



ROYAL GLOBAL UNIVERSITY

— GUWAHATI —

ROYAL SCHOOL OF LIFE SCIENCES

DEPARTMENT OF FORENSIC SCIENCE

PROPOSED SYLLABUS & COURSE STRUCTURE

MASTER OF SCIENCE IN FORENSIC SCIENCE

WEF AY 2023-2024

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Preamble

Over the past decades the higher education system of our country has undergone substantial structural and functional changes resulting in both quantitative and qualitative development of the beneficiaries. The upgradation of Postgraduate programmes will play an extremely important role in promoting human as well as societal well-being and in developing India as envisioned in its Constitution - a democratic, just, socially conscious, cultured, and humane nation upholding liberty, equality, fraternity, and justice for all. A holistic and multidisciplinary education would aim to develop all capacities of human beings -intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such an education will help develop well-rounded individuals that possess. Such changes will further result in learning outcome-based curriculum in order to maximize the benefits of the newly designed curriculum. The learning outcome-based curriculum in general and in Forensic Science will definitely help the teachers of the discipline to visualize the curriculum more specifically in terms of the learning outcomes expected from the students at the end of the instructional process. It is pertinent to mention here that the purpose of education is to develop an integrated personality of the individual and the educational system provides all knowledge and skills to the learner for this.

The template as developed has the provision of ensuring the integrated personality of the students in terms of providing opportunity for exposure to the students towards core courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. The template of learning outcome-based framework has categorically mentioned very well defined expected outcomes for the programme like core competency, communication skills, critical thinking, affective skills, problem-solving, analytical, reasoning, research-skills, teamwork, digital literacy, moral and ethical awareness, leadership readiness and so on along with very specific learning course outcomes at the starting of each course. Therefore, this template on Learning Outcomes based Curriculum Framework (LOCF) for M.Sc. in Forensic Science Honors under The Assam Royal Global University will be more flexible, multi-disciplinary, holistic and will definitely be a landmark in the field of outcome-based curriculum construction.

1. INTRODUCTION

1.1 About the Department:

1.1.1 Overview of the Department:

The Department of Forensic Science, The Assam Royal Global University, aims at developing talented individuals for the prosperity of the society. The curriculum is designed in such a way that the students can apply the knowledge into practice. The aim of the department is to provide an on-hand training of practical knowledge to meet the demands of the industry and to prepare students for higher studies and research. The interactive method of teaching is to bring about attitudinal changes to future professionals of the industry.

1.1.2 Department highlights in terms of its ranking, courses

The Department of Forensic Science is committed to expand and absorb the wide diversity of scientific disciplines associated with forensics. Our B.Sc. and M.Sc., programmes are designed multi-faceted with a holistic and comprehensive education across a wide range of subject areas, which would enable the students to contribute effectively to basic and applied education and research in the field of forensic science.

1.1.3 About the programme

The M.Sc. Forensic Science programme includes a wide diversity of courses covering all aspects of Forensic Sciences. In addition to unique combinations of basic, advanced and applied courses (as Core and Discipline-Specific Elective papers), the programme also has a strong interdisciplinary component. Emphasis is on experiential learning through hands-on laboratory exercises, field trips and projects. Current thrust areas of teaching provide students with substantial exposure and skills in plant biology. The disciplines studied include introduction to forensic science, criminal laws, forensic chemistry and toxicology, forensic biology and serology, forensic ballistics, instrumentation methods, digital forensics, forensic photography, forensic anthropology and odontology etc. to name some.

1.1.4 About Post Graduate Attributes

In addition to academic rigor and training in subject-specific areas listed above, our students will also be well trained in ethics, critical thinking, reasoning and analytical skills, effective communication, laboratory safety, sensitivity to environment and sustainable living.

1.1.5 About the process of course development involving various stakeholders at different stages.

The draft course contents will be finalized by the Academic Council after extensive deliberations and discussions involving all faculty members in Board of Studies Meetings. Feedback from students and alumni will be obtained during their study periods. The draft courses will be uploaded on the University website to invite comments and suggestions from various stakeholders and

reviewed by the Council Prior to approval by the Departmental Council, Courses Committee of UG and PG in Forensic Science and then sent to two external experts in the subject area for their critical inputs and suggestions. The finalized course contents will be then discussed in school Board of Studies and submitted for administrative approval by statutory bodies of RGU.

1.2 Introduction to CBCS (Choice Based Credit System) Choice Based Credit System:

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. Grading system provides uniformity in the evaluation and computation of the Cumulative Grade Point Average (CGPA) based on performance in examinations which enables the student to move across institutions of higher learning. The uniformity in evaluation system also enables the potential employers in assessing the performance of the candidates.

1.2.1 Approach to Curriculum Planning

While designing these frameworks, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education section, these frameworks foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e-learning platforms. In addition, the framework pragmatic to the core; it is designed such a way to enable the learners implementing the concepts to address the real-world problems. A major emphasis of these frameworks is that the curriculum focuses on issues pertinent to India and also of the west. Above all, these frameworks are holistic and aim to mould responsible Indian citizen who have adequate skills in reflective thinking, rational scepticism, scientific temper, digital literacy and so on such that they are equipped to fight immediate social issues apropos to Indian milieu, including corruption and inequity.

The fundamental premise underlying the learning outcomes-based approach to curriculum planning and development is that higher education qualifications such as a Master's Degree (Hons) programmes are earned and awarded based on (a) demonstrated achievement of outcomes (expressed in terms of knowledge, understanding, skills, attitudes and values) and (b) academic standards expected of graduates of a programme of study.

Learning outcomes-based frameworks in any subject must specify what postgraduates completing a particular programme of study are (a) expected to know, (b) understand and (c) be able to do at the end of their programme of study. To this extent, LOCF in MSc Forensic Science is committed to allowing for flexibility and innovation in (i) programme design and syllabi development by higher education institutions (HEIs), (ii) teaching-learning process, (iii) assessment of student learning levels, and (iv) periodic programme review within institutional parameters as well as LOCF guidelines, (v) generating framework(s) of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course learning outcomes. HEIs, on their turn, shall address to the situations of their students by identifying relevant and common outcomes and by developing such outcomes that not only match the specific needs of the students but also expands their outlook and values.

1.2.2 Definitions:

- i. 'Academic Programme' means an entire course of study comprising its programme structure, course details, evaluation schemes etc. designed to be taught and evaluated in a teaching Department/Centre or jointly under more than one such Department/ Centre
- ii. 'Course' means a segment of a subject that is part of an Academic Programme
- iii. 'Programme Structure' means a list of courses (Core, Elective, Open Elective) that makes up an Academic Programme, specifying the syllabus, Credits, hours of teaching, evaluation and examination schemes, minimum number of credits required for successful completion of the programme etc. prepared in conformity to University Rules, eligibility criteria for admission
- iv. 'Core Course' means a course that a student admitted to a particular programme must successfully complete to receive the degree and which cannot be substituted by any other course
- v. 'Elective Course' means an optional course to be selected by a student out of such courses offered in the same or any other Department/Centre
- vi. 'Open Elective' means an elective course which is available for students of all programmes, including students of same department. Students of other Department will opt these courses subject to fulfilling of eligibility of criteria as laid down by the Department offering the course.
- vii. 'Credit' means the value assigned to a course which indicates the level of instruction; One-hour lecture per week equals 1 Credit, 2 hours practical class per week equals 1 credit. Credit for a practical could be proposed as part of a course or as a separate practical course
- viii. 'SGPA' means Semester Grade Point Average calculated for individual semester.
- ix. 'CGPA' is Cumulative Grade Points Average calculated for all courses completed by the students at any point of time. CGPA is calculated each year for both the semesters clubbed together.
- x. 'Grand CGPA' is calculated in the last year of the course by clubbing together of CGPA of two years, i.e., four semesters. Grand CGPA is being given in Transcript form. To benefit the student a formula for conversation of Grand CGPA into %age marks is given in the Transcript.

1.2.3 Nature and Extent of Master's Degree Programme in Forensic Science:

A student pursuing 2 years post-graduate programme in Forensic Science shall be awarded an appropriate Degree in that discipline on completion of 4th Semester if he/she secures 102 Credits. An illustration of credits requirements in relation to the type of award is illustrated below:

Sl. No.	Year	Mandatory Credits to be secured for the Award
1	After successful completion of 1st Year	52
2	After successful completion of 2nd Year	102

Master's Degree is a well-recognized, structured, and specialized Post graduate level qualification in tertiary, collegiate education. The contents of this degree are determined in terms of knowledge,

understanding, qualification, skills, and values that a student intends to acquire to look for professional avenues or move to higher education at the postgraduate level.

Master's Degree programmes attract entrants from the graduate level or equivalent, often with subject knowledge that are directly relevant to the field of study/profession. Thus, MSc Course in Forensic Science aims to equip the students to qualify for joining a profession or to provide development opportunities in particular employment settings. Post Graduates are enabled to enter a variety of jobs or to continue academic study at a higher level.

1.2.4 Aims of Master's Degree Programme in Forensic Science:

The overall objectives of the Learning Outcomes-based Curriculum Framework (LOCF) for M.Sc.- degree in Forensic Science are-

1. To impart the basic knowledge of Forensic Science with theories, principles, processes, and studies of traditional and modern Forensic Science.
2. To impart more multi-disciplinary and holistic course curriculum.
3. To develop the learners providing research-based knowledge
4. To equip the students in solving the practical problems pertinent to India
5. To mould responsible citizen for nation-building and transforming the country towards the future
6. To provide an environment that ensures cognitive development of students in a holistic manner. A dialogue about plants and its significance is fostered in this framework, rather than didactic monologues on mere theoretical aspects
7. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A forensic science graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
8. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
9. To enable the graduate prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC Civil Services Examination.

1.3 Master of Science in Forensic Science Programme Details: Programme Objectives (POs):

1. Make students familiar with the field of forensic science which includes investigating a crime by applying forensic science principles.
2. Enhance knowledge, in depth understanding and application of forensic science, policing and criminal investigation by teaching and research.
3. Develop critical and analytical subject specific skills involving the principles, practices and techniques of specific field.
4. Develop competence in research methods and presentation of information.
5. Develop skills in forensic identification, forensic problem solving either independently or as a team member.
6. Keep abreast with all recent developments and emerging trends in Forensic science, Ethics and the law.

1.3.1 Program Learning Outcomes relating to MSc degree Programme in Forensic Science:

The student graduating with the Degree M.Sc. Forensic Science should be able to acquire

PLO 1: Understand application of Forensic Science, Photography and Crime Scene Management, Techniques of Forensic Physics, Forensic Ballistics, Forensic Chemistry and Toxicology, Criminal laws, Study Forensic Dermatoglyphics and other impressions. All PSOs are helpful in forensic identification with reference to various crimes.

PLO 2: Critical Thinking and problem-solving ability: An increased understanding of fundamental concepts and their applications of scientific principles is expected at the end of this course. Students will become critical thinker and acquire problem solving capabilities.

PLO 3: Digitally equipped: Students will acquire digital skills and integrate the fundamental concepts with modern tools.

PLO 4: Ethical and Psychological strengthening: Students will also strengthen their ethical and moral values and shall be able to deal with psychological weaknesses.

PLO 5: Team Player: Students will learn team workmanship in order to serve efficiently institutions, industry and society.

PLO 6: Independent Learner: Apart from the subject specific skills, generic skills, especially in Forensic Science, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes-based curriculum would ensure equal academic standards across the country and broader picture of their competencies.

1.3.2 Teaching Learning Process

Teaching and learning in this programme involve classroom lectures, Practical lab and tutorials. It allows-

- The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention.
- Written assignments and projects submitted by students
- the project-based learning
- Group discussion
- Home assignments
- Quizzes and class tests
- PPT presentations, Seminars, interactive sessions
- Diversity survey
- Co-curricular activity etc.
- Industrial Tour or Field visit

1.3.3 Assessment Methods

Methods	Weightage
Semester End Examination	70%
Internal Assessment	30%
Total	100%

1.4 Programme Structure:

The Master of Science in Forensic Science programme is a two-year course divided into four semesters. A student is required to complete 102 credits for completion of the course and the award degree.

2. SCHEME OF EVALUATION

I. Theory Papers (T)	II. Practical Papers (P)	III. Combined Theory & Practical Papers (TP):
Continuous Evaluation: 15% (Assignment, Class Test, Seminar, Quiz: Any Three)	Continuous Evaluation: 25% (Skill Test, lab copy, viva, lab involvement: Any Three)	Continuous Evaluation: 15% (Assignment, Class Test, Seminar, Lab Experiment, Copy and Viva: Any Three)
Mid-term examination: 10%	-----	Mid-term examination: 10%
Attendance: 5%	Attendance: 5%	Attendance: 5%
Semester End Examination: 70%	Semester End Examination: 70%	Semester End Examination: 70%

3. PROGRAMME STRUCTURE

M.Sc. Forensic Science 2023-2025							
1 ST SEMESTER							
Sl.No.	Subject Code	Names of papers	L	T	P	C	TCP
Core Papers							
1	FSC144C101	Forensic Science and Crime Scene Management.	4	0	0	4	4
2	FSC144C102	Criminology and Law	4	0	0	4	4
3	FSC144C103	Forensic Physics	4	0	0	4	4
4	FSC144C104	Forensic Ballistics and Explosives	4	0	0	4	4
5	FSC144C115	Forensic Science and Criminalistics (Practical)	0	0	6	3	6
6	FSC144C116	Forensic Physics, Forensic Ballistics and Explosives (Practical)	0	0	6	3	6
Total credits for core papers						22	28
Ability Enhancement Compulsory Courses (AECC)							
6	CEN984A101	Communicative English – I	1	0	0	1	1
7	BHS984A102	Behavioural Science – I: Introduction to behavioural science	1	0	0	1	1
Discipline Specific Elective (DSE) (ANY ONE TO BE SELECTED)							
8	FSC144D101	Fundamentals of Forensic Psychology	3	0	0	3	3
9	FSC144D102	Quality Management and research Methodology	3	0	0	3	3
Total credits			17	0	6	27	33
2ND SEMESTER							
Sl.No.	Subject Code	Names of papers	L	T	P	C	TCP
Core Papers							
1	FSC144C201	Forensic Chemistry and Toxicology	3	1	0	4	4
2	FSC144C202	Forensic Dermatoglyphics And Others Prints	3	1	0	4	4
3	FSC144C203	Instrumental Methods – I	3	1	0	4	4
5	FSC144C214	Forensic Chemistry And Toxicology (Practical)	0	0	6	3	6
6	FSC144C215	Forensic Dermatoglyphics And Others Prints (Practical)	0	0	6	3	6
Total credits for core papers						18	24
Ability Enhancement Compulsory Courses (AECC)							
6	CEN984A201	Communicative English – II	1	0	0	1	1
7	BHS984A202	Behavioural Science – II: Development of Individuals and Behavioural Skills	1	0	0	1	1

Ability Enhancement Elective Courses (AEEC)							
8	FSC144S221	Digital Forensics	2	0	0	2	2
Discipline Specific Elective (DSE) (ANY ONE TO BE SELECTED)							
9	FSC144D201	Forensic Anthropology and Odontology	3	0	0	3	3
10	FSC144D202	Forensic Photography	3	0	0	3	3
Total credits			19	0	6	25	31
3RD SEMESTER							
Sl.No.	Subject Code	Names of papers	L	T	P	C	TCP
Core Papers							
1	FSC144C301	FORENSIC SEROLOGY AND IMMUNOLOGY	3	1	0	4	4
2	FSC144C302	FORENSIC BIOLOGY	3	1	0	4	4
3	FSC144C313	FORENSIC SEROLOGY AND BIOLOGY (PRACTICAL)	0	0	8	4	8
Total credits for core papers						12	16
ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)							
4		COMMUNICATIVE ENGLISH – III	1	0	0	1	1
ABILITY ENHANCEMENT ELECTIVE COURSES (AEEC)							
5	FSC144S321	INSTRUMENTAL METHODS II	2	0	0	2	2
DISCIPLINE SPECIFIC ELECTIVE (DSE) (ANY ONE TO BE SELECTED)							
6	FSC144D301	FORENSIC GENETICS AND DNA PROFILING	4	0	0	4	4
7	FSC144D303	BIOMETRICS AND EMERGING TRENDS	4	0	0	4	4
COMPULSORY PAPER							
8	FSC144C321	PROJECT DISSERTATION	0	0	12	6	12
Total credits			13	2	20	25	35
4TH SEMESTER							
Sl.No.	Subject Code	NAMES OF PAPERS	L	T	P	C	TCP
CORE PAPERS							
1	FSC144C401	FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE	4	0	0	4	4
2	FSC144C402	QUESTIONED DOCUMENTS	4	0	0	4	4
3	FSC144C413	FORENSIC MEDICINE AND QUESTIONED DOCUMENTS (PRACTICAL)	0	0	8	4	8
TOTAL CREDITS FOR CORE PAPERS						12	16
ABILITY ENHANCEMENT COMPULSORY COURSES (AECC)							
4		COMMUNICATIVE ENGLISH – IV	1	0	0	1	1
DISCIPLINE SPECIFIC ELECTIVE (DSE) (ANY ONE TO BE SELECTED)							

5	FSC144D401	MICROSCOPY AND PHOTOGRAPHY	4	0	0	4	4
6	FSC144D402	FORENSIC GENETICS AND BIOINFORMATICS	4	0	0	4	4
COMPULSORY PAPER							
7	FSC144C421	PROJECT DISSERTATION	0	0	16	8	16
Total credits			13	0	24	25	38

4. SEMESTER WISE DISTRIBUTION OF COURSES AND CREDITS:

Semester	No. Of Core papers	No. of DSE papers	No. of AECC papers	No. Of AECC papers	Project (Minor/Major)	Total credit
1 st	6	1	2	None	None	27
2 nd	5	1	2	1	None	25
3 rd	3	1	2	1	Minor	25
4 th	3	1	2	-	Major	25
Total						102

5. DETAILED SYLLABUS:

1ST SEMESTER SYLLABUS CORE PAPERS (ALL COMPULSORY)

PAPER I: FORENSIC SCIENCE AND CRIME SCENE MANAGEMENT
SUBJECT CODE: FSC144C101,
CREDIT UNITS: L-T-P-C =4-0-0-4
SCHEME OF EVALUATION: Theory Papers (T);
[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objective:

The objective of this course is to introduce the students to Forensic Science and its role in the criminal investigation system. The students would be appraised about the function & principles of Forensic Science & its historical background. This course shall provide the students necessary information to understand the role of Forensic Laboratories in crime scene investigation, handling of evidence and their examination. Additionally, students will also learn about Indian Police system and various techniques used in criminal profiling.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define and classify the crime scene and types.	BT1 & BT2
CO2	explain about Forensic Science, various Laboratories and their Set-Up.	BT2
CO3	analyse the nature, collection and preservation of Physical evidences.	BT3
CO4	the detailed analysis & significance of Criminal Profiling for the purpose of justice	BT4

Module	Course content	Lecture hours
I	Introduction to Forensic Science: Definition, Need, Scope, Concepts and Significance of Forensic Science, History and Development of Forensic Science, Laws and Basic principles of Forensic Science, Branches of forensic science, Organizational set-up of a Forensic Science Laboratories. Investigative strategies, Expert testimony and eye-witness report	12
II	Crime Scene Management: Crime Scene: Introduction, Types, Significance, Role of Investigator, Steps of Crime Scene Management: Protection, Searching Methods, Documentation of the Crime Scene; Collection, Preservation, Packaging, Chain of Custody: Types, Significance and Evaluation, Reconstruction of scene of crime, Report writing .	14
III	Report and Evidence Evaluation: Components of reports and Report formats in Crime Scene and findings. Constitutional validity of Forensic Evidence, Expert Testimony: Admissibility in court of law, Pre-Court preparations & Court appearance, FIR and its types.	12

IV	Physical patterns Introduction- Physical patterns in identification, individualization and reconstruction. Pattern due to blood, Pattern on glass, firearms related patterns, patterns in arson and fires served articles and physical matches, comparison of imprints, indentation, striation, typical presentations, Gait patterns, Bite patterns. Modus operandi, portrait parley.	10
Total		48

Text Books:

1. Ahuja, R. Criminology, Rawat Publication, Jaipur (2000)
2. Arrigo, B. and Shipley, S. Introduction to Forensic Psychology, Academic Press. London (2000)

Reference Books:

1. Hess, A.K. and Weiner, I.B. Handbook of Forensic Psychology 2nd ed. Jhon Wiley & Sons (1999)
2. James, S.H Scientific and Legal Application of Bloodstain Pattern Interpretation, CRC Press, Boca Raton, (1998)
3. James, S.H. and Nordby, J.J. Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC press, USA (2003)
4. Kleiner, M. Handbook of Polygraph Testing, Academic Press (2002)
5. Lyman, M.D. Criminal Investigation- The Art and the Science, Prentice Hall (2002)
6. Meguire, M.; Morgan, R. and Reiner, R. Oxford Handbook of Criminology, 2nded. Clarendon Press, New York (1997)
7. Mordby, J.J. Deed Reckoning- The Art of Forensic Detection, CRC Press, Boca Raton, (2000)
8. Dehaan, J.D. Kirk's Fire Investigation 5thed. Prentice Hall (2002)
9. Eckert, W.G and James, S.H. Interpretation of Blood Stains, Evidence of Crime Scene, Elseiver Publication, New York (1989)
10. Fisher, B.A.J. Techniques of Crime Scene Investigation 7thed. CRC Press, New York, (2003)
11. Gross, H. Criminal Investigation- A Practical Handbook for Magistrates, Police Officers and Lawyers, Universal Pub. Co. (2000)
12. Bag, R.K. Supreme Court on Criminal Law, Asia Law House, India (1999)
13. Bennett, W.W. and Hess, K.M. Criminal Investigation, Wordsworth Thompson Learning, (2001)
14. Bridges, B.C.; Vollmer, A. and Munir, M. Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting Expert Testimony Opinion Evidence, University Book Agency, Allahabad(2000)
15. David L. Shapiro, Forensic Psychology Assessment: An Investigative Approach, Bacon Publisher(1991)
16. Deb, R. Criminal Justice, The Law Book Co. (1998)

PAPER II: Criminology and Law

SUBJECT CODE: FSC144C102,

CREDIT UNITS: L-T-P-C = 4-0-0-4

SCHEME OF EVALUATION: Theory Papers (T)

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance: 5%; Semester End Examination: 70%]

Course Objectives:

The objective of this course is to introduce students about the concepts of Crime, Criminology and the factors that contribute to a person becoming antisocial. The students gain knowledge regarding Police Administration, Indian Judiciary & Criminal Justice System. To introduce the different sections of IPC, CrPC and the Indian Evidence Act & the Acts pertaining to Forensic Science.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define concept of Criminology	BT1
CO2	illustrate legal provisions focusing on different types of crimes	BT2
CO3	apply various IPC, CrPC, IEA & Acts pertaining to Forensic Science.	BT3
CO4	the detailed analysis & significance of Criminal Profiling for the purpose of justice	BT4

Module	Course content	Lecture Hours
I	Crime and Society: Concept and Definition of Crime, Causes and Elements of Crime, Social Change and Crime, Control and Prevention of Crime, Hate Crime, Organized Crime, Cyber Crime, Industrialization, Criminal Behavior: Theories and Significance, Characteristics of crime (Actus Reus, Mens Rea, Prohibited Act & Punishments) Modus Operandi and Criminal Psychology, Crime Rate in India and in World, NCRB.	12
II	Indian Judiciary and Criminal Justice System: Criminal Justice System: Introduction, Structure, Components and Working. Indian Judiciary: Introduction, Courts: Hierarchy, Types, Procedure, Power and Jurisdiction, Prosecution and defence. Lok Adalat, Lokpal, Lokayukta, Juvenile Court Evidence, Enquiry, Investigation, Trial, FIR, Panchnama Inquest Charge Sheet, Dying Declaration and Dying deposition. A subpoena (summons).	10
III	Criminal Law and Legislation Constitution of India: Preamble, Rights to Equality (Articles 14 to 18), Rights to Freedom 15 (Articles 19 to 22) Indian Penal Code: Introduction, General Exceptions (Sections: 76, 77, 82, 83, 84, 90, 96 to 106) -Offences against person: Sections: 299, 300, 302, 304B, 306, 319, 320, 326, 339, 340, 351, 359, 362, 375, 376 & 377. -Offences against property: : Sections: 378, 383, 390, 405, 415, 441, 463, 471, 499, 503, 511. Indian Evidence Act: Introduction, Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 159. Code of Criminal Procedure: Introduction, Sections: 53, 54, 311A, 291, 292, 293. Bailable and Non Bailable Offences. Cognizable and Non Cognizable Offences.	14
IV	Act Pertaining to Forensic Science: Narcotic Drugs and Psychotropic Substances Act, Drugs and Cosmetics Act, Explosive Substances Act, Dowry Prohibition Act, Arms Act, Wild Life Protection Act, I.T. Act (Information Technology Act- 2000), POCSO Act, The Criminal Procedure (Identification) Act-2022.	12
Total		48

Text Books:

1. Adler, F.: Mueller, G.O.W. and Laufer, W.S. (2006) Criminology 5th ed. McGraw Hill.
2. Arrigo, B.A. (2002): Introduction to Forensic Psychology, Academic Press Inc.

3. Barak, G. (1998): Integrative Criminology, Dartmouth Publishing Co. Ltd.
4. Bare Acts with short notes on the following: Narcotic Drugs & Psychotropic Substances Act, Drugs & Cosmetics Act, Explosive Substances Act, Dowry Prohibition Act, Prevention of Food Adulteration Act, Prevention of Corruption Act, Arms Act, Wild Life Protection Act.
5. Biderman, A.D. and Zimmer, H. (1961): The Manipulation of Human Behavior, Wiley, New York.

Reference Books:

1. Howitt, D. (2002): Forensic and Criminal Psychology, Prentice Hall Publication.
2. Indian Evidence Act
3. Indian Penal Code.
4. Johnson, E.H. (2016): Crime, Correction and Society.
5. Reid, S.T. (2011): Crime and Criminology 13th ed. Oxford University Press, USA.
6. Constitution of India
7. Cooke, G. (1980): The role of Forensic Psychologist, Springfield.
8. Criminal Procedure Code.
9. Goldstein, A.M. and Weiner, I.B. (2003) Handbook of Psychology, John Wiley & Sons.
10. Haward, L (1981): Forensic Psychology, Batsford Academic and Education Ltd., London.

<p>PAPER III: FORENSIC PHYSICS SUBJECT CODE: FSC144C103, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T) [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance: 5%; Semester End Examination: 70%]</p>

Course Objective: : The course aims to provide the students, knowledge of types of glass and their composition. It aims to impart forensic aspects of fibre examination and examination of tool marks. It will help the students to better understand the physical evidence, its importance and application of different examination for various evidences.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define concept of Forensic Physics	BT1
CO2	compare various physical evidences	BT2
CO3	apply various techniques used in examination of physical evidence.	BT3
CO4	categorize and classify various physical evidences and patterns.	BT4

Module	Course content	Lecture Hours
I	Glass: Composition and types of glasses-soda-lime, boro-silicate, safety glass, laminated, light sensitive, tampered / toughened, wire glass, coloured glass. Matching and comparison. Forensic examinations of glass fractures, rib marks, hackle marks, cone fracture, wavy, backward fragmentation, concentric and radial fractures. Colour, fluorescence, physical measurements, refractive index, density gradient, becke-line, specific	12

	gravity examination and elemental analysis of glass evidence.	
II	Paint and Fiber: Types of paint and their composition, macroscopic and microscopic analysis of paint pigments, pigment distribution, micro-chemical analysis-solubility test, pyrolysis gas chromatography, TLC, colorimetric analysis, IR spectroscopy and X-ray diffraction. Elemental analysis, mass spectrometer, interpretation of paint evidence. Types of fibres, forensic aspects of fibre examination. Difference between natural and man-made fibres.	12
III	Soil, Cement and Concrete: Types and composition of soil, sample preparation, removal of contaminants, colour, molecular particle size distribution, turbidity test, pH measurements, microscopic examination, density gradient analysis, ignition-loss test, elemental analysis, interpretation of soil evidence. Cement Analysis- bromo form test, fineness test, ignition-loss test. Identification of adulterated cement. Mortar and concrete analysis	12
IV	Tool marks: Types of tool marks compression marks, striated marks, combination of compression and striated marks, repeated marks, class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks and cut mark son clothes and walls etc. Restoration erased / obliterated marks-Method of making-cast, punch, engrave; methods of obliteration, method of restoration etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks–restoration of marks on wood, leather, polymer etc. Accidental Investigation: collision model, types of injuries from accident, Tyre marks / prints and skid marks and comparison with control samples. Evidences encountered at SOC.	12
Total		48

Suggested Readings:

1. Caddy,B;ForensicExaminationofGlassandPaintAnalysisandInterpretation,CRCPress,Ne York,2001.
2. Shaw, D; Physics in the Prevention and Detection of Crime,ContemPhys.Vol.17,1976.
3. Saferstein, R; Forensic Science Handbook. Vol.I,II, (Ed.), Prentice Hall, New Jersey,1988.
4. Working Procedure Manual; Physics BPR&D Publication,2000.
5. Sharma, B.R; Forensic Science in Criminal Investigation and Trials(3rdEd.), Universal Law Publishing Co.,New Delhi,2001.
6. Working Procedure Manual-Physics,BPR&DPublication.2000
7. Hess, K.P; Textile Fibers and their Use, 6thEdn,Oxford and IBH Publishing Co.,1974.

PAPER IV: Forensic Ballistics and Explosives

SUBJECT CODE: FSC144C104,

CREDIT UNITS: L-T-P-C = 3-1-0-4

SCHEME OF EVALUATION: Theory Papers (T)

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objective:

This objective of this course to provide knowledge about historical development of firearms, ammunition & explosives. The students will also learn about various branches of Forensic Ballistics such as Internal, External & Terminal. The students shall learn regarding practical approach of Gun Shot Residues (GSR) with the help of various techniques. They will also gain knowledge about Firearms Injuries, its nature and identification.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define concept of Forensic Physics	BT1
CO2	explain about various types of firearms and their mode of operations	BT2
CO3	apply various techniques used in examination of ballistic evidence.	BT3
CO4	distinguish the types of propellant, primer and their composition of GSR	BT4

Module	Course content	Lecture Hours
I	<p>History & Development of Fire Arms: Early History of Firearms Classification, details of various Small Arms used in Crime – Shotguns, Rifles, Revolvers, Pistols.</p> <p>Firing Mechanism, Bore and Calibre, Choke, Suppressor, Rifling – Class Characteristics of Rifled Bore, Types of Rifling.</p> <p>Ammunition: Types, Cartridge Components (Cartridge Case, Primer Propellant, Bullets, Pellets and Wads). Various types of Primers/ Priming Mixtures, Propellants, Shotgun Ball Ammunition, Various Types of Bullets, Head-stamp Markings.</p>	14
II	<p>Branches of Forensic Ballistics:</p> <p>Internal Ballistics: Definition, Ignition and Burning of Propellants, Manner of Burning, Shape and Size of the Propellants, Degressive and Progressive Powders, All Burnt Point, Velocity, Muzzle Velocity, Factors Affecting Muzzle Velocity.</p> <p>External Ballistics: Definition- Trajectory Drop in the Flight of the Projectiles Force of Gravity, Air Resistance-base Drag, Yaw, Determination of Velocity of Shot-charge, Shape of Bullet (Spherical Ball, Cylinder-Conical, Flat Nose, Round Nose, etc.)</p> <p>Terminal Ballistics: Definition, Interaction and Penetration of various types of Projectiles in various Tissues, various aspects of Wound Ballistics including Wounds of Entrance/ Exit/ Track of Projectile, Gunshot Injuries caused by different types of Firearm Ammunitions, Remaining Velocity, Stopping Power, Ricochet.</p>	14
III	<p>Arms Ammunition: Improvised Firearms. Linkage & GSR Matching of Crime & Test Bullets and Cartridge Cases. Determination of Range of Fire, Time of Fire. Visual and Chemical, Instrumental Methods with Special</p>	10

	Reference to the Applications of Neutron Activation Analysis, Atomic Absorption Spectroscopy, Scanning Electron Microscopy. Gun Shot Residues (GSR): Mechanism of Formation of GSR, Modern Methods of Analysis of GSR from the Shooting Hand & Target.	
IV	Explosives: Introduction, Classification, Composition and Characteristics of Explosives, Pyrotechnics, IEDs, Explosion Process and Affects, Types of Hazards, Effect of Blast Wave on Structures, Human, etc. Specific Approach to Scene of Explosion, Post- blast Residue Collection, Reconstruction of Sequence of Events, Systematic Examination of Explosives and Explosion Residues in the Laboratory using Chemical and Instrumental Techniques.	10
Total		48

Text Books:

1. Boundreau, J.F.; Qwan, Q.Y.; Faragher, W.E. and Denault, G.C. Arson and Arson Investigation: Survey & Assessment, National Institute of Law Enforcement, U.S. Dept. of Justice, Printing Press; (1977)
2. Dehaan, J.D. Kirk's Fire Investigation, 5th ed. Prentice Hall, Eaglewood Cliffs, N.J; (2002)
3. Dimaio, J.M. Gunshot Wounds. CRC press, Washington DC; (1999)
4. Heard, B.J. Handbook of Firearms and Ballistics. Jhon Willey, England; (1997)

Reference books:

1. Sellier, K.G. and Kneubuehl, B.P. Wound Ballistics and the Scientific Background. Elsevier, London; (1994)
2. Siddiqui, M.A. Law of Firearms & Explosives with Principles of Forensic Ballistics. Pakistan; (2018)
3. Warlow, T.A. Firearms, the Law and Forensic Ballistics. Taylor & Francis, London; (1996)
4. Watson, C.A. Official and Standardized Methods of Analysis. Royal Society of Chemistry, UK; (1994)
5. Working Procedure Manuals of Chemistry, Explosives and Narcotics. BPR & D Pub., New Delhi; (2000)
6. Yinon, J. and Zitrin, S. Modern Methods & Application in Analysis of Explosives. John Wiley & Sons, England; (1993).
7. Johari, M. Identification of Firearms, Ammunition and Firearms Injuries. BPR & D, New Delhi; (1980)
8. Jury, F.J.; Hatcher, J.S. and Weller, J. Firearms Investigation, Identification and Evidence. Stackpole Books, Harrisburg, PA; (1977)
9. Ordog, G.J. Management of Gunshot Wounds. Elsevier, New York; (1983)
10. Howard, M.J. Firearms Identification, vols. 1, 2 & 3. Springfield, Illinois; (1973)
11. Hogg, I.V. The Cartridges Guide- A small arms Ammunition Identification Manual. The Stackpole co. Harrisburg, PA; (1982)

PAPER V: FORENSIC SCIENCE AND CRIMINALISTICS(PRACTICAL)

SUBJECT CODE: FSC144C115

CREDIT UNITS: 0-0-6-3

SCHEME OF EVALUATION: Practical (P)

[Continuous Evaluation: 25%: Skill Test, lab copy, viva, lab involvement (Any Three)

Attendance: 5%, Semester End Examination: 70%]

Course Objective:

The objective of the course is to develop practical approach among the students in different types of crime scenes, their management and reconstruction. They will also learn about collection, packaging, forwarding and examination of various types of physical evidences found at crime scene.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	relate and list different reports of NCRB, CrPC, etc.	BT1
CO2	understand the nature of various tools & techniques used in Forensic Examination	BT2
CO3	develop the art of collection, packaging, preservation & analysis of trace evidences.	BT3
CO4	distinguish the types of scene of crime and evidence types.	BT4

Practical would be based on the theory syllabus and would broadly include the following:

Module	Course content	Lecture Hours
I	1. To study the history of crime cases from forensic science perspective. 2. To cite examples of crime cases in which apprehensions arose because of Daubert standards. 3. To study the annual reports of National Crime Records Bureau and depict the data on different type of crime cases by way of smart art/templates.	09
II	4. To write report on different type of crime cases. 5. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus. 6. To examine the hierarchical set up of different forensic science establishments and suggest improvements.	09
III	7. The use of searching methods for crime scene (Outdoor and Indoor SOC) 8. Outdoor crime scene investigation (Accident) 9 Indoor crime scene investigation (Murder)	09
IV	10. Collection of evidence –with proper equipment and tools 11. Packing, Labelling and Sealing of evidences from crime scene. 12. Fingerprints lifting from the scene of crime. (latent, patent)	09
Total		36

PAPER VI: FORENSIC PHYSICS, FORENSIC BALLISTICS AND EXPLOSIVES

(PRACTICAL)

SUBJECT CODE: FSC144C116

CREDIT UNITS: 0-0-6-3

SCHEME OF EVALUATION: Practical (P)

[Continuous Evaluation: 25%: Skill Test, lab copy, viva, lab involvement (Any Three)

Attendance: 5%, Semester End Examination: 70%]

Course Objectives:

The course will aim to impart hands on knowledge about the examination of physical evidences such as soil, paint, fibre, etc. They will also learn about various preliminary, chemical examinations of ballistic evidences such as bullets, cartridges, powders, etc. found at a scene of crime.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	select various types of examination depending upon nature of evidence.	BT1
CO2	classify and compare the physical and ballistic evidences.	BT2
CO3	apply theoretical learning to the practical based experiment.	BT3
CO4	classify and compare	BT4

Practical would be based on the theory syllabus and would broadly include the following:

Module	Course content	Lecture hours
I	1. General comparison of Paints, Soils and Glass 2. Lifting of prints and impressions by cast and replicas. 3. Study of Lip prints and its examination.	09
II	4. Tool Marks examination 5. Determination of density, by density gradient tube techniques. 6. To study paint solubility test.	09
III	7. Study of headstamp marking on bottom of cartridge cases.. 8. Matching bullets and cartridge cases 9. Study of shotgun ammunition	09
IV	10. Study of different types of propellants 11. Chemical test for GSR 12. Determination of bullet entry and exit hole	09
Total		36

DISCIPLINE SPECIFIC PAPERS (only one to be selected)

<p>PAPER I: FUNDAMENTALS OF FORENSIC PSYCHOLOGY SUBJECT CODE: FSC144D101, CREDIT UNITS: L-T-P-C = 3-0-0-3 SCHEME OF EVALUATION: Theory (T) [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>
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Course Objective: The course is developed with an aim to identify and apply theoretical knowledge of psychology in forensic science

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	choose proper tools and techniques depending upon the psychological situation.	BT1
CO2	understand the psychology of criminals.	BT2
CO3	apply detection of deception techniques.	BT3
CO4	take part in survey and analyzing the criminal profiling cases.	BT4

Module	Course content	Lecture hours
I	Basics: Forensic Psychology and the Law, Ethical Issues in Forensic Psychology, Civil and criminal case assessment, assessing mental competency, Mental disorders and Forensic Psychology, Eye witness testimony, Criminal profiling- need and types, Forensic Scientific evidence, Crime and Psychopathology, Genetics and Crime, Serial murders, Modus Operandi.	9
II	Psychological Assessment: Psychological Assessment Tools, Detection of deception, Various methods for detection of deception, Interview, Non-verbal detection, statement assessment, Hypnosis, Psychological assessment, voice stress analyzer, Polygraph, thermal imaging, Brain Electrical Oscillation Signature Profiling, Functional Magnetic Resonance study, Current research in detection of deception/truth finding mechanisms.	10
III	Polygraph: Historical aspects of Polygraph, Principles of polygraph, psycho physiological aspects, operational aspects, Question formulation techniques, Interviewing technique procedure, The Art-Polygraph, Legal and Ethical aspects, Human rights of individual.	7
IV	Narco-Analysis: Historical aspects, Principle and Theory, General Procedure –Legal and Ethical aspects, Human rights of individual. Brain Electrical Oscillation Signature (BEOS) Profiling: Principle and Theory, General Procedure – Legal and Ethical aspects, Human rights of individual.	10
Total		36

Text Books:

1. Forensic Science in Criminal Investigation & Trials – B.R.Sharma
2. The Hand Book of Forensic Psychology – Weiner Hass

Reference books:

1. Investigative Forensic Hypnosis – J. Niehans
2. Art & Science of the Polygraph Techniques – J.A.Matte
3. Hand Book of Polygraph Testing – M.Kloinen
4. Detecting Lies & Deceit – A.Vrij
5. Hand Book of Forensic Psychology – O’ Donohue Levensky
6. Brain Experience – C.R.Mukun
7. Criminal Profiling – B.Turvey

PAPER II: QUALITY MANAGEMENT AND RESEARCH METHODOLOGY**SUBJECT CODE: FSC144D102,****CREDIT UNITS: L-T-P-C = 3-0-0-3****SCHEME OF EVALUATION: Theory only (T)**

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objectives: The course aims to introduce the need to maintain a system which can monitor quality in forensic laboratories, to impart knowledge about different organisations involved in setting guidelines for quality parameters and role of assessors in recommendations of various organizations.

Course Outcome : After successful completion of the course, student will be able to

Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define the quality management systems and its requirements in forensic science	BT1
CO2	understand the concepts of data collection.	BT2
CO3	develop research design according to the research methodology.	BT3
CO4	compare and examine the statistical data .	BT4

Module	Course content	Lecture Hours
I	Quality Management System: Quality Management System: Quality, Total Quality, Quality assurance, Quality Control, Quality Planning, and Quality Audit: Internal and External Audit, Accreditation, NABL, ISO, IEC, BIS. Technical Requirements for testing and calibration of laboratories: Test and calibration methods and their validation, measurements, standards and reference material, traceability, sampling.	9
II	Introduction to Research Methodology: Meaning of Research, Objectives Of Research, Types Of Research, Significance Of Research, Problems Encountered By Researchers In India. Research problem: Definition, Necessity and Techniques of Defining Research Problem, Research Proposal, Literature Search, Hypothesis, Report Writing	9

III	Research Design: Meaning, Need and Features Of Good Research Design, Types Of Research Design, Basic Principles of Experimental Designs, Design Of Experiments, Synopsis Design For Research Topic. Sampling Design: Sample Design, Census And Sample Surveys, Types Of Sampling Design, Sampling Errors Characteristics Of Good Sample Design	9
IV	Descriptive Statistics: Types Of Data, Basic Concepts Of Frequency Distributions, Measure Of Central Tendency, Mean, Median And Mode, Measure Of Dispersion, Range, Mean Deviation And Standard Deviation. Correlation and Regression Analysis. Methods of data collection: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaire and Schedules, Other Methods. Collection Of Secondary Data, Selection Of Appropriate Method For Data Collection, Case Study Method , Guidelines For Developing Questionnaire, Successful Interviewing , Survey V/S Experiment.	9
Total		36

Suggested Readings:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
3. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
4. Wadehra, B.L. 2000. Law relating to patents, trademarks, copyright designs and geographical indications. Universal Law Publishing.
5. Malhotra Naresh K. (2008). Marketing Research. Pearson publishers, Latest Edition.
6. Zikmund, Babin, Carr, Griffin (2003). Business Research Methods. Cengage Learning, India, Latest Edition.
7. Cooper Donald R and Schindler Pamela S. (2006). Business Research Methods. McGraw-Hill Education, Latest Edition. Shri Vaishnav Vidyapeeth Vishwavidyalaya Master of Technology (Computer Science and Engineering) Choice Based Credit System (CBCS)
8. Anderson, Sweeney, William, Cam (2014). Statistics for Business and Economics. Cengage Learning, Latest Edition.
9. Krishnaswami O. R., Ranganatham M. (2011). Methodology of Research in Social Sciences. Himalaya Publishing House, Latest Edition.
10. Kothari C. R. (2004). Research Methodology. Vishwa Prakashan, Latest Edition.

2ND SEMESTER SYLLABUS
CORE PAPERS (ALL COMPULSORY)

<p>PAPER I: FORENSIC CHEMISTRY & TOXICOLOGY SUBJECT CODE: FSC144C201 CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: THEORY (T) [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objectives: The students will be able to understand the various types of drugs, commonly abused along with their presumptive & instrumental analysis. They will know the legal provisions & Forensic investigation regarding drugs, cosmetics, fire and arson evidences. The students shall also learn regarding various types of poison, their nature, action sign & symptoms with standard procedure of examination in poisoning cases. They will also get to know medico-legal aspect of poisons and the management of toxicological cases.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	recall the knowledge of chemistry and its importance in various cases.	BT1
CO2	understand the basics of Forensic Chemistry & Toxicology, their scope, role & significance.	BT2
CO3	identify the nature of Arson Scene and Forensic investigation of Arson cases.	BT3
CO4	examine knowledge on the preventive methods of poisoning and drug cases.	BT4

Module	Course content	Lecture hours
I	<p>Forensic Chemistry: Introduction, and scope of forensic chemistry, Detective Dyes and its importance in trap cases. Chemistry of fire, and patterns of fire.</p> <p>Arson: Introduction, Legal Definition, Chemistry of Fire, Fire Accelerants and their Types, Scientific Investigation and Evaluation of Clue Materials, searching of fire scene, collection, preservation and examination of arson evidences, Instrumental Methods for Fire Debris Analysis.</p>	12
II	<p>Beverages: Introduction and classification of beverages, Distillation and Fermentation of beverages, Analysis of beverages-alcoholic and non-alcoholic, country-made liquor, Effects of alcohol on body, Signs and Symptoms of alcohol intoxication. Breath analyser, types of breath analyser and working.</p> <p>Petroleum products; Introduction, properties of petrol, diesel and kerosene, examination for adulteration.</p>	14

III	<p>Forensic Toxicology: Introduction, Role of the Toxicologist, toxins and their types. Poison: Definition, Classification on the Basis of their Origin, Physiological Action and Chemical Nature, Absorption, Distribution, Metabolism and Excretion of Poisons, Types of poisoning. Factors modifying action of poisons.</p> <p>Removal of unabsorbed poison- Antidotes, Administration of Antidotes. Collection and Preservation, Choice of Preservatives for toxicological samples.</p>	12
IV	<p>Drugs of Abuse: Introduction, Classification of drugs, Drug Addiction and its Problems. Classification of Drugs of Abuse, Analgesics, Depressants, Stimulants, Hallucinogens and Narcotics. Designer Drugs. Identification, Field Tests and Laboratory Tests. Drug Abuse in Sports: Introduction, Common Prohibited Substances, Analytical Approach.</p>	10
Total		48

Reference Books:

- Hodgson, E. A Textbook of Modern Toxicology 4th ed. John Wiley & Sons: Canada; (2010).
- Klaassen, C. Casarett & Doll's Toxicology: The Basic Science of Poisons 8th ed. Mc Graw Hill: (2013).
- Lundquist, F. and Curry, A.S. Methods of Forensic Science. Interscience Publisher: California; (1963).
- Maehly, A. and Stromberg, L. Chemical Criminalistics. Springer: New York; (2011).
- Matsumura, F. Toxicology of Insecticides. Springer: New York; (1985).
- Moenssens, A.A. and Moses, R.E. Scientific Evidence in Criminal Cases. Foundation Press: New York; (1973).

Suggested readings:

- Brown, W. Drinking, Drugs & Driving Drunk: How Different Drugs Affect the Driving Experience 2nd ed. William Gladden Foundation Press: (2011).
- Clarke, E.G.C. and Moffat, A.C. Clarke's Isolation and Identification of Drugs: In Pharmaceuticals, Body Fluids and Post Mortem Material. Pharmaceutical Press: (1986).
- Connors, K.A. A text book of Pharmaceuticals Analysis 2nd ed. Wiley: New York; (1975).
- Cunliffe, F. Criminalistics and Scientific Investigation (Prentice-Hall series in criminal justice). Prentice Hall: (1980).
- Curry, A.S. Advances in Forensic Chemical Toxicology. CRC Press: (1972).
- Curry, A.S. Analytical Methods in Human Toxicology: Part II. Wiley VCH: (1986).
- Curry, A.S. Poison Detection in Human Organs. Springer: (1976).
- Froede, R.C. The Laboratory Management of the Medico-Legal Specimen. Annals of Clinical & Laboratory Science, 6(3), (1976).
- Gosselin, R.E.; Hodge, H.; Smith, R.P. and Gleason, M.N. Clinical Toxicology of Commercial Products: Acute Poisoning 4th ed. Williams & Wilkins: Baltimore; (1969).

PAPER II: FORENSIC DERMATOGLYPHICS AND OTHERS PRINTS

SUBJECT CODE: FSC144C202,

CREDIT UNITS (L-T-P-C):3-1-0-4

SCHEME OF EVALUATION: Theory Papers (T)

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objective: The objective of this course is to impart complete knowledge to students regarding the various aspects of Forensic dactyloscopy. The importance of development, collection, preservation fingerprints and as well as other impressions encountered at a crime scene.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define fingerprints and other prints.	BT1
CO2	understand importance of collection and analysis of fingerprints and other prints	BT2
CO3	acquire knowledge of the development and collection methods of different variety of prints found at scene of crime.	BT3
CO4	analyse and compare the samples of different types of prints.	BT4

Module	Course content	Lecture Hours
I	Dermatoglyphics: Introduction, history and development of dermatoglyphics, Formation of ridges and its characteristics, skin crease. Comparative dermatoglyphics- Morphological plan of volar pads and configurational area, variation in primates.	10
II	Dactyloscopy: Fundamentals of fingerprint construction, pattern types, transition between pattern types, ridge counting, ridge tracing, ridge characteristics, pattern size. Classification of fingerprints- Henry's system, single-digit, extension of Henry's classification.	10
III	Fingerprints: Composition of sweat, types of fingerprints(latent, patent, plastic), development of chance, latent, visible and plastic prints. Taking of fingerprints from living and dead person, lifting and preservation of fingerprints. Development of fingerprints: by conventional methods(fluorescent method, magnetic powder method, fuming method, chemical method, etc.). development of fingerprint on skin, porous, non-porous surface. Modern methods of fingerprinting, AFIS.	14
IV	Other prints: Palm prints and foot prints- Topography. Tracing and formulation of main line, axial radii, configurational areas in both palm and foot/sole prints. Collection, tracing, lifting and casting of foot prints. Gait pattern, factors affecting gait pattern, gait pattern analysis. Lip prints: Nature, types, location, collection, evaluation and forensic significance of lip prints. Ear prints : Nature, types, location, collection, evaluation and forensic significance of ear prints	14

Total	48
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Reference Books:

1. Bridges, B.C; Criminal Investigation, Practical Fingerprinting, Thumb Impression, Hand writing expert Testimony, Opinion Evidence., Univ. Book Agency, Allhabad, 2000.
2. Chatterjee, S.K; Speculationin Fingerprint Identification, Jantralekha printing Works, Kolkata,1981.
3. Cossidy, M.J; Footwear Identification, Royal Canadian, Mounted Police, 1980.
4. Cowger James F;Friction Ridge Skin-Comparison & Identification of Fingerprints, CRC Press, NY,1993.
5. Harold Cummins and Charles Midlo. Finger Prints, Palms And Soles: An Introduction To Dermatoglyphics
6. Henry, C.L. & Ganesslen, R.E; Advancesin Fingerprint Technology, CRC Press, London,1991.
7. Iannavelli,A.V;EarIdentification,ForensicIdentificationSeries,Paramount,1989.
8. JainA.K., Flynn, P. & Ross A.A., Handbook of Biometrics, Springer, New York2008
9. Mehta, M.K; Indentification of Thumb impression & cross examination of Finger prints, N.M. Tripathi Pub. Bombay,1980.

<p>PAPER III: INSTRUMENTAL METHODS I SUBJECT CODE: FSC144C203, CREDIT UNITS: L-T-P-C = 3-1-0-4 SCHEME OF EVALUATION: Theory Papers (T) [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>
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Course objectives: The objective of this course is to understand the basic & advances analytical instrumental techniques or methods for identification, characterization & quantification of different exhibits found at crime scene. The students will be able to learn different destructive and non-destructive spectroscopic techniques along with their use & forensic significance. They will also gain knowledge about principles & working of different spectroscopy techniques.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define the basic concept of atomic and molecular spectroscopy and interaction of radiation with matter.	BT1
CO2	interpret the forensic significance of different instrumental techniques such as UV-Vis, AAS, IR, Raman	BT2
CO3	develop the working, principles & applications of spectroscopic techniques	BT3
CO4	categorise about the X-ray spectroscopy, X-Ray absorption & X-Ray diffraction	BT4

Module	Course content	Lecture hours
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I	<p>Concepts of Atomic Spectroscopy: What is Spectroscopy, Electromagnetic Spectrum, Sources of Radiations, their Utility and Limitations, Conventional Sources for UV, Visible and Infrared Rays, Sources for Shorter Wavelength Radiations (X-Ray Tubes) Radioactivity, Gamma Rays and Beta Rays. Laser (He, Ne, Argon Ion, Dye Lasers, Semi Conductor Lasers) as Source of Radiation. Interaction of Radiation with Matter: Reflection, Absorption, Transmission, Fluorescence, Phosphorescence and their Forensic Applications.</p>	12
II	<p>Concepts of Molecular Spectroscopy: Molecular Spectra: Introduction, Molecular Orbital, Types of Molecular Energies, Vibrational and Electronic Spectra, Atomic Spectra, Energy Levels, Quantum Numbers and Designation of States, Selection Rules, Auger Effect. Detection of Radiations, Photographic Detectors, Thermal Detectors, Photoelectric Detectors, Radiation Filters, 15 etc.</p>	16
III	<p>Absorption Spectroscopy Ultra Violet and Visible Spectrophotometry: Types of Sources and Stability, Wavelength Selection, Filters-Cells and Sampling Devices, Detectors, Resolution, Applications of UV- Visible Spectroscopy, Difference/ Derivative Spectroscopy.</p> <p>Fluorescence and Phosphorescence Spectrophotometry: Types of Sources, Structural Factors, Instrumentation and its Applications.</p> <p>Atomic Absorption Spectrometry: Introduction, Instrumentation and Techniques, Interference in AAS, Background Correction Methods, (GFAAS) Quantitative Analysis. It's Applications In Forensic Science.</p> <p>Infrared Spectrophotometry: Instrumentation of Dispersive and Fourier Transform Spectrophotometry, Sample Handling, Quantitative Analysis and Interpretation of IR Spectra.</p>	8
IV	<p>Raman Spectroscopy: Basic Principle, Sample Handling, Instrumentation, Structural Analysis, Stokes and Anti-Stokes Lines, Forensic Applications. Atomic Emission Spectrometry: Introduction, Arc/Spark Emission, Instrumentation and Techniques, ICP-AES, Comparison of ICP Vs. AAS Methods, Its Applications.</p> <p>X-Ray Spectroscopy: Elements of X-Ray Spectroscopy, X-Ray Absorption and Fluorescence Methods, X-Ray Diffraction, Auger Emission Spectroscopy (AES), and Dispersive X-Ray Analysis (EDX), Wavelength Dispersive X-Ray Analysis (WDX).</p> <p>Nuclear Magnetic Resonance Spectroscopy: Basic Principles, Theory and Instrumentation.</p>	12
Total		48

Text Books:

1. Dennis D. T., Turpin, D. H. Lefebvre D. D. and Layzell D. B.(eds) (1997). Plant Metabolism (Second Edition) Longman, Essex, England.
2. William G Hopkins, Norman P Hunar (2009) Introduction To Plant Physiology, Wiley.
- Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.

Reference Books:

1. Buchanan B.B, Gruissem W. and Jones R. L (2000). Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland,USA.
2. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.

PAPER IV: FORENSIC CHEMISTRY AND TOXICOLOGY(PRACTICAL)**SUBJECT CODE: FSC144C214****CREDIT UNITS: 0-0-6-3****SCHEME OF EVALUATION: Practical (P)****[Continuous Evaluation: 25%: Skill Test, lab copy, viva, lab involvement (Any Three)****Attendance: 5%, Semester End Examination: 70%]****Course Outcome :** After successful completion of the course, student will be able to

Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	recall the basic concept of chemistry and toxicology.	BT1
CO2	understand the concept of adulteration	BT2
CO3	apply various methods and techniques in examination of various chemical evidences.	BT3
CO4	compare the evidence with the control/standard samples.	BT4

Detailed syllabus:

Practical would be based on the theory syllabus and would broadly include the following

Module	Course content	Lecture Hours
I	1. Preliminary & Confirmatory Examination of Chemicals Used in Trap Cases. 2. Preliminary & Confirmatory Examination of the Chemicals Seized in Case of Acid Attack. 3. Estimation Analysis of Petroleum Products using different methods like Density, Viscosity etc. 4. Detection of Adulterants in Cement Samples.	11
II	5. Examination of Petroleum Products by GC & UV-VIS Spectrophotometry. 6. Examination of Country-made Liquor by UV-VIS Spectrophotometry. 7. Preliminary Examination Black Powder.	10
III	8. Identification of Common Plants i.e. Calotropis, Cannabis, Dhatura, Nux Vomica, Marking Nut, Abrus Precatorius, Opium Poppy etc. by Physical Examination and Color Test. 9. Identification of Different Vegetable Poisons by Thin Layer Chromatography etc. 10. Extraction and Identification of Insecticides and Pesticides by Colour Test/TLC.	09

IV	11. Identification of Salts and Metals by Simple Colour Test in Case of Metallic Poisoning. 12. Extraction and Identification of Drugs/ Toxicants from Biological Matrix and their Detection. 13. Extraction and Identification of Metallic Poisons from Viscera Using Dry Ashing Method Followed by Reinsch's Test.	06
Total		36

PAPER IV: FORENSIC DERMATOGLYPHICS AND OTHERS PRINTS (PRACTICAL)

SUBJECT CODE: FSC144C215

CREDIT UNITS: 0-0-6-3

SCHEME OF EVALUATION: Practical (P)

[Continuous Evaluation: 25%: Skill Test, lab copy, viva, lab involvement (Any Three)

Attendance: 5%, Semester End Examination: 70%]

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define types of fingerprints.	BT1
CO2	understand the importance of collection, preservation and documentation..	BT2
CO3	identify different types of prints based on class and individual characteristics..	BT3
CO4	analyse fingerprints and other prints such lip prints, foot prints.	BT4

Practical would be based on the theory syllabus and would broadly include the following:

Module	Course content	Lecture hours
I	1. Print your own 10 digit fingerprint card using black ink. 2. Primary and secondary classification of above fingerprint chart. 3. Identification of ridge characteristics.	9
II	4. Development and lifting of latent fingerprints using black, and magnetic powder. 5. Development and lifting of latent fingerprints using fluorescent powder on colourful surface. 6. Development of fingerprints using chemical methods.	9
III	7. Development of latent fingerprints using iodine fuming method 8. Comparison of fingerprints by class and individual characteristics. 9. Documentation of fingerprint evidence.	9
IV	10. Casting of footprints/shoe prints on soft surface Determination of Sex from Skull. 11. Comparison and identification of individuals from lip print evidence.	9

	12. The collection and comparison of palm prints.	
Total		36

ABILITY ENHANCEMENT ELECTIVE COURSES

<p>PAPER I: DIGITAL FORENSICS SUBJECT CODE: FSC144S221 CREDIT UNITS: L-T-P-C = 2-0-0-2 SCHEME OF EVALUATION: Theory (T) [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objectives: After studying this paper, student will know the fundamental and forensic examinations of digital evidence. The legal and privacy issues of digital evidence, the tools of cyber forensics and the types of cybercrime.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define the fundamental and forensic examinations of digital evidence	BT1
CO2	classify different types of cybercrime..	BT2
CO3	acquire the knowledge of legal and piracy issues of digital evidence.	BT3
CO4	analyse the tools of cyber forensics.	BT4

Module	Course content	Lecture hours
I	Digital Forensic I: Cyber Crime and digital evidence, types of cybercrimes, digital evidence, Digital Vs Physical Evidence, Nature of Digital Evidence, Precautions while dealing with Digital Evidence. Introduction to Cyber forensic, Cyber forensic steps (Identification, Seizure, Acquisition, Authentication, Presentation, Preservation), Computer forensic expert, Cyber forensic investigation process, The goal of the forensic investigation	6
II	Digital Forensic II : 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.	6
III	Cyber Forensic Tools and Utilities: Introduction, Examining a Breadth of Products, Cyber Forensic Tools Good, Better, Best: What's the Right Incident Response Tool for Your Organization, EnCase, what is disk Imaging etc. Specifications for Forensic tools Tested. Restoration of deleted files. Password cracking and E-mail tracking. Encryption and decryption methods. Tracking users	6

IV	Cyber Crime: Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs. Types of computer crimes – computer stalking, pornography, hacking, computer terrorism. An overview of hacking, spamming, phishing and stalking.	6
Total		24

Reference Books:

1. Digital Forensics: Digital Evidence in Criminal Investigations by Angus McKenzie Marshall
2. Cyber Forensic A Field Manual for Collecting, Examining and Preserving Evidence of Compute Crimes by Albert J Menendez. Auerbach Publications.
3. Cyber Forensic by Marecella Menendez.
4. Computer Forensic by Newman.
5. Cyber Crime Investigation Field Guide, by B Middleton
6. Incident Response and Computer Forensic by Kelvin Mandia, TMH Publication.

DISCIPLINE SPECIFIC PAPERS (only one to be selected)

<p>PAPER I: FORENSIC ANTHROPOLOGY AND ODONTOLOGY SUBJECT CODE: FSC144D201, CREDIT UNITS: L-T-P-C = 3-0-0-3 SCHEME OF EVALUATION: Theory (T) [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objectives:

The course is designed to give the students an idea about the structure and function of various bones in an organism, basic concept of stature identification, gender detection and odontological studies.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define physical anthropology and odontology	BT1
CO2	classify between human and non-human structural variations.	BT2
CO3	apply various techniques of somatoscopic measurements.	BT3
CO4	test for estimation of stature from long bones.	BT4

Module	Course content	Lecture hours
I	Forensic Anthropology: Definition, scope and objectives, Human skeleton, comparative skeletal anatomy of human and non-human. Identification of bones and determination of side: Age determination from skeletal remains: General considerations, classification of bones, suture closure in skull and	9

	ossification in other bones.	
II	Sex determination from skeletal remains: skull, Pelvis, and other bones. Estimation of stature from skeletal remains with special reference to long bones. Personal Identification Techniques: (Somatoscopy, Somatometry, Osteometry and Craniometry) & their Importance in Determination of Age and Sex. Portrait Parle/Bertillon system, Introduction and Importance of Photo fit/Identification Kit System for Facial Reconstruction..	9
III	Cranio-Facial Super Imposition Techniques: Photographic Super Imposition, Video-Superimposition, Roentgen graphic Superimposition. Use of Somatoscopic and Craniometric Methods in Reconstruction. Importance of Tissue Depth to Reconstruct various Facial Features. Genetic and Congenital Anomalies: Causes, Types, Identification and their Forensic Significance	9
IV	Forensic Odontology: Development and scope, role in mass disaster. Structural variation in teeth (human and non-human), types of teeth and their functions, determination of age from teeth: eruption sequence, Gustafson's method, dental anomalies, their significance in personal identification. Bites marks: Forensic significance, collection and preservation of bite marks, photography of bite marks, and evaluation of bite marks. Legal aspects of bite mark.	9
Total		36

Text Books:

1. Beals, R.L. and Hoijer, H. An Introduction to Anthropology. Macmillan, New York, 1965.
2. Biswas, G. (2021) Review of Forensic Medicine and Toxicology. Jaypee Brothers Medical Publishers.
3. Clement, J. G. and Ranson, D. L. (Eds.) Craniofacial Identification in Forensic Medicine, Oxford University Press, New York, 1998.
4. Comas, J. A Manual of Physical Anthropology. Charles C. Thomas, Springfield, 1960.
5. Cummins, H. and Midlo, C. Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics. Blackiston Co., Philadelphia, 1944.
6. El-Najjar, M. Y. and McWilliams, K. R. Forensic Anthropology. Charles C. Thomas, 1978.
7. Glaister, J.; Rentoul, E. and Smith, H. Glaister's Medical Jurisprudence and Toxicology. Forensic Medicine & Toxicology, Churchill Livingstone, Edinburgh, 1973.

Reference Books:

1. Gray, H.; Williams, P. L. and Bannister, L. H. Gray's Anatomy- The Anatomical Basis of Medicine and Surgery. Churchill Livingstone, New York, 1999.
2. Haglund, W. D. and Sorg, M. H. (Eds.) Forensic Taphonomy. CRC Press, London, 1997.
3. Hooton, E.A. Up from the Ape. Macmillan, New York, 1946.
4. Jensen, R. A. Mass Fatality and Causality Incidents: A Field Guide. CRC Press, 2017.
5. Krogman, W.M. and Iscan, M. Y. Human Skeleton in Forensic Medicine 2nd ed. Charles C. Thomas, Springfield, 1986

PAPER II: FORENSIC PHOTOGRAPHY

SUBJECT CODE: FSC144D202,

CREDIT UNITS: L-T-P-C = 3-0-0-3

SCHEME OF EVALUATION: Theory only (T)

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objectives:

The aim of the course is to cover the historical development, principles and processes of photography in relation to law enforcement and criminal justice. This includes the evolution of camera, photographic processes and development of modern photography, use of forensic light sources and techniques and related laws and jurisprudence in photography.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define photography and light optics	BT1
CO2	understand the basic principle of photography and videography in forensic science	BT2
CO3	apply procedures related to photography in crime detection and investigation.	BT3
CO4	classify the development of forensic photography as a field in criminology.	BT4

Module	Course content	Lecture hours
I	Photography: History of forensic photography, History of photography in criminal investigations, Case law, Forensic working groups on photography, Infamous cases Basics of light and optics: Light Temperature, Sources of light, Light intensity, Light angles, Optics.	9
II	Camera equipment & functions: Camera body, Lenses & lens care, Hot shoe, Camera/equipment handling, Date/time, Media storage and Image files. Techniques of photography: Different kinds of developers and fixtures, modern developments in photography, linkage of cameras and film negatives, digital photography, digital water marking and digital imaging, photogrammetry, videography/ high speed videography, crime scene and laboratory photography.	9
III	Principles of long exposure photography: Adjusting shutter speed, aperture & ISO, Composing long exposure photographs, Exposure evaluation, Bracketing, Common issues. Principles of crime scene/evidence photography: General rules, Photo card, Over-all photos, Mid-range photos, Close-up photos, Macro photography, Use of scale.	9

IV	<p>Vehicle & Collision Photography: General rules, “8-way” photos, VIN & License plate photos, using flash in vehicles, Confined/small spaces photos, Marks/debris/roadway photos.</p> <p>Subject & Injury Photography: General rules, “4-way” photos, Flash considerations for subject/injury, Use of scale and color chart, Clothing and footwear photography.</p>	9
Total		36

Text Books:

1. Murgod, S., Karnam, S., Gouse, S., & Girish, H. C. (2018). Forensic photography: Prospect through the lens. *Journal of forensic dental sciences*, 02-04.
2. Redsicker, D. R., Gordner, G., James, S. H., & Laws, A. C. (2001). *The practical methodology of forensic photography* (Vol. 183). Boca Raton, FL: CRC Press.
3. Barsley, R. E., West, M. H., & Fair, J. A. (1990). Forensic photography: ultraviolet imaging of wounds on skin. *The American journal of forensic medicine and pathology*, 11(4), 300-308

Reference books:

1. Marin, N., & Buszka, J. M. (2013). *Alternate light source imaging: forensic photography techniques*. Routledge.
2. Robinson, E. M. (2016). *Crime scene photography*. Academic Press.

3RD SEMESTER SYLLABUS
CORE PAPERS (ALL COMPULSORY)

<p>PAPER I: FORENSIC SEROLOGY AND IMMUNOLOGY SUBJECT CODE: FSC144C301, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objective: The objective of this course is to introduce the students to the basic concepts of Forensic Serology and Immunology.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define concepts of serology.	BT1
CO2	classify about blood groups.	BT2
CO3	apply various techniques used in examination of biological evidence.	BT3
CO4	identify and analyse the nature, collection and preservation of biological evidences.	BT4

Module	Course content	Lecture hours
I	Blood: Composition and functions of blood, collection of blood and species identification, Structure and function of serum protein, Hemoglobin and its variants. Blood groups – history, biochemistry and genetics of ABO, Rh, Mn and other blood group systems. ABO blood grouping methods from blood stains and other body fluids/stains, racial distinctions from blood groups.	15
II	Analysis of Blood in Forensic Serology: Blood identification, Test for identification of blood, Species and origin determination, History of Bloodstain Pattern interpretation, Size and Shape of bloodstains, spattered blood, other Bloodstain Patterns, Interpretation of Bloodstain on cloths and footwears.	15
III	Other Biological Fluids and Stains: Composition of semen, Morphology of sperm, Microscopic identification of Spermatozoa, Oligospermia and Azoospermia, Identification of Azoospermic semen stains, Prostate specific antigen (PSA, P30) as an indicator of semen, Composition of saliva, Presumptive and confirmatory test for semen and saliva.	15
IV	Immunology: Immune system, innate and acquired immunity, antibody and antigens, Types of Immunoglobulins, Chemical properties and function of Immunoglobulin, antisera, Forensic significance of Lectins, buffers and serological reagents, methods of sterilization for serological work, Antigen-Antibody Reactions.	15
Total		60

Reference Books:

1. Working Procedure Manual Serology, DFS, New Delhi.
2. Danniell P. Stites, Abba I. Jerr, Tristram G. Parstow Medical immunology, Ninth edition; Prentice Hall International Inc. 1997.
3. Saferstein, R. (1982): Science Handbook, Vol. I, II, & III, Prentice Hall New Jersey.
4. Stern, C. (1964) : Principles of Human Genetics, Freeman, California.
5. Beerman, K.E.: Blood Group Serology, Churchill, and Lincoln, P.J. (1988)
6. Race, R.R, and Sanger, R. (1975) : Blood Groups in Man. Blackwell Scientific, Oxford.
7. Gilblet, E. (1969) : Markers in Human Blood, Davis, Pennsylvania
8. Culliford, B.E. (1971) The Examination and Typing of Blood Stains, US Deptt. of Justice, Washington
9. Chowdhari, S. (1971) : Forensic Biology, B P R & D, Govt, of India.
10. Dunsford, I and Bowley, C. (1967) : Blood Grouping Techniques, Oliver & Boyd, London.

3RD SEMESTER SYLLABUS
CORE PAPERS (ALL COMPULSORY)

<p>PAPER II : FORENSIC BIOLOGY SUBJECT CODE: FSC144C302, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objective: The objective of this course is to introduce the students to the basic concepts and different components of Forensic Biology.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No	Course Outcome	Blooms Taxonomy Level
CO1	define concept of forensic biology	BT1
CO2	illustrate the significance of wood in forensic science	BT2
CO3	apply various techniques used in examination of biological evidences	BT3
CO4	compare different types of biological specimens.	BT4

Module	Course content	Lecture hours
I	Fundamentals of Forensic Biology: Scope of Forensic Biology, Types of biological evidences, Importance of biological evidences in forensic investigation, Structure and Function of Cell, Plant and animal cell, Basics of Human anatomy and physiology.	15
II	Forensic Botany: Various types of woods, timbers, seeds and leaves and their identification and matching. Study and identification of pollen grains, Morphological and anatomical characteristics of plants producing drugs of abuse like opium, Cannabis, Coca plant, Tobacco, etc. Diatoms: Characteristics and application in forensic investigation.	15
III	Wild Life Forensics: Importance of wild life species in an ecosystem, Endangered and rare species, Different methods of killing and poaching of the wild life animals, Wild life Management, Identification of wild	15

	animals: examination of physical evidences like hair, nails, teeth, pugmarks, etc., Wild Life Protection Act.	
IV	Microbial Forensics: Introduction to microbiology, Bacteria- Structure of cell wall, gram positive and gram-negative bacteria. Sterilization techniques using Physical and Chemical agents, Microbial growth and environmental factors affecting the growth, Introduction to biological warfare, general properties of various biological warfare agents and their toxic effects. Popular case studies of bio-terrorism.	15
Total		60

Reference Books:

1. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers 2nd Edition (2005) - John M. Butler, Academic Press, ISBN:0121479528
2. James, S.H. And Nordby, J. J.; Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press USA
3. Laboratory Procedure Manual - Forensic Biology (2005), Directorate of Forensic Science, MHA, New Delhi
4. Lehninger Principles of Biochemistry 6th Edition (2012) – Nelson and Cox, W.H. Freeman, ISBN: 978-1429234146
5. Molecular Biology of the Cell, 6th Edition (2014) – Bruce Alberts, et al., Garland Science, ISBN: 978-0815341055

3RD SEMESTER SYLLABUS CORE PAPERS (ALL COMPULSORY)

<p>PAPER III : FORENSIC SEROLOGY AND BIOLOGY (PRACTICAL) SUBJECT CODE: FSC144C313, CREDIT UNITS: L-T-P-C = 0-0-4-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objective: The objective of this course is to develop a practical approach among students about the various experiments carried out using biological samples related to forensic science.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	choose the enzymes of our interest	BT1
CO2	interpret the blood group from the sample	BT2
CO3	apply methods to extract the DNA from the sample	BT3
CO4	categorize different biological samples	BT4

Module	Course content	Lecture hours
I	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 blood sample. 4. To identify blood samples by chemical tests.	15

II	5. To identify the given stain as saliva. 6. To identify the given stain as urine. 7. To carry out cross-over electrophoresis. 8. To study the correlation between impact angle and shape of bloodstain.	15
III	1. DNA extraction of conventional method 2. To carry out the separation of amino acids by thin layer chromatography.	15
IV	3. Preparation of gel plates for electrophoresis. 4. To carry out electrophoresis for separation of enzymes.	15
Total		60

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).

3RD SEMESTER SYLLABUS ABILITY ENHANCEMENT ELCTIVE COURSE (COMPULSORY)

PAPER V : INSTRUMENTAL METHODS II SUBJECT CODE: FSC144S321, CREDIT UNITS: L-T-P-C = 2-0-0-2 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]
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Course Objective: The objective of this course is to understand the basic & advances analytical instrumental techniques or methods for identification, characterization & quantification of different exhibits found at crime scene. The students will be able to learn different techniques (chromatography, electrophoresis, and immuno-assays) along with their use & forensic significance. They will also gain knowledge about principles & working of different chromatography, electrophoresis, and immuno-assays.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define the basic concept of chromatography, electrophoresis, and immuno-assays	BT1
CO2	interpret the forensic significance of different instrumental techniques such as TLC, HPLC, Agarose Gel Electrophoresis	BT2
CO3	develop the working, principles & applications of chromatography, electrophoresis, and immuno-assays	BT3
CO4	categorise the various types of chromatography, electrophoresis, and immuno-assays	BT4

Module	Course content	Lecture hours
I	Spectroscopy: Mass Spectroscopy- Working Principle, and its applications in forensic science, inductively coupled plasma Mass Spectroscopy (ICP-MS)- Introduction, Working principle, and forensic applications.	8
II	Separation and Detection Techniques: Introduction to Chromatography, types of chromatography, working principle and instrumentation of Gas chromatography (GC), thin layer chromatography (TLC), Column chromatography. Forensic applications of Chromatography.	8
III	General Principles of Biological / Biochemical Analysis: pH and Buffers. Centrifugation Techniques: Basic principle of sedimentation, types of centrifuges, analysis of sub-cellular fractions, Ultracentrifuge	8
IV	Electrophoresis: Introduction to Electrophoresis, Electrophoretic Mobility, Electrophoresis Apparatus, Types of Electrophoresis: Agarose Gel Electrophoresis, SDS-PAGE, applications in forensic science. Immuno-Assays: Introduction, Types of Immuno-Assays, ELISA, Types of ELISA and their application in forensic science.	8
Total		32

Reference Books:

1. Barris, H. and Hopkinson, D. A. (1976): Handbook of Enzyme, Electrophoresis, Elsevier, North, Holland, New York.
2. Christian Donnell R, Khan Javed, Kennedy Thomas (2011), Basic Principles of Forensic Chemistry; 1st Edition, Humana Press.
3. Egon Stahl. Thin-Layer Chromatography: A Laboratory Handbook, 2013
4. G.R Chatwal & S.K Anand; "Instrumental Methods of Chemical Analysis", Himalaya Publ. House, 2004.
5. Mule, S.J (1974), Immunoassays for Drugs subjects to ab, CRC Press.

3RD SEMESTER SYLLABUS

Discipline Specific Elective (DSE) (ANY ONE TO BE SELECTED)

<p>PAPER VI : FORENSIC GENETICS AND DNA PROFILING SUBJECT CODE: FSC144D301, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>
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Course Objective: The objective of this course is to impart knowledge about forensic genetics and the applications of DNA profiling.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define DNA.	BT1
CO2	understand the importance of human genetics.	BT2
CO3	acquire knowledge of biological evidences.	BT3
CO4	analyse and compare various biological evidences.	BT4

Module	Course content	Lecture hours
I	DNA: Genetic Material, Structure of DNA, denaturation and renaturation of DNA, DNA binding proteins, factors affecting DNA stability, DNA Damage and repair, Chemical properties of DNA, DNA replication in prokaryotes and eukaryotes, genetic code, transcription and translation machinery.	15
II	Human genetics: Introduction, heritability, human chromosomes, human genetic variations, Mendelian inheritances, polymorphic traits, Heritable human diseases, molecular basis and detection of inherited disease, gene mapping, Genetic markers, forensic applications of genetic markers.	15
III	Biological evidence: Sources, collection of evidence, characterization and storage, extraction and quantification of DNA, General principles of DNA extraction and quantification, sequence variations - VNTRs, STRs, and SNPs, Detection techniques- RFLP, PCR amplifications, YSTR, Mitochondrial DNA Evaluation of results, Allele frequency determination.	15
IV	STR Profiling: Structure of STR loci, Detection of STR polymorphisms, Interpretation of result, Assessment of STR profiles, estimating the frequencies of STR profiles, DNA profiling- History, applications in disputed paternity cases, missing person's identity, child swapping, civil immigration, disadvantages of DNA profiling, Analysis of SNP, DNA chip technology, DNA typing from blood, semen, & bone, application in wildlife investigations.	15
Total		60

Suggested Readings

1. Saferstein, Richard, Handbook of Forensic Science, Vol. I, II, (Ed.) Prentice Hall, Eaglewood Cliffs, NJ;
2. William Goodwin, Adrian Linacre, Sibte Hadi; An introduction to forensic genetics John Wiley & son's ltd, UK.
3. Coyle, H. (ed.) Nonhuman DNA Typing, International Forensic Science and Investigation Series, CRC Press, Boca Raton.
4. Linacre, A. (ed.)Forensic Science in Wildlife Investigations, International Forensic Science and Investigation Series, CRC Press, Boca Raton.
5. Bruce Budowle, Steven. Schutzer, Roger G. Breeze and Paul S. Keim Microbial Forensics.
6. Niels Morling, Handbook of Forensic Genetics (Forensic Science and Medicine) Humana Press.
7. John M. Butle. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers Elsevier Academic Press.

3RD SEMESTER SYLLABUS

DISCIPLINE SPECIFIC ELECTIVE (DSE) (ANY ONE TO BE SELECTED)

PAPER VIII : BIOMETRICS AND EMERGING TRENDS

SUBJECT CODE: FSC144D303,

CREDIT UNITS: L-T-P-C = 4-0-0-4

SCHEME OF EVALUATION: Theory Papers (T);

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objective: The objective of this course is to make students familiar with the biometric system and new emerging trends which are used in day-to-day applications in various fields such as institutions, banks, travel, etc. This subject will help students to learn and apply this knowledge in their security and protection of their personal data.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No	Course Outcome	Blooms Taxonomy Level
CO1	choose the biometric system for specific uses.	BT1
CO2	compare different biometric system and their drawbacks.	BT2
CO3	select solutions to the given security problems.	BT3
CO4	list out different emerging trends in biometrics.	BT4

Module	Course content	Lecture hours
I	Fundamental aspects of Biometrics: Definition, characteristics and operation of biometric system, Classification of biometric systems – physiological and behavioural, Types of Biometrics Fingerprints Identification, Palm prints recognition, Iris recognition, retina identification, geometry of hand and face, Handwriting recognition, signatures identification, keystrokes dynamics, gait pattern analysis, Speaker recognition. Strength and weakness of physiological and behavioural biometrics.	15
II	Biometric Process Key biometric processes: Enrolment, identification and verification, sensor module, feature extraction module, database module, matching module, Positive and negative identification, Performance measures used in biometric systems – FAR, FRR, GAR, FTA, FTE and ATV, Biometric versus traditional technologies. Multimodal Biometrics.	15
III	Emerging technologies under development: Blood pulse, Nailbed Identification, Body salinity Identification, vein Pattern, Facial thermography, Skin Luminescence, Brain Wave Pattern, Foot Dynamics. Applications of Biometric Technologies, Challenges and Issues in Using Biometrics.	15
IV	Security of Biometrics; Introduction to Security of Biometric System, Adversary attacks: Insider Attacks, Infrastructure attacks, Attacks on user Interface: Impersonation, Obfuscation, Spoofing, Countermeasure of spoof detection, Attacks on biometrics processing: On system modules & at interconnections, Attack on template database & Countermeasures in biometric template security.	15
Total		60

Reference Books:

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).
4. Anil K. Jain, Handbook of Biometrics
5. Kittler Josef & Mark S. Nixon; “Audio and Video based Biometric Person Authentication”, Springer, 2003.
6. Bolle R.M., Connell J.H., Pankanti S., Ratha N.K. and Senior A.W. (2004), Guide to Biometrics, Springer publications.
7. Sudha, Indira S., Biometrics & Fingerprint Analysis.

4TH SEMESTER SYLLABUS
CORE PAPERS (ALL COMPULSORY)

<p>PAPER I : FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE SUBJECT CODE: FSC144C401, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objective: The objective of this course is to introduce students with the medico legal aspects of death and changes after death. This subject will also explain the types of injuries and related investigations focusing the injuries. This subject aims at explaining students with the concept of forensic entomology in crime investigations

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define concept of forensic medicine and jurisprudence.	BT1
CO2	compare various types of injuries and their forensic importance.	BT2
CO3	apply the concept of forensic entomology, their history and significance.	BT3
CO4	categorize and classify various mechanical injuries.	BT4

Module	Course content	Lecture hours
I	Introduction to Forensic Medicine and Medical Jurisprudence: Definition of Forensic Medicine and Medical Jurisprudence, Role of Forensic Pathologist, medicolegal expert in the investigation of death, collection and preservation of postmortem exhibits.	15
II	Thanatology: Definition and concepts of death, Signs of death changes after death, Early changes - Algor mortis, rigor mortis, cadaveric spasm, heat stiffening, cold stiffening, changes in blood, chemical changes in cerebrospinal fluid, changes in vitreous humour, post mortem lividity, fluidity of blood. Late changes- putrefaction, external and internal changes. Adipocere, mummification.	15
III	Injuries: Mechanical Injuries- Blunt force trauma, sharp force injury, Firearm and explosive injuries, Defence injuries, fabricated injuries. Thermal injuries, Lightning, Electricity injuries. Medico-legal aspect of injury/hurt: simple and grievous hurts Antemortem & Postmortem Wounds, Age of the injury, Causative Weapon and appearance of Suicidal, Accidental and Homicidal injuries, burns-classifications of burns, cause of death.	15
IV	Forensic Entomology: History, significance, determination of time since death, Dipterean larval development & successional colonization in body, determining body movement, presence and position of wounds, linking suspect to the scene, identification of drugs and toxins from the insects and larvae feeding on the body, collection of entomological evidence.	15

Total	60
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Reference Books:

1. Modi J. S. : Medical Jurisprudence and Toxicology.
2. Parikh C.K. :Chikitsa Nyaya Shastra Aur Vish Vigyan.
3. Reddy : Forensic Medicine.
4. Taylor : Medical Jurisprudence

4TH SEMESTER SYLLABUS
CORE PAPERS (ALL COMPULSORY)

<p>PAPER II : QUESTIONED DOCUMENTS SUBJECT CODE: FSC144C402, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>

Course Objective: The aim of this course is to make students understand the detailed concepts of handwriting and questioned documents and to write a opinion based on examination of the same. The subjects also provides the knowledge on how to handle, preserve and protect the documents of various categories and compare different types of documents encountered in different cases.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define the handwritings and their natural variations.	BT1
CO2	compare various types of inks, papers and writers based on individual characteristics.	BT2
CO3	apply the knowledge into the disputed documents and handwriting cases.	BT3
CO4	examine forgeries and forged documents and currency notes.	BT4

Module	Course content	Lecture hours
I	Handwriting: Principles of handwriting, Writing habits, Individual characteristics of handwriting., Signature identification and examination-genuine and forged signatures. Disguise writing, Secret writing, Anonymous writing, intended writing.	15
II	Introduction to question document: History of questioned documents, classification of question documents, handling of document in special situations- torn document, fragile document, burnt document, water damaged document. various types of forensic documents- genuine and forged documents, holographic documents, basic tools needed for forensic document examination & their use. Admitted, specimen, questioned, disputed and standard documents.	15

III	Typewritten and Printed Documents: Identification of typewriters and printers, identification of typist, various types of printing processes, identification of printed matter- security documents Writing instruments and surfaces: Writing instruments and their types, identification of ink, types of paper, manufacturing and examination of paper. Currency notes: Feature identification and examination.	15
IV	Forgery Detection: Definition and types of forgery, examination of age of document, use ESDA and VSC in document examination. Alteration in documents- addition, overwriting, erasure, obliterations. Indentations & charred documents, examination of seal, rubber stamps and other mechanical impressions. Indian passport/visas, stamp papers, postal stamps etc. Opinion writings and reasons for opinion.	15
Total		60

Reference Books:

1. Hilton, O; Scientific Examination of Questioned Documents. Revised Edition, Elsevier, New York, 1982.
2. Osborn, A.S; Questioned Documents, 2nd Ed., universal Law Publications, Delhi, 1998.
3. Osborn, A.S; The Problem of Proof, 2nd Ed., Universal Law Pub. Delhi, 1998.
4. Thomas, C.C; Identification System for Questioned Documents, Billy Prior Bates Springfield, Illinois, USA, 1971.
5. Harrison, W.R; Suspect Documents Their Scientific Examination, Universal Law Publication, Delhi, 2001.

4TH SEMESTER SYLLABUS
CORE PAPERS (ALL COMPULSORY)

PAPER III: FORENSIC MEDICINE AND QUESTION DOCUMENT (PRACTICAL) SUBJECT CODE: FSC144C413 CREDIT UNITS: 0-0-8-4 SCHEME OF EVALUATION: Practical (P) [Continuous Evaluation: 25%: Skill Test, lab copy, viva, lab involvement (Any Three) Attendance: 5%, Semester End Examination: 70%]
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Course Objective: The objective of the course is to develop practical approach among the students in different types of crime scenes, their management and reconstruction. They will also learn about collection, packaging, forwarding and examination of various types of physical evidences found at crime scene.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No	Course Outcome	Blooms Taxonomy Level
CO1	relate and list different identification of class characteristics of handwriting.	BT1
CO2	understand the nature of various tools & techniques used in forensic examination	BT2
CO3	develop the art of collection, packaging, preservation & chemical analysis of viscera.	BT3
CO4	distinguish and examine the addition, alteration and obliteration in the documents.	BT4

Module	Course content	Lecture hours
I	1. Identification of Diatoms. 2. List out the differences between anti-mortem and post-mortem wounds.	12
II	3. Forensic identification of class and individual characteristics of Handwriting. 4. To study the natural variations in handwriting written in different circumstances. 5. Examination and identification of signature forgeries (simulated, traced, modelled, memorised).	15
III	6. Examination of indented handwriting. 7. Examination of additions, alterations and obliterations in the documents. 8. Examination of mechanical and chemical use to manipulate the document.	15
IV	9. To decipher secret writings on papers by fire/ flame method. 10. To decipher secret writings on papers by chemical method. 11. To examine security features in currency notes under different microscopes. 12. Case study based on disputed and admitted signatures.	18
Total		60

Reference Manual:
DFS Manuals.

4TH SEMESTER SYLLABUS
Discipline Specific Elective (DSE) (ANY ONE TO BE SELECTED)

<p>PAPER V : MICROSCOPY AND PHOTOGRAPHY SUBJECT CODE: FSC144D401, CREDIT UNITS: L-T-P-C = 4-0-0-4 SCHEME OF EVALUATION: Theory Papers (T); [Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]</p>
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Course Objective: : The course aims to provide the students with the use of microscopy in different branch of forensic science. To make them understand the principle, applications and working process of different microscopes.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define microscope and explain its applications in forensic science.	BT1 & BT2
CO2	describe principle, applications and working process of different microscopes.	BT2
CO3	apply the gained knowledge in the practical works.	BT3
CO4	distinguish between scanning electron microscope and transmission electron microscope.	BT4

Module	Course content	Lecture hours
I	Introduction to Microscopy: History, Electromagnetic radiation, Properties of light, Magnification, Resolution, Resolving Power, Depth of field, Depth of Focus, Numerical aperture, Lens, Aberration of lenses.	15
II	Light Microscopy: Introduction, Image formation in simple and compound microscope, Working principle and applications of Simple microscope, compound microscope, Bright field, Dark field microscopy, Comparison microscope, Stereo Microscope, Fluorescence Microscope.	15
III	Electron Microscopy: Introduction, Types of Electron Microscopy. Scanning electron microscopy (SEM), Transmission electron microscopy (TEM): Theory and basic principles, Instrumentation & forensic applications. Comparison of SEM and TEM. Comparison between Light Microscopy and Electron Microscopy.	15
IV	Photography: Black & White and colour photography - Basic principles and techniques. Cameras and lenses, developments and printing, link between Cameras and Film negatives, Digital photography, Photogrammetry and videography, crime scene and laboratory photography, Recent developments in photography.	15
Total		60

Reference Books:

1. An Introduction to Microscopy, Suzanne Bell : Keith Morris
2. Forensic Science Handbook Volume I : Richard Saferstein
3. Light Microscopy, R. G. E. Murray : Carl F. Robinow
4. Fundamentals of Light Microscopy and Electronic Imaging : Douglas B. Murphy, Michael W. Davidson.
5. Physical Principles of Electron Microscopy An Introduction to TEM, SEM, and AEM: Ray F. Egerton.
6. The History of Photomicrography :Normand Overney and Gregor Overney
7. H.L. Blitzer and J.Jacobia; Forensic Digital Imaging and Photography, Academic Press (2002)

4TH SEMESTER SYLLABUS DISCIPLINE SPECIFIC ELECTIVE (DSE) (ANY ONE TO BE SELECTED)

PAPER VI : FORENSIC GENETICS AND BIOINFORMATICS

SUBJECT CODE: FSC144D402,

CREDIT UNITS: L-T-P-C = 4-0-0-4

SCHEME OF EVALUATION: Theory Papers (T);

[Continuous Evaluation: 15%, Assignment, Class Test, Seminar, Quiz (Any three); Mid-term Examination: 10%; Attendance:5%; Semester End Examination: 70%]

Course Objective: The objective of this course is to introduce the students to the basic concepts of genetics and bioinformatics which are applied in the field of forensic science.

Course Outcome : After successful completion of the course, student will be able to		
Sl.No.	Course Outcome	Blooms Taxonomy Level
CO1	define concepts of human genetics.	BT1
CO2	classify about types of mutations.	BT2
CO3	apply various bioinformatics tools for data analysis.	BT3
CO4	identify and analyse the amino acid and nucleotide sequences.	BT4

Module	Course content	Lecture hours
I	Human Genetics I: Introduction to genetics, heritability, genetic variations, human chromosomes, Mendelian inheritances, Heritable human diseases. Molecular basis and detection of inherited disease, gene mapping.	15
II	Human Genetics II: Mendelian Population, gene pool, Hardy-Weinberg equilibrium, statistical assessment of deviation from Hardy-Weinberg equilibrium, Genetic markers, Mutations: causes, types, rates, genetic load, mutation detection methods, population structure and gene flow.	15
III	Bioinformatics I: Database: Introduction, theory and methods of searching database, integrated information retrieval, searching for sequence homology and alignment, Sequence editing tools.	15
IV	Bioinformatics II: Introduction Basics of gene identification and gene prediction, pattern recognition, gene prediction tools, micro-array analysis tools, applications, concepts of FASTA and BLAST. Types of databases in bioinformatics.	15
Total		60

Suggested Readings

1. John M. Butler, (2nd Edition) (2005), Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers , Elsevier (USA).
2. Lawrence Kobilinsky, L., Liotti, T.F and Sweat, J.O., (2005), DNA: Forensic and Legal Applications, John Wiley and Sons, Inc.
3. Race, R.R, and Sanger, R., (1975), Blood Groups in Man, Blackwell Scientific, Oxford.
4. Richard Saferstein (Vol. I,II&III) (1982), Forensic Science Hand book, Prentice Hall New Jersey.
5. Rudin, N. and Inman, K. (2nd Edition) (2002), An Introduction to Forensic DNA Analysis, CRC Press.
6. William Goodwin, Adrian Linacre, Sibte Hadi, (2007), An Introduction to Forensic Genetics, John Wiley & Sons Ltd.