocuments.
c. The significance of comparing hand writingsamples.
d. The importance of detecting frauds and forgeries by analyzing questioneddocuments.

Unit 1: Nature and Scope of Questioned Documents
Definition of questioned documents. Types of questioned documents. Preliminary examination of documents.
Basic tools needed for forensic documents' examination – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, visible spectral comparator, electrostatic detection apparatus.
Determining the age and relative age of documents.

Unit 2: Comparison of Documents
Comparison of handwriting. Development of individuality in handwriting. Natural variations and fundamental divergences in handwritings. Class and individual characterstics.
Merits and demerits of exemplar and non-exemplar samples during comparison of handwriting.
Standards for comparison of handwriting.
Comparison of paper, ink, printed documents, typed documents, Xeroxed documents.

Unit 3: Forgeries
Alterations in documents, including erasures, additions, over-writings and obliterations.
Indented and invisible writings. Charred documents.
Examination of counterfeit Indian currency notes, passports, visas and stamp papers.
Disguised writing and anonymous letters.

Practicals **Credits:2**

1. To identify handwritingcharacters.
2. To study natural variations inhandwriting.
3. To compare handwritingsamples.
4. To detect simulatedforgery.
5. To detect tracedforgery.
6. To study the line quality defects in handwritingsamples.
7. To examine the security features of currency notes, passports and plasticmoney.
8. To study alterations, obliterations and erasures in handwritingsamples.
9. To cite a case wherein Section 45 of Indian Evidence Act was invoked, seeking expert opinion for authentication of handwriting and/orsignatures.
10. To cite a case wherein Section 489A of the Indian Penal Code was invoked in context of fakecurrency.

Suggested Readings

1. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton (1982).
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, Foundation Press, New York(1995).
3. R.N. Morris, *Forensic Handwriting Identification: Fundamental Concepts and Principles*, Academic Press, London(2000).
4. E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants(1997).

Teaching Learning Methodology

Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions and field visits.

The exhaustive list of methodologies is listed in point no.7. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course.

Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 4C3

C-10: ForensicBiology **Credits:4**

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

a. The significance of biological and serologicalevidence.
b. The forensic importance of hairevidence.
c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crimeinvestigations.
d. How wildlife forensics aid in conserving naturalresources.
e. How forensic entomology assists in deathinvestigations.

Unit 1: Biological Evidence

Nature and importance of biological evidence.

Significance of hair evidence. Transfer, persistence and recovery of hair evidence. Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair.

Types and identification of microbial organisms of forensic significance.

Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance.

Unit 2: Wildlife Forensics

Fundamentals of wildlife forensic. Significance of wildlife forensic. Protected and endangered species of animals and plants. Illegal trading in wildlife items, such as skin, fur, bone, horn, teeth, flowers and plants. Identification of physical evidence pertaining to wildlife forensics. Identification of pug marks of variousanimals.

Unit 3: Forensic Entomology

Basics of forensic entomology. Insects of forensic importance. Collection of entomological evidence during death investigations.

Practicals **Credits:2**

1. To examine hair morphology and determine the species to which the hairbelongs.
2. To prepare slides of scale pattern of humanhair.
3. To examine human hair for cortex andmedulla.
4. To carry out microscopic examination of pollengrains.
5. To carry out microscopic examination ofdiatoms.
6. To cite a crime case in which diatoms have served as forensicevidence.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlifeforensics.

Suggested Readings

1. L. Stryer, *Biochemistry*, 3rd Edition, W.H. Freeman and Company, New York(1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, *Harper's Biochemistry*, APPLETON & Lange, Norwalk(1993).
3. S. Chowdhuri, *Forensic Biology*, BPRD, New Delhi (1971).
4. R. Saferstein, *Forensic Science Handbook*, Vol. III, Prentice Hall, New Jersey(1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton(1997).

Teaching Learning Methodology

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER DC01FS- 4A1

AEEC-2: Handwriting IdentificationandRecognition **Credits:2**

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

a. Important features in handwritingidentification.
b. Basis of handwriting characteristics.
c. Significance of forensicdocumentation.

Unit 1: Handwriting Identification
Basis of handwriting identification. Characteristics of handwriting – scope and application. Class and individual characteristics. Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. Factors influencing handwriting – physical, mechanical, genetic and physiological.

Unit 2: Handwriting Examination
Basis of handwriting comparison. Collection of handwriting samples. Forgery detection. Counterfeiting. Examination of altered and erased documents. Tools used in handwriting examination.

Unit 3: Handwriting Recognition
Basis of handwriting recognition. Off-line and on-line handwriting recognition. Steps involved in handwriting recognition – pre-processing, feature extraction and classification. Applications of handwriting recognition.

Suggested Readings

1. O. Hilton, *Scientific Examination of Questioned Documents*, CRC Press, Boca Raton (1982).
2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, Foundation Press, New York(1995).
3. R.N. Morris, *Forensic Handwriting Identification: Fundamental Concepts and Principles*, Academic Press, London(2000).
4. E. David, *The Scientific Examination of Documents – Methods and Techniques*, 2nd Edition, Taylor & Francis, Hants(1997).
5. Z. Liu, J.H. Cai and R. Buse, Handwriting Recognition: *Soft Computing and Probabilistic Approach* (Volume 133), Springer Science and Business Media(2003).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	Internal Assessment for 25 marks	Marks
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 4G1

GE-4: Psychology **Credits: 4**

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

a. The definition and basic concept of psychology
b. The schools of Psychology
c. The branches of Psychology
d. The scope and goals of psychology
e. Neurons, Nervous system and Endocrine System
f. Sensation, Learning, Memory and motivation
g. States of Consciousness
h. Human Personality and its assessment
i. Freud's Psychoanalytical theory

Unit 1: Introduction to Psychology

- Understanding psychology: definition, psychology as a discipline, psychology as science and social science, understanding mind and behavior. Evolution of psychology : philosophical and biological origin.
- Schools of psychology: Structuralism, Functionalism, Behaviorism, Psycho-dynamic and Gestalt psychology.
- Different branches of psychology : biological psychology, cognitive psychology, social psychology, developmental psychology, clinical psychology, counseling psychology, educational/school psychology, industrial/ organizational psychology, forensic psychology, military psychology and sports psychology.
- Scope and goals of psychology.

Unit 2: Bio-Psychology

- Neurons: Structure of neurons, External, internal and supporting structures, types of neurons. Neural impulse transmission-electrical and chemical, role of neurotransmitters.
- The Anatomy of the Nervous system and The Peripheral Nervous system- Central Nervous system, Forebrain, Midbrain and Hindbrain, Hypothalamus, Cortex, Spinal cord. Autonomic Nervous system: Sympathetic and Parasympathetic Nervous system.
- The Endocrinesystem- The endocrine glands and hormones, hormonal influence on learning and memory, effects of hormones on human behavior.

Unit 3: Cognitive Processes

- Sensation- Selection, Sensory Adaptation, Analysis & Coding. Perception-sensing, perceiving, classifying, Gestalt principles.
- Learning- Classical conditioning: Elements, principles, generalization, discrimination, second order conditioning. Operant conditioning: Reinforcement, punishment, shaping, chaining, stimulus control, schedules of reinforcement, partial reinforcement effect. Social learning theory.
- Memory: - Encoding, storage and retrieval processes. Three levels of memory- Sensory, short term and long term memories. Atkinson-Shiffrin Model of memory. Implicit and explicit memory. Semantic, episodic and procedural memory.

Unit 4: Personality and Consciousness

- States of mind: Nature of consciousness, Changes in consciousness: dream and sleep. Stages of sleep. Altered states: Hypnosis- facts and myths, meditation, drug induced states.
- Motivation: model of motivation-need, drive, response and goal. Primary and secondary motives. Learned motives: affiliation, achievement and power motives. Maslow's theory of hierarchical motives.
- Human Personality and Assessment of Personality,Personality- categorizing by types, describing by traits. Freud's Psychoanalytical theory–levels of consciousness, structure of personality-id, ego & superego, psychosexual stages of development and defence mechanisms.

Practical s **Credits: 2**

1. Life Satisfaction Scale
2. Student Problem Checklist
3. Internal External Locus of Control
4. Immediate Memory Span
5. Division of Attention
6. Self-Concept Questionnaire
7. Ravens Standard Progressive Matrices
8. Guidance Needs Inventory
9. General Health Questionnaire
10. Beck's Depression Inventory
11. Anxiety Scale

Suggested Readings:

1. Andreassi, J. L. (2000). *Psychophysiology: Human behaviour and physiological response* (4th ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
2. Baron, R.A. (2004). *Psychology*, 5th ed. New Delhi: Pearson Education.
3. Bootzin, R., & Bower, G.H. (1991). *Psychology today-An Introduction*, 7th ed. New York: McGraw Hill Inc.
4. Coon, D. (1983). *Introduction to psychology: Exploration and application*. New York: West Publishing Co.
5. Feldman R.S (2011).*Understanding Psychology*, 10th edition.Delhi : Tata- McGraw Hill.
6. Friedman, H. S. &Schustack, M.W. (2003). *Personality: Classic Theories and Modern Research*, 2nd ed.. Delhi: Pearson Education.
7. Leukal, F. (1985). *An Introduction to Physiological Psychology*. (1st ed.). New Delhi: CBS Publishers and Distributors.
8. Levinthal, C.F. (1996). *Introduction to Physiological Psychology* (3rd Ed.) Prentice-Hall of India Pvt. Ltd.
9. Morgan, C.T., King, R.A., Weisz, J.R., &Schopler, J. (1993). *Introduction to psychology*, 7th ed. New Dehi: Tata McGraw Hill.
10. Munn,N.L.,Fernald,L.D., &Fernald,P.S.(1997). *Introduction to Psychology*. Delhi: Houghton Mifflin.
11. Rosensweig, M.R., Leiman, A. L., Breedlove, & S. Marc, (1996). *Biological Psychology*, Sinauer Associates, lnc.
12. Schneider, A.M. & Tarshis, B. (1986). *An Introduction to Physiological Psychology*.(3rd Ed.). New York: Random House, Inc.
13. Weiten, W. (2002) *Psychology: Themes and variations,* 5th edn. New York: Brooks/Cole

14. Publishing Co.
15. Zimbardo, P. G. *Psychology and Life* (12th edn.). Glenview, IL: Scott, Foresman. 1988.

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

THIRD YEAR

SEMESTER-V
PAPER: DC01FS- 5C1

C-11: ForensicBallistics **Credits: 4**

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

a. The classification of firearms and their firingmechanisms.
b. The methods of identifyingfirearms.
c. The characteristics ofammunition.
d. The importance of firearmevidence.
e. The nature of firearminjuries.
f. The methods for characterization of gunshotresidue.

Unit 1: Firearms
History and development of firearms. Classification of firearms. Weapon types and their operation. Firing mechanisms of different firearms.
Internal ballistics – Definition, ignition of propellants, shape and size of propellants, manner of burning, and various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting.
External Ballistics – Vacuum trajectory, effect of air resistance on trajectory, base drag, drop, drift, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity, Measurements of trajectory parameters, introduction to automated system of trajectory computation and automated management of ballisticdata.
Terminal Ballistics – 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, influence of range. Ricochet and its effects, stopping power.

Unit 2: Ammunition
Types of ammunition. Constructional features and characteristics of different types of cartridges and bullets. Primers and priming compounds. Projectiles. Headstamp markings on ammunitions. Different types of marks produced during firing process on cartridge – firing pin marks, breech face marks, chamber marks, extractor and ejectormarks.

Unit 3: Firearm Evidence
Matching of bullets and cartridge cases in regular firearms. Identification of bullets, pellets and wads fired from improvised, country made firearms. Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire.
Mechanisms of formation of gunshot residues. Methods of analysis of gunshot residues from shooting hands and targets, with special reference to clothings.
Identification and nature of firearms injuries. Reconstruction with respect to accident, suicide, murder and self defence.

Practicals **Credits:2**

1. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms.
2. To correlate the velocity of bullet with the impact it produces on thetarget.
3. To correlate the striking angle of the bullet with the impact on thetarget.
4. To estimate the range of firedbullets.
5. To carry out the comparison of firedbullets.
6. To carry out the comparison of fired cartridgecases.
7. To identify gunshotresidue.
8. To correlate the nature of injuries with distance from which the bullet wasfired.
9. To differentiate, with the aid of diagram, contact wounds, close range wounds and distant wounds.

Suggested Readings

1. B.J. Heard, *Handbook of Firearms and Ballistics*, Wiley and Sons, Chichester(1997).
2. W.F. Rowe, Firearms identification, *Forensic Science Handbook,* Vol. 2, R. Saferstein (Ed.), Prentice Hall, New Jersey(1988).
3. A.J. Schwoeble and D.L. Exline, *Current Methods in Forensic Gunshot Residue Analysis*, CRC Press, Boca Raton(2000).
4. E.Elaadin*EncyclopediaofForensicScience,Volume2*,J.A.Siegel,P.J.Saukkoand G.C. Knupfer (Eds.), Academic Press, London (2000).

Teaching Learning Methodology

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 5C2

C-12: ForensicToxicology **Credits:2**

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

a. The significance of toxicological studies in forensicscience.
b. The classification of poisons and their modes ofactions.
c. The absorption of poisons in bodyfluids.
d. The forensic identification of illicitliquors.
e. The classification and characteristics of the narcotics, drugs and psychotropic substances.
f. The menace of designerdrugs.
g. The methods of identifying and purifying narcotics, drugs and psychotropicsubstances.

Unit 1: Basics of Toxicology
Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests.
Postmortem Toxicology. Human performance toxicology.
Dose-response relationship. Lethal dose 50 and effective dose 50.

Unit 2: Poisons
Classification of poisons. Physico-chemical characteristics and mode of action of poisons. Accidental, suicidal and homicidal poisonings.
Signs and symptoms of common poisoning and their antidotes. Collection and preservation of viscera, blood and urine for various poisoncases.
Identification of biocides and metal salts in body fluids. Metabolism and excretion of poisons. Application of immunoassays in forensicwork.
Animal poisons. Snake venom. Mode of action. Carbon monoxide poisoning.
Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms.
Beverages. Alcoholic and non-alcoholic illicit liquors. Analysis and identification of ethyl alcohol. Estimation of ethyl alcohol in blood and urine. Proof spirit.
Crime scene management in illicit liquor cases.

Unit 3: Narcotics, Drugs and Psychotropic Substances
Definition of narcotics, drugs and psychotropic substances. Broad classification – Narcotics, stimulants, depressants and hallucinogens. General characteristics and common example of each classification. Natural, synthetic and semi-synthetic narcotics, drugs and psychotropic substances.
Designer drugs. Tolerance, addiction and withdrawal symptoms of narcotics, drugs and psychotropic substances
Crime scene search for narcotics, drugs and psychotropic substances – searching a suspect, searching a dwelling, searching a vehicle.
Clandestine drug laboratories. Collection and preservation of drug evidence. Testing of narcotics, drugs and psychotropic substances.
Isolation techniques for purifying narcotics, drugs and psychotropic substances – thin layer chromatography, gas-liquid chromatography and high performance liquid chromatography. Presumptive and screening tests for narcotics, drugs and psychotropic substances. Microcrystalline testing of drugs of abuse.

Analysis of narcotics, drugs and psychotropic substances in breast milk, saliva, urine, hair and antemortemblood.
Drugs and driving. Dope tests.
Analysis of narcotics, drugs and psychotropic substances in postmortem blood. Postmortem changes affecting the analysis of narcotics, drugs and psychotropic substances.

Practicals **Credits:2**

1. To identifybiocides.
2. To identify metallicpoisons.
3. To identify organicpoisons.
4. To identify ethylalcohol.
5. To identify methylalcohol.
6. To carry out quantitative estimation of ethylalcohol.
7. To prepareiodoform.
8. To identify drugs of abuse by spottests.
9. To perform color tests forbarbiturates.
10. To separate drugs of abuse by thin layerchromatography.

Suggested Readings

1. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
2. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*,2nd Edition, Oxford University Press, New York(1983).
3. S.B. Karch, *The Pathology of Drug Abuse*, CRC Press, Boca Raton(1996).
4. A. Poklis, Forensic toxicology in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton(1997).
5. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, *Alcohol, Drug and Driving*, **4**, 99(1988).
6. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton(2013).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	Internal Assessment for 25 marks	Marks
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER DC01FS- 5D1

DSE-1:DigitalForensics **Credits: 4**

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

a. The basics of digitalforensics.
b. The cases which fall under the purview of digitalcrimes.
c. The types of digitalcrimes.
d. The elements involved in investigation of digitalcrimes.

Unit 1: Fundamentals and Concepts

Fundamentals of computers Hardware and accessories – development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats.
Memory and processor. Methods of storing data. Operating system. Software.
Introduction to network, LAN, WAN and MAN.

Unit 2: Computer Crimes

Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems.
Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs.
Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security in cyber space.
An overview of hacking, spamming, phishing and stalking.

Unit 3: Computer Forensics Investigations

Seizure of suspected computer. Preparation required prior to seizure.
Protocol to be taken at the scene. Extraction of information from the hard disk.
Treatment of exhibits. Creating bitstream of the original media. Collection and seizure of magnetic media. Legal and privacy issues. Examining forensically sterile media. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Trackingusers.

Practicals **Credits:2**

1. To identify, seize and preserve digital evidence from crimescenes.
2. To detect deletions, obliterations and modifications of files using encasesoftware.
3. To trace routes followed by e-mails andchats.
4. To identify the IP address of the sender ofe-mails.
5. To demonstrate concealment techniques using cryptographicPGP.
6. To identify encryptedfiles.
7. To identify hiddenfiles.
8. To use digital signatures for securing e-mail and onlinetransactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digitalrecord.
11. To carry out imaging of harddisks.

Suggested Readings

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, *Computer Crimes and Computer Forensics*, Select Publishers, New Delhi (2003).
2. C.B. Leshin, *Internet Investigations in Criminal Justice*, Prentice Hall, New Jersey(1997).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).

Teaching Learning Methodology

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 5D2

DSE-2:ForensicSerology **Credits: 4**

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

a. The significance of serologicalevidence.
b. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crimeinvestigations.
c. The usefulness of genetic markers in forensicinvestigations.
d. The forensic importance of bloodstainpatterns

Unit 1: Forensic Importance of Body fluids

Common body fluids. Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood. Determination of blood groups. Antigens and antibodies.

Forensic characterization of bloodstains. Typing of dried stains. Blood enzymes and proteins. Semen. Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination.

Composition, functions and forensic significance of saliva, sweat, milk and urine. Tests for their identifications.

Unit 2: Genetic Marker Analysis Cellular antigens. ABO blood groups. Extracellular proteins and intracellular enzymes.

Significance of genetic marker typing data. Sexual assault investigations.

Unit 3: Bloodstain Pattern Analysis

Bloodstain characteristics. Impact bloodstain patterns. Cast-off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

Practicals **Credits:2**

1. To determine blood group from fresh blood samples.
2. To determine blood group from dried blood sample.
3. To carry out the crystal test on a bloodsample.
4. To identify blood samples by chemicaltests.
5. To identify the given stain assliva.
6. To identify the given stain asurine.
7. To carry out cross-overelectrophoresis.
8. To study the correlation between impact angle and shape ofbloodstain.
9. To identify the point of convergence from the bloodstainpatterns.

Suggested Readings

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

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

SEMESTER-VI
PAPER: DC01FS- 6C1

C-13: ForensicAnthropology& Odontology **Credits: 4**

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

a. Importance of forensic anthropology in identification ofpersons.
b. Different techniques of facial reconstruction and their forensicimportance.
c. Significance of somatoscopy andsomatometry.
.

Unit 1: Significance of Forensic Anthropology
Scope of forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, sex, stature from skeletal material.

Unit 2: Personal Identification – Somatoscopy and Somatometry
Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.
Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Unit 3: Facial Reconstruction
Portrait Parle/ Bertillon system. Photofit/identi kit. Facial superimposition techniques.
Cranio facial super imposition techniques – photographic super imposition, videosuperimposition, Roentgenographic superimposition. Use of somatoscopic and craniometric methods in reconstruction. Importance of tissue depth in facialreconstruction.
Genetic and congenital anomalies – causes, types, identification and their forensic significance.

Unit 4: Forensic Odontology
Development, scope and role of forensic odontology in mass disaster and anthropology. Types of teeth and their comparativeanatomy.
Bite marks. Forensic significance of bite marks. Collection, preservation and photography of bite marks evidence. Legal aspects of bite marks. Estimation of age from teeth.

Practicals **Credits:2**

1. To *determine of age from skull andteeth.*
2. To determine of sex fromskull.
3. To determine sex frompelvis.
4. To study identification and description of bones and theirmeasurements.
5. To investigate the differences between animal and humanbones.
6. To perform somatometric measurements on livingsubjects.
7. To carry out craniometric measurements of humanskull.
8. To estimate stature from long bonelength.
9. To conduct portrait parley using photofit identificationkit.

Suggested Readings

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

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 6C2

C-14: ForensicMedicine& Microbial Forensics **Credits: 4**

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

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

Unit 1: Death Investigations

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

Unit 2: Autopsy

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

Unit 3: Microbial Forensics

Organisms of Forensic significance, types, isolation and identification.

Unit 4: Bioterrorism

Bioterrorism: Definition, Concepts of Biosecurity Weapons of mass destruction (WMD), mass-casualty weapons (MCW), NBC and CBRNE, Dirty Bombs.

Practicals **Credits:2**

1. To design a questionnaire for the first responder to the deathscene.
2. To design a protocol to deal with the media at the crimescene.
3. To design a checklist for the forensic scientists at the deathscene.

4. To design a canvass form giving description of an unidentified victim.
5. To analyze and preserve bite marks.

Suggested Readings

1. K. Smyth, *The Cause of Death*, Van Nostrand and Company, New York(1982).
2. M. Bernstein, Forensic odontology in, *Introduction to Forensic Sciences*, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton(1997).
3. J. Dix, *Handbook for Death Scene Investigations*, CRC Press, Boca Raton(1999).
4. H.B. Baldwin and C.P. May in, *Encyclopedia in Forensic Science, Volume 1*, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London(2000).
5. V.J. Geberth, *Practical Homicide Investigation*, CRC Press, Boca Raton(2006).
6. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton(2008).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton(2013).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 6D1

DSE-3: DNA Forensics **Credits:4**

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

a. The basic principle of DNAanalysis.
b. The forensic significance of DNAtyping.
c. The importance of short tandem repeats and restriction fragment length polymorphism in DNAtechnique.
d. Role of DNA typing in parentagetesting.

Unit 1: Basic Principles
DNA as biological blueprint of life. Extraction of DNA for analysis.
Quantitation of DNA – yield gel quantitation and slot blot quantitation.
Mitochondrial DNA – sequence analysis.

Unit 2: Forensic DNA Typing
Collection of specimens. Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence.
Short tandem repeats (STR) – role of fluorescent dyes, nature of STR loci.
Restriction fragment length polymorphism (RFLP) – genetic markers used in RFLP, typing procedure and interpretation of results.
Touch DNA.

Unit 3: Parentage Testing
Principles of heredity. Genetics of paternity. DNA testing in disputed paternity. Mandelian laws of parentage testing. Mathematical basis of parentage identification.
Missing body cases. Reference populations and databases.
Report Writing: *Role of DNA typing in identifying unrecognizable bodies.*

Allele frequency determination. Hardy-Weinberg law. Probability determination in a population database.

Practicals **Credits:2**
1. To carry out the separation of amino acids by thin layerchromatography.
2. To carry out *extraction of DNA from bodyfluids.*
3. To preparation of gel plates forelectrophoresis.
4. To carry out electrophoresis for separation ofenzymes.
5. To prepare a report on the role of DNA typing in solving paternitydisputes.

Suggested Readings

1. J.M. Butler, *Forensic DNA Typing*, Elsevier, Burlington(2005).
2. K. Inman and N. Rudin, *An Introduction to Forensic DNA Analysis*, CRC Press, Boca Raton(1997).
3. H. Coleman and E. Swenson, *DNA in the Courtroom: A Trial Watcher's Guide*, GeneLex Corporation, Washington(1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton(2013).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: DC01FS- 6D2

DSE-4: Research Project (including Research Methodology & Bio-statistics **Credits: 6**

The research project will be based on a research topic in Forensic Science/Criminology. The topic will be assigned in consultation with police and forensic science establishments, giving due consideration to the problem areas faced by these institutions. The students will be expected to undertake extensive field work, in collaboration with mobile police laboratories.

GENERIC ELECTIVE COURSES

To be offered to students of other disciplines

One each in Semester I, II, III and IV. To be chosen from thefollowing.

GE-1: Criminalistics
GE-2: Forensic Dematoglyphics
GE-3: ForensicChemistry
GE-4: Forensic Biology andSerology
GE-5: Forensic Anthropology and Forensic Medicine
GE-6: DigitalForensics

PAPER: GE-1

Criminalistics **Credits:4**

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

a. The significance of forensic science to humansociety.
b. The fundamental principles and functions of forensicscience.
c. The working of the forensic establishments in India andabroad.
d. The causes of criminal behavior and significance of criminalprofiling.
e. The consequences of crime insociety.
f. The methods of securing, searching and documenting crimescenes.
g. The art of collecting, packaging, preserving and analyzing different types of physical and traceevidence.

Unit 1: Functions of Forensic Science
Definitions and concepts in forensic science. Scope of forensic science. Need of forensic science. Basic principles of forensic science.
Tools and techniques in forensic science.
Branches of forensic science. Data depiction. Report writing.
Forensic science in India: Organizational set up of forensic science laboratories.

Unit 2: Criminology
Definition, aims and scope. Theories of criminal behavior. Criminal anthropology.
Criminal profiling. Role of media.
Elements, nature, causes and consequences of crime. Deviant behavior. Hate crimes, organized crimes and public disorder..
Social change and crime.
Understanding modus operandi. Investigative strategy. Police's power of investigation. Filing of criminal charges. Correctional measures and rehabilitation of offenders.

Unit 3: Crime Scene Management
Crime scene investigations. Protecting and isolating the crime scene. Crime scene search methods.
Documentation of crime scene by photography, sketching and field notes.
Types, significance and classification of physical and trace evidence. Locard Principle. Collection and care of evidence. Submission of evidence. Chain of custody. Reconstruction of crimescene.
Glass evidence – collection, packaging, analysis. Matching of glass samples by mechanical fit and refractive index measurements. Fracture analysis and direction ofimpact.
Paint evidence – collection, packaging and preservation. Analysis by destructive and non-destructive methods. Importance of paint evidence in hit and run cases.
Fibre evidence – artificial and man-made fibres. Collection of fibre evidence. Identification and comparison of fibres.
Soil evidence – importance, location, collection and comparison of soil samples.
Toolmark evidence. Classification of toolmarks. Forensic importance of toolmarks. Collection, preservation and matching of toolmarks. Restoration of erased serial numbers and engraved marks.

Practicals **Credits:2**

1. To study the history of crime cases from forensic scienceperspective.
2. To review the sections of forensic science at INTERPOL and compare with those in Central Forensic Science Laboratories in India. Include suggestions for improvements ifany.
3. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smartart/templates.
4. To examine the hierarchical set up of different forensic science establishments and suggestimprovements.
5. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in PoliceScience.
6. To compare and contrast the role of a Police Academy and a Police TrainingSchool.
7. To compare the code of conduct prescribed by different establishments for forensic scientists.
8. To review past criminal cases and elucidate which theory best explains the criminal behavior of theaccused.
9. To review crime cases where criminal profiling assisted the police to apprehend the accused.
10. To examine the role of media in creating awareness on right to live in a crime-free society.
11. To evaluate the post-trauma stress amongst victims of racialdiscrimination.
12. To compare glass samples by refractive indexmethod.
13. To compare paint samples by thin layerchromatography.
14. To compare fibre evidence by examining their crosssections.
15. To compare soil samples by density gradientmethod.
16. To identify and compare toolmarks.

Suggested Readings

1. B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi(2001).
2. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton(2005).
3. D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton(2002).
4. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
5. J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester(1997).
6. M. Byrd, *Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence*, CRC Press, Boca Raton(2001).
7. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton(2013).

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	100

Continuous Internal Assessment (CIA)

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PAPER: GE-2

ForensicDermatoglyphics **Credits: 4**

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

a. The fundamental principles on which the science of fingerprinting isbased.
b. Fingerprints are the most infallible means ofidentification.
c. The world's first fingerprint bureau was established inIndia.
d. The method of classifying criminal record by fingerprints was worked out in India, and byIndians.
e. The physical and chemical techniques of developing fingerprints on crime scene evidence.
f. The significance of foot, palm, ear and lipprints.

Unit 1: Basics of fingerprinting
Introduction and history, with special reference to India.
Biological basis of fingerprints. Formation of ridges. Fundamental principles of fingerprinting. Types of fingerprints. Fingerprint patterns. Fingerprint characters. Plain and rolled fingerprints. Classification method for fingerprint record keeping. Automated Fingerprint Identification System.

Unit 2: Development of Fingerprints
Latent prints. Constituents of sweat residue.
Latent fingerprints' detection by physical and chemical techniques.
Mechanism of detection of fingerprints by different developing reagents.
Application of light sources in fingerprint detection. Preservation of developed fingerprints.

Unit 3: Other Impressions
Importance of footprints. Casting of foot prints, Electrostatic lifting of latent foot prints.
Lip prints - Nature, location, collection and examination of lip prints. Ear prints and their significance.
Palm prints and their historical importance.

Practicals **Credits:2**

1. To enumerate with the aid of diagrams, different types of fingerprint patterns and fingerprintcharacters.
2. To record plain and rolledFingerprints.
3. To identify core and delta in samplefingerprints.
4. To examine the patterns of all your ten fingers and carry out the primary classification of your indexcard.
5. To detect of fingerprints by powdermethod.
6. To detect fingerprints by ninhydrinmethod
7. To detect fingerprints by iodinemethod.
8. To detect fingerprints by silver nitratemethod
9. To lift the developed fingerprints from different surfaces usingtape.
10. To cast footprints using plaster ofParis.
11. To study the patterns in lipprints.

Suggested Readings

1. J.E. Cowger, *Friction Ridge Skin*, CRC Press, Boca Raton(1983).
2. D.A. Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis*, CRC Press, Boca Raton(2000).
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, *Fingerprints and other Ridge Skin Impressions*, CRC Press, Boca Raton(2004).
4. Lee and Gaensleen's, *Advances in Fingerprint Technology*, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton(2013).

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	Marks
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Final Examination	75
	100

Continuous Internal Assessment (CIA)

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1	One Internal examination	15
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Examination Scheme/Assessment Question Pattern for the internal exam will be as below

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Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
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	Total		50 Marks

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Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
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	Total		75 Marks

PAPER: GE-3

ForensicChemistry **Credits: 4**

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

a. The methods of analyzing trace amounts of petroleum products in crime scene evidence.
b. The methods of analyzing contaminants in petroleumproducts.
c. The classification and characteristics of the narcotics, drugs and psychotropic substances.
d. The methods of identifying narcotics, drugs and psychotropicsubstances.
e. The forensic identification of illicitliquors.
f. The classification of explosives, including the synthesis and characterization of representativeanalogs.
g. The significance of bomb scenemanagement.

Unit 1: Petroleum and Petroleum Products
Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.

Unit 2: Narcotics, Drugs, Psychotropic Substances and Alcoholic Beverages
Natural and synthetic. Drug dependence. Classification of drugs of abuse – narcotics, hallucinogens, depressants, stimulants and anabolic steroids. Withdrawal symptoms. Tests of narcotics, drugs and psychotropic substances of.
Alcoholic and non-alcoholic beverages. Analysis of alcoholic beverages. Detection and determination of ethanol and methanol. Licit and illicit liquors.

Unit 3: Explosives
Classification of explosives – low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents.
Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Blast waves. Bomb scene management. Searching the scene of explosion.

Practicals **Credits:2**

1. To carry out analysis ofgasoline.
2. To carry out analysis ofdiesel.
3. To carry out analysis of keroseneoil.
4. To identify illicit drugs by spottests.
5. To perform color tests foropiates.
6. To perform color tests forbarbiturates.
7. To identify methylalcohol.
8. To identify ethylalcohol.
9. To carry out chemical tests on explosivesubstances.

Suggested Readings

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4th Edition, The Foundation Press, Inc., New York(1995).
2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton(2013).
4. F.G. Hofmann, *A Handbook on Drug and Alcohol Abuse*, 2nd Edition, Oxford University Press, New York(1983).

Teaching Learning Methodology

Instructional methods and teaching methodology will be diverse and have a combination of lectures, active problem solving, demonstrations, group discussions and field visits.

The exhaustive list of methodologies is listed in point no.7. The instructor would provide a scheme of work that details specific teaching and learning strategies for each unit of the course.

Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: GE-4

Forensic BiologyandSerology **Credits: 4**

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

a. The significance of biological and serological evidence.
b. The forensic importance of hairevidence.
c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crimeinvestigations.
d. The importance of bloodstain patterns in reconstructing the crimescene.

Unit 1: Biological Evidence

Nature and importance of biological evidence.

Significance of hair evidence. Transfer, persistence and recovery of hair evidence. Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair.

Types and identification of microbial organisms of forensic significance.

Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and their forensic significance.

Unit 2: Forensic Importance of Body fluids

Identification of body fluids. Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood. Determination of blood groups. Antigens andantibodies.

Semen. Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination.

Composition, functions and forensic significance of saliva, sweat, milk and urine. Tests for their identifications.

Unit 3: Bloodstain Pattern Analysis

Bloodstain characteristics. Impact bloodstain patterns. Cast-off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence.

Crime scene reconstruction with the aid of bloodstain pattern analysis.

Practicals **Credits:2**

1. To examine hair morphology and determine the species to which the hairbelongs.
2. To prepare slides of scale pattern of humanhair.
3. To examine human hair for cortex andmedulla.
4. To carry out microscopic examination of pollengrains.
5. To carry out microscopic examination ofdiatoms.
6. To determine blood group from fresh bloodsamples.
7. To carry out chemical identification of humanblood.
8. To carry out crystal test of humanblood.
9. To carry out cross-overelectrophoresis.
10. To carry out identification ofsaliva.
11. To carry out identification ofurine.
12. To study the correlation between impact angle and shape ofbloodstain.
13. To identify the point of convergence from the bloodstainpatterns.

Suggested Readings

1. L. Stryer, *Biochemistry*, 3rd Edition, W.H. Freeman and Company, New York(1988).
2. W.G. Eckert and S.H. James, *Interpretation of Bloodstain Evidence at Crime Scenes*, CRC Press, Boca Raton(1989).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
4. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton(1997).
5. T. Bevel and R.M. Gardner, *Bloodstain Pattern Analysis*, 3rd Edition, CRC Press, Boca Raton(2008).

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: GE-5

ForensicAnthropology **Credits: 4**

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

a. Importance of forensic anthropology in identification ofpersons.
b. Different techniques of facial reconstruction and their forensicimportance.
c. Significance of somatoscopy andsomatometry.
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Unit 1: Significance of Forensic Anthropology
Scope of forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Determination of age, sex, stature from skeletal material.

Unit 2: Personal Identification – Somatoscopy and Somatometry
Somatoscopy – observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin, Darwin's tubercle, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks.
Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Unit 3: Facial Reconstruction
Portrait Parle/ Bertillon system. Photofit/identi kit. Facial superimposition techniques.
Cranio facial super imposition techniques – photographic super imposition, videosuperimposition, Roentgenographic superimposition. Use of somatoscopic and craniometric methods in reconstruction. Importance of tissue depth in facialreconstruction.
Genetic and congenital anomalies – causes, types, identification and their forensic significance.

Practicals **Credits:2**

1. To *determine of age from skull andteeth.*
2. To determine of sex fromskull.
3. To determine sex frompelvis.
4. To study identification and description of bones and theirmeasurements.
5. To investigate the differences between animal and humanbones.
6. To perform somatometric measurements on livingsubjects.
7. To carry out craniometric measurements of humanskull.
8. To estimate stature from long bonelength.
9. To conduct portrait parley using photofit identificationkit.

Suggested Readings

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

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Examination Scheme/Assessment (Written)

	Marks
Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

SN	**Internal Assessment for 25 marks**	**Marks**
1	One Internal examination	15
2	Assignment/Seminars/Viva-voce/ Research Papers Presentation/Class Interaction/Attitude	10

Examination Scheme/Assessment Question Pattern for the internal exam will be as below

Section A	MCQ & Objective Questions	15 Questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 10 marks each	20 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	1 Question x 15 marks each	15 Marks
	Total		50 Marks

Examination Scheme/Assessment Question Pattern for the end semester exam will be as below

Section A	MCQ & Objective Questions	15 questions x 1 mark each	15 Marks
Section B	Analytical Questions/Illustrations/ case studies/essay type questions	3 Questions x 10 marks each	30 Marks
Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks

PAPER: GE-6

Digital Forensics **Credits:4**

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

a. The basics of digitalforensics.
b. The cases which fall under the purview of digitalcrimes.
c. The types of digitalcrimes.
d. The elements involved in investigation of digitalcrimes.

Unit 1: Fundamentals and Concepts
Fundamentals of computers Hardware and accessories – development of hard disk, physical construction, CHS and LBA addressing, encoding methods and formats.
Memory and processor. Methods of storing data. Operating system. Software.
Introduction to network, LAN, WAN and MAN.

Unit 2: Computer Crimes
Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems.
Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs.
Types of computer crimes – computer stalking, pornography, hacking, crimes related to intellectual property rights, computer terrorism, hate speech, private and national security in cyber space.
An overview of hacking, spamming, phishing and stalking.

Unit 3: Computer Forensics Investigations
Seizure of suspected computer. Preparation required prior to seizure.
Protocol to be taken at the scene. Extraction of information from the hard disk.
Treatment of exhibits. Creating bitstream of the original media. Collection and seizure of magnetic media. Legal and privacy issues. Examining forensically sterile media. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Trackingusers.

Practicals **Credits:2**

1. To identify, seize and preserve digital evidence from crimescenes.
2. To detect deletions, obliterations and modifications of files using encasesoftware.
3. To trace routes followed by e-mails andchats.
4. To identify the IP address of the sender ofe-mails.
5. To demonstrate concealment techniques using cryptographicPGP.
6. To identify encryptedfiles.
7. To identify hiddenfiles.
8. To use digital signatures for securing e-mail and onlinetransactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digitalrecord.
11. To carry out imaging of harddisks.

Suggested Readings

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, *Computer Crimes and Computer Forensics*, Select Publishers, New Delhi (2003).
2. C.B. Leshin, *Internet Investigations in Criminal Justice*, Prentice Hall, New Jersey(1997).
3. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey(2004).
4. E. Casey, *Digital Evidence and Computer Crime*, Academic Press, London (2000).

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Examination Scheme/Assessment (Written)

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Internal Assessment	25
Final Examination	75
	100

Continuous Internal Assessment (CIA)

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Section C	Analytical Questions/Illustrations/ case studies/essay type questions	2 Questions x 15 marks each	30 Marks
	Total		75 Marks