NOORUL ISLAM CENTRE FOR HIGHER EDUCATION

(Deemed to be University Under Section 3 of the UGC Act, 1956)
Kumaracoil, Thuckalay

DEPARTMENT OF ALLIED HEALTH SCIENCE

B.Sc. FORENSIC SCIENCE

CURRICULUM AND SYLLABI

REGULATION 2021

NOORUL ISLAM CENTRE FOR HIGHER EDUCATION
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DEPARTMENT OF ALLIED HEALTH SCIENCES
B.Sc. Forensic Science Programme
Curriculum and Syllabi
Regulation: 2021

Vision of the University

To be recognized by the Government and society at large as an institution able to deliver excellence with relevance in the field of higher education and research focusing on the needs of the nation in tune with the technological revolution to cope with the knowledge explosion and global competence.

Mission of the University

To develop the institution as a Centre of Excellence, keeping pace with the advances in the field, to provide quality higher education to the students and install in them high standards of discipline and ethics so that they become enlightened individuals in the service of humanity and to carry out focused research in the frontier areas of science and technology.

Department of Allied Health Sciences

Vision of the Department

Empower & elevate students to understand the conditions conductive to harmonious healthy society & to create graduates who endeavour the welfare of mankind.

Mission of the Department

The mission of the Department of Allied Sciences – Forensic Science at NICHE is to buildup students towards application & Practice of knowledge as well as to impart quality education for lifelong professional growth & opportunity in a wide range of careers. Equipping the students with recent technologies to provide accessible & innovative care & service as well as installing strength of creativity in young minds with sound research aptitude.

Description of the programme

The course offers the study of scientific applications and knowledge that helps in the investigation of crimes. This course covers a wide range of subjects and how to carefully analyse and study different objects at crime scenes as they are the most important proofs such as blood stains, soil, bones, fingerprints, recovering data from mobiles, laptops, computers, DNA

profiling, etc. The course helps the students to develop certain skills like intelligence, viewing the cases from different perspectives, strong analytical skills, keen observation skills, patience, ability to work with other experts, etc.

Programme Educational Objectives - PEO	
PEO-A	Develop critical thinking and investigation in a stepwise manner that builds through the sequence of courses.
PEO-B	Develop problem-solving skills in a stepwise manner that builds through the sequence of courses.
PEO-C	Approach analysis of evidence without prejudice.
PEO-D	Develop a conceptual understanding of criminal justice system, rules of evidence, legal system.
PEO-E	To culminate with course experience that requires amalgamation of diverse skills and capacities in the solution of a real problem.

Graduate Attributes-GA	
GA-1	**Foundational Scientific Knowledge** Acquire a deep understanding of fundamental principles across core scientific disciplines, including physics, chemistry, biology, and mathematics, providing a strong foundation for further learning and research.
GA-2	**Practical Skills and Laboratory Competence** Develop hands-on laboratory skills and the ability to conduct experiments, analyze data, and apply scientific methods to real-world problems in various scientific domains
GA-3	**Research and Analytical Thinking** Foster research capabilities and critical thinking skills, enabling the design and execution of scientific investigations, interpretation of experimental results, and formulation of evidence-based conclusions.
GA-4	**Data Analysis and Statistical Techniques** Utilize modern data analysis techniques and statistical tools to interpret experimental data, draw meaningful conclusions, and solve complex scientific and mathematical problems
GA-5	**Interdisciplinary Knowledge and Applications** Integrate knowledge from multiple scientific disciplines to approach problems holistically, understanding how different scientific fields contribute to innovation and real-world applications.
GA-6	**Environmental Awareness and Sustainability** Demonstrate an understanding of environmental issues and the impact of scientific practices on the environment, promoting sustainability and responsible use of natural resources in all scientific endeavors.
GA-7	**Ethical Conduct and Scientific Integrity** Uphold ethical standards and integrity in scientific research and practice, ensuring honesty, accuracy, and responsibility in data handling, experimentation, and reporting
GA-8	**Communication and Presentation Skills** Develop effective communication skills to articulate scientific concepts, research findings, and technical information clearly and concisely to both scientific and non-scientific audiences
GA-9	**Technology Integration and Innovation** Apply cutting-edge technologies and tools in scientific experimentation and research, leveraging innovation to drive progress and stay at the forefront of scientific discovery.
GA-10	**Lifelong Learning and Adaptability** Cultivate a mindset of continuous learning, staying informed about scientific advancements and adapting to new tools, methods, and technologies to remain competitive in a rapidly evolving scientific landscape.

Programme Outcome - PO	
PO-A	Apply the knowledge of pure science like Physics, Chemistry, Biology towards the solution of crime
PO-B	Describe and apply the basic principles of forensic science
PO-C	Design a novel strategy to check the crime rate in consideration of society harmony.
P0-D	Carry out practical techniques and strategy developed in forensic science.
PO-E	Application of modern techniques, skills, and modern tools required for forensic investigations.
PO-F	Apply contextual knowledge to assess and investigates societal issues.
PO-G	Appraise methods of forensic investigation and laws relevant to forensic science.
PO-H	Apply ethical principles to commit professional ethics & responsibilities & norms of the forensic science practice
PO-I	Function effectively as an individual & as a member o leader in diverse teams & in multidisciplinary setting.
PO-J	To develop effective communication skills regarding victims handling, executive officers & judicial officers with effective presentation & report writing skills
PO-K	Case analysis demonstrate knowledge & understanding of the science principles in investigation.
PO-L	Effective Communication by oral, written, computing and graphical means of knowledge & understanding in investigation.
PO-M	Recognize the need to participate in lifelong learning through continuing education and research.

Mapping of Graduate Attributes and Programme Outcome

GAs / PEOs	GA-01	GA-02	GA-03	GA-04	GA-05	GA-06	GA-07	GA-08	GA-09	GA-10
PEO-A	N	A	A	A	H	A	A	A	H	A
PEO-B	N	A	A	A	N	A	A	A	N	A
PEO-C	N	A	A	A	N	A	A	A	H	A
PE0-D	N	A	A	A	H	A	A	A	N	A
PEO-E	N	A	A	A	N	A	H	A	N	H

H- Highly Associated A- Associated Not – Not Associated

Mapping of Programme Educational Objective (PEOs) and Programme Outcomes (POs)

PEO / PO	PEO-A	PEO-B	PEO-C	PEO-D	PEO-E
PO-A	A	A	H	H	A
PO-B	A	A	H	H	A
PO-C	A	H	A	A	A
P0-D	A	H	H	H	A
PO-E	A	A	H	H	A
PO-F	H	H	H	H	A
PO-G	H	H	H	H	A
PO-H	A	A	A	A	A
PO-I	H	H	H	A	A
PO-J	A	A	A	A	A
PO-K	A	A	A	A	H
PO-L	H	H	H	H	H
PO-M	A	A	A	A	A

H- Highly Associated A- Associated Not – Not Associated

Duration of the programme: 3 Years/ 6 Semesters

FS Credit :132

CURRICULUM & SYLLABI
REGULATION - 2021
SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	EG3601	English- I	3	1	0	4
2	MS36F1	French I	3	0	0	3
3	BS3610	Indian Constitution	2	0	0	2
4	FS3601	Fundamentals of Crime, Criminology & Police	3	0	0	3
5	BS3611	General Chemistry	3	0	0	3
6	BS3612	General Physics	3	0	0	3
PRACTICAL						
7	BS3681	General Chemistry Laboratory	0	0	2	2
8	BS3682	General Physics Laboratory	0	0	2	2
TOTAL			17	1	4	22

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	EG3602	English- II	3	1	0	4
2	MS36F2	French II	3	0	0	3
3	GE3605	Human Values & Professional Ethics	2	0	0	2
4	FS3602	Basics of Forensic Science	3	0	0	3
5	BS3613	General Biology	3	0	0	3
6	FS3603	Forensic Psychology	3	0	0	3
PRACTICAL						
7	FS3671	Basics of Forensic Science Laboratory	0	0	2	2
8	BS3683	General Biology Laboratory	0	0	2	2
TOTAL			17	1	4	22

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	FS3604	Forensic Physics & Criminalistics	3	1	0	4
2	FS3605	Forensic Serology	3	1	0	4
3	FS3606	Instrumentation Techniques in ForensicScience	3	1	0	4
4	FS3607	Forensic Medicine	3	0	0	3
5	FS3608	Introduction to Computers & Cyber Crime	2	0	0	2

PRACTICAL						
7	FS3672	Forensic Physics & Criminalistics Laboratory	0	0	2	2
8	FS3673	Forensic Serology Laboratory	0	0	2	2
9	FS3674	Instrumentation Techniques in Forensic Science Laboratory	0	0	2	2
TOTAL			14	3	6	23

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	FS3609	Forensic Dermatoglyphics	3	1	0	4
2	FS3610	Digital & Cyber Forensics	3	1	0	4
3	FS3611	Forensic Ballistics	3	1	0	4
4	FS3612	Criminal Law	3	0	0	3
5	FS3613	Forensic Audio Video Analysis	2	0	0	2
PRACTICAL						
7	FS3675	Forensic Dermatoglyphics Laboratory	0	0	2	2
8	FS3676	Forensic Ballistics Laboratory	0	0	2	2
9	FS3677	Digital & Cyber Forensics Laboratory	0	0	2	2
TOTAL			14	3	6	23

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	**FS3614**	Questioned Documents Examination	4	0	0	4
2	**FS3615**	Forensic Anthropology	4	0	0	4
3	**FS3616**	DNA Fingerprinting	4	0	0	4
4	**FS3617**	Statistics & Research Methodology in Forensics	2	0	0	2
5	**FS36XX**	Elective 1	3	0	0	3
PRACTICAL						
7	**FS3678**	Questioned Documents Examination Laboratory	0	0	2	2
8	**FS3679**	Forensic Anthropology Laboratory	0	0	2	2
9	**FS3680**	Basics of DNA Fingerprinting Laboratory	0	0	2	2
TOTAL			17	0	6	23

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	**FS3618**	Forensic Chemistry & Toxicology	3	1	0	4
2	**FS3619**	Arson & Explosives	3	1	0	4
3	**FS36XX**	Elective II	2	1	0	3
PRACTICAL						
4	**FS36P1**	Dissertation/Minor Project	0	1	5	6
5	**FS36P2**	Internship	0	0	2	2
TOTAL			8	4	7	19

LIST OF ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
ELECTIVES						
1	**FS36A1**	Wildlife Forensics and Forensic Entomology	3	0	0	3
2	**FS36A2**	Human Physiology and Anatomy	3	0	0	3
3	**FS36A3**	Accident Investigation and Forensic Photography	3	0	0	3
4	**FS36A4**	Artificial Intelligence	3	0	0	3
5	**FS36A5**	Environmental Science	3	0	0	3

SEMESTER I

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	EG3601	English- I	3	1	0	4
2	MS36F1	French I	3	0	0	3
3	BS3610	Indian Constitution	2	0	0	2
4	FS3601	Fundamentals of Crime, Criminology & Police	3	0	0	3
5	BS3611	General Chemistry	3	0	0	3
6	BS3612	General Physics	3	0	0	3
PRACTICAL						
7	BS3681	General Chemistry Laboratory	0	0	2	2
8	BS3682	General Physics Laboratory	0	0	2	2
TOTAL			17	1	4	22

EG3601	English -1	L	T	P	C
		3	1	0	4

OBJECTIVES

To make the students acquire basic knowledge in English with communicative competence, enable them to develop their communication skills effectively.

Course Outcome – COs At the end of the course, the students will be able to		Cognitive Skill
CO-01	Learn the prose of various English authors like George Bernard Shaw, L. A. G. Strong, James Thurber, Oscar Wilde and Robert Lynd.	R, U
CO-02	Learn the poetry of an Indian author Nissim Ezekiel, the romantic poet William Wordsworth and Robert Frost.	R, U
CO-03	Learn the short story of an Indian author Kushwant Singh, and English writers O. Henry and W. Somerset Maugham.	R, U,
CO-04	Improve their technical vocabulary, and they will learn basic grammatical competencies such as Tense, Active Voice, Passive Voice, Transformation of Sentence, Agreement of subject with verb, Vocabulary – Antonyms, Synonyms, Suffix, Prefix, One word Substitution, Odd one out.	U, A

CO-05	Learn about the format of writing formal letters as well as business letters, thereby improving their writing skill and developing their reading skill by reading comprehension.	U, A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-02	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-03	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-04	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-05	L	M	L	M	L	M	M	M	L	M	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Prose: a galaxy of precious prose: (detailed) **12**

1. Spoken English and Broken English – George Bernard Shaw
2. Reading for Pleasure – L. A. G. Strong
3. University Days – James Thurber
4. The Model Millionaire – Oscar Wilde
5. On Forgetting – Robert Lynd

Unit II: Poetry: Harmony (detailed) **12**

1. The Solitary Reaper – William Wordsworth
2. Stopping by Woods on a Snowy Evening – Robert Frost
3. Enterprise – Nissim Ezekiel
4. Lead, Kindly Light – Cardinal Newman
5. Where the mind is without fear – Rabindranath Tagore

Unit III: Short story: Popular short stories (non–detailed) **12**

1. The Gift of the Magi – O. Henry
2. The Ant and the Grasshopper – W. Somerset Maugham
3. The Mark of Vishnu – Kushwant Singh

Unit IV: Grammar **12**

1. Functional english – parts of speech, articles, prepositions, auxiliaries and modals, agreement of subject with verb
2. Vocabulary – antonyms, synonyms, suffixes, prefixes, one-word substitutes, odd words out

Unit V **12**

Basics of Letter Writing – Reading Comprehension

TOTAL: 60 HOURS

TEXTBOOKS

1. A Galaxy of Precious Prose, ed. Dr. Rao, Syamala B. , Madras. Blackie Books, 2001.
2. Harmony : An Anthology of Poems, ed. Tripathy, Biyot K. , OUP India, 1997.
3. Popular Short Stories, ed. Board of Editors, Oxford Press, 1997.

REFERENCE BOOKS

1. Spoken English and Broken English, Linguaphone Institute.
2. Indian Writing in English by K.R. Srinivasa Iyengar. Sterling publisher.
3. William Blake's London: An Interpretation by Samir Mazarweh. Grin Verlag publishers

BS3610	Indian Constitution	L	T	P	C
		2	0	0	2

OBJECTIVES

To know about the basic structure of Indian Constitution

Course Outcome-COs At the end of the course, students will able to		Cognitive Skill
CO-1	Gain basic Knowledge of Structure and Principles of Indian Constitution	U
CO-2	Gain basic knowledge of Fundamental Rights & Directive Principles	R, A
CO-3	Gain basic knowledge of Function of Union Government	R
CO-4	Gain basic knowledge of Function of State Government	R
CO-5	Gain basic knowledge of Function of Judiciary	A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-02	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-03	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-04	L	M	L	M	L	M	M	M	L	M	L	S	S
CO-05	L	M	L	M	L	M	M	M	L	M	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Constitution – Structure and Principles **6**

Meaning and importance of Constitution, Making of Indian Constitution – Sources, Salient features of Indian Constitution, Preamble.

Unit 2: Fundamental Rights and Directive Principles **6**

Fundamental Rights, Fundamental Duties, Directive Principles.

Unit 3: Government of the Union **6**

President of India – Election and Powers, Prime Minister and Council of Ministers, Lok Sabha – Composition and Powers, Rajya Sabha – Composition and Powers

Unit 4: Government of the States **6**

Governor – Powers, Chief Minister and Council of Ministers, Legislative Assembly – Composition and powers, Legislative Council – Composition and powers

Unit 5: The Judiciary **6**

Features of judicial system in India, Supreme Court –Structure and jurisdiction, High Court – Structure and jurisdiction

TOTAL: 30 HOURS

TEXTBOOKS

1. Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis, 2018 (23rd edn.)
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.

REFERENCE BOOKS

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, 2015(11th edn.)New Delhi

FS3601	Fundamentals of Crime, Criminology & Police	L	T	P	C
		3	0	0	3

OBJECTIVES

To know the causes of criminal behaviour, the significance of criminal profiling to mitigate crime, the effect of crime in society.

Course Outcome- COs At the end of the course, students will able to		Cognitive skill
CO1	Gain knowledge of crime and its nature	U, R
CO2	Gain knowledge on different theories of crime	U, R
CO3	Define different types of crime	U, R
CO4	Gain knowledge of history and organisation of Police	U, R
CO5	Gain knowledge of police science	U, R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	L	L	S	M	M	S	S
CO-02	S	S	S	M	M	M	L	L	S	M	M	S	S
CO-03	M	M	M	M	M	M	L	L	M	M	M	S	S
CO-04	S	S	S	S	S	S	L	S	S	S	S	S	S
CO-05	M	M	S	S	M	M	L	L	M	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Introduction **9**

Crime – definitions – historical perspectives – nature, origin and scope – Deviance, social context of deviance, delinquency – Criminology and its relations with other social sciences – Criminology's interdisciplinary nature. Criminal profiling. Understanding modus operandi.

Unit 2: Explanations of Crime **9**

Pre-classical school – Classical school – Biological positivism – Cartographic school – Neo-classical School – Positive school-Italian School. Sociological Theories.

Unit 3: Typology of Crime and Criminal Behaviour **9**

Crime against person – Crime against property – Conventional crime – White collar crime – Organized crime – Cybercrime – Environmental crime – Habitual offenders – Professional criminals – Violent and aggressive offenders, Violence against women, sexual offenders – Recidivists, Hate Crime, Workplace Violence.

Unit 4: History of Police & Central Police Organization **9**

Historical development of police - Ancient, Medieval and Modern Indian Police. General organization of the State Police - Administrative hierarchy and the Ranges.

C I D- Organization and functions of various branches, Economic Crime Wing – Cyber division, Intelligence Wing, Training wing, Technical Services - SCRB, FSL, FPB.

Organizational set up and functions of

(a) Line Units: - Assam Rifles; CRPF; RPF; ITBP; CISF; BSF; NSG&SPG.

(b) Staff Units: - BPR&D – NCRB, SVNPA, LNJNICFS, CDTS,

(c) Directorate of Forensic Sciences- CFSL, CFPB, GEQD, DNA fingerprint unit.

(d) Mixed Units: - CBI, IB& R and A Wing.

Unit 5: Police science **9**

Definition & scope. Investigation - FIR, case diary. Cognizable & Non-cognizable offences, investigation in cognizable offences. Police's power of investigation. Who is an Investigator? -

Investigator & his qualities, General guidelines for investigator. Interview of witness. Interrogation of suspect. Filing of criminal charges. Policing styles and principles. Community policing.

TOTAL: 45 HOURS

TEXT BOOKS

1. N. V. Paranjape. Criminology & Penology. Central Law Publication. 2018.
2. Frank E Hagan. Introduction to Criminology-Theories, Methods & Criminal Behaviours. Sage Publication 2016.
3. Siegel Larry. Criminology: Theories, Patterns and Typologies. Cengage Learning, 2016.
4. Mike Maguire, Rod Morgan, Robert Reiner. The Oxford Handbook of Criminology. Oxford University Press. 2007.

REFERENCE BOOKS

1. Ahmed Siddique, (1993), Criminology, Problems and Perspectives, III Edn., Eastern Book House, Lucknow.
2. Chockalingam, K. (1997), 'Kuttraviyal' (Criminology) in Tamil, Parvathi Publications, Chennai.
3. Edwin H. Sutherland and Donald R. Cressey (1974), Principles of Criminology, Lippincott, Philadelphia.

BS3611	General Chemistry	L	T	P	C
		3	0	0	3

OBJECTIVES

The objective of the course is to develop the basic knowledge of chemistry among the forensic science students and application of chemistry and its several technological aspects in forensic science.

Course Outcome-COs At the end of the course, students will able to		Cognitive skill
CO-1	Gain basic Knowledge of Liquids	U
CO-2	Gain basic knowledge of thermodynamics	U, A
CO-3	Gain basic knowledge of chemical kinetics	U, R
CO-4	Gain basic knowledge of chemical bonding	U
CO-5	Gain basic knowledge of hydrocarbon	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	L	L	S	L	L	S	S
CO-02	S	S	S	S	M	M	L	L	M	M	L	S	S
CO-03	M	M	M	S	M	M	L	L	M	L	L	S	S
CO-04	M	S	M	S	S	S	L	L	S	L	L	S	S
CO-05	M	S	M	S	M	M	L	L	S	L	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Introduction to Chemistry **9**

Modern periodic law, long form of periodic table and its features, atomic size, ionic radius, ionization potential, electron affinity, electronegativity, screening effect, anomalous behavior of first element of a group, diagonal relationship, general characteristics of s-block and p-block elements, metals and non-metals, transition and inner transition elements. Oxidation and reduction.

Unit 2: Thermodynamics **9**

Thermodynamics intensive and extensive properties, state and path functions.Zeroth law, first law of thermodynamics- concept of heat, internal energy, enthalpy, limitations. Second law- carnot theorem, concept of entropy, work and free energy functions, concept of activity and activity coefficient.Third law of thermodynamics.

Common ion effect in the precipitation of cations, primary and secondary standard solutions, indicators, gravimetric and volumetric analysis, chromatographic separation, theory of titrations of acid and base.

Unit 3: Chemical Kinetics **9**

Chemical Kinetics Rate, order and molecularity of reactions, first and second order reactions, collision theory, homogeneous and heterogeneous catalysis, adsorption-physical and chemical adsorption, surface tension, viscosity, half-life of first order reaction, activation energy and factors influencing activation energy.

Unit 4: Chemical Bonding: **9**

Ionic and covalent bond, bond parameters, VSEPR theory, valence bond theory, molecular orbital theory, Hybridization and structure of molecules.

Coordination compounds: EAN rule, types of ligands, stability of complexes, application of coordination compounds in qualitative and quantitative analysis.

Unit 5: Hydrocarbons: **9**

Hydrocarbons Classification- alkanes, alkenes, alkynes, IUPAC nomenclature, isomerism, electron displacement effects in organic molecules, resonance, types of organic reactions, types of reagents, reaction intermediates, polymers, classification of polymers, application of some commercially important polymers, aromatic compounds, Aromaticity and Huckel's rule, dyes.

TOTAL: 45 HOURS

TEXTBOOKS

1. Concise Inorganic Chemistry by J.D. Lee. CBS Publishers and Distributors,4th Edition, 2004. New Delhi.
2. Organic Chemistry by Moris and Boyed, Oxford IBH Publishing Co. Pvt. Ltd, 1975
3. Heterocyclic Chemistry by Gupta and Kumar Vol I and Vol II CBS Publishers and Distributors, New Delhi.
4. Ken A. Dill Sarina Bromberg, Molecular Driving Forces Statistical Thermodynamics in Biology, Chemistry, Physics, and Nanoscience, 2nd Edition 2011, Garland Series T&F, New York.
5. James H. Espenson, Chemical Kinetics and Reaction Mechanisms, Mc Graw Hill, 2nd Edition 1995, New York.

REFERENCE BOOKS

1. Morrison, Boyd and Bhattacharjee, Organic Chemistry, 7th Edition, Pearson
2. Arthur Winter, Organic Chemistry I, John Wiley & Sons, Inc, 2nd Edition 2014,New Jersey.
3. George A. Olah, Arpad Molnar, G. K. Surya Prakash, Hydrocarbon Chemistry,John Wiley & Sons, Inc, 2008, New Jersey.

BS3612	General Physics	L	T	P	C
		3	0	0	3

OBJECTIVES

The objective of the course is to develop the basic knowledge of physics among the forensic science students and application of physics and its technological aspects in forensic science.

Course Outcome-COs At the end of the course, students will able to		Cognitive skill
CO-1	Gain basic knowledge of physics law	U, R
CO-2	Gain basic knowledge of refraction and lens	U, A
CO-3	Gain basic knowledge of properties of matter	U, A
CO-4	Gain basic knowledge of radiation and its application	U, A
CO-5	Gain basic knowledge of laser and its application	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-02	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-03	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-04	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-05	S	S	S	M	S	L	L	L	M	L	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Introduction to Physics **9**

Momentum conservation, collision, work and power, energy conservation, units and dimensions, vector and scalar quantities, laws of motion, fluid dynamics-Bernoulli's equation, viscosity, Poiseuille equation, elastic and inelastic collision

Unit 2: Refraction **9**

Newton's rings, simple table spectrophotometer, total internal reflection. Refraction through thin layers, thick lens, and lens combinations, Aberrations, interference in thin films, fringes in wedge shaped films.

Unit 3: Matters **9**

Dielectric properties of matter – polarization, electrostatic energy, magnet static field, magnetic properties of matter. Electromagnetic induction

Unit 4: Radiation **9**

Radiation and its nature, nuclear structure, radioactivity, fission and fusion, Boolean algebra, De-Morgan's theorem

Unit 5: Laser **9**

Absorption and emission of light- Absorption- spontaneous emission and stimulated emission, Einstein relations, Population inversion- Active medium-Pumping, different pumping methods, population inversion, Resonators – plane mirror and confocal resonators – Metastable state, Three level and Four level Laser systems. Ruby Laser, He-Ne laser, Semiconductor Laser, Laser beam Characteristics, coherence. Applications of Laser.

TOTAL: 45 HOURS

TEXTBOOKS

1. V.K. Gupta, Principle of Electronic by CBS Publishers and Distributors, 4th Edition, 2004, New Delhi.
2. Malnino, Digital Electronics, Chapman and Hall Publications. 2012.

3. Flloyd, Digital Electronics by Tata McGraw Hill Publishing Company, Ltd., 2nd Edition. 2003, New Delhi.
4. Nicola Manini, Introduction to the Physics of Matter: Basic atomic, molecular, and solid-state physics by Springer 2014, New York
5. Carlos, Introduction to the Basic Concepts of Modern Physics Special Relativity, Quantum and Statistical Physics, 2nd Edition, Springer 2014, Italy

REFERENCE BOOKS

1. Tayal D.C. (2002). Nuclear Physics. (1st ed.). New Delhi: Himalaya Publishing House.
2. Roy R.R. and Nigam B.P. (1983). .Nuclear Physics, (2nd ed.). Bangalore: New age International Ltd.

BS3681	General Chemistry Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

The objective of the course is to develop the basic knowledge of chemistry among the forensic science students and application of chemistry and its several technological aspects in forensic science

Course Outcome-COs At the end of the course, students will able to		Cognitive Skill
CO-1	Determine density & viscosity of liquid	U, A
CO-2	Determine surface tension of liquid	U, A
CO-3	Determine strength of acid	U, A
CO-4	Conduct qualitative analysis	U, A
CO-5	Identify organic compound	U, A

R-Remember, U-Understand, A-Apply, An-Analyze ,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	S	L	L	S	L	L	S	S
CO-02	S	S	S	S	M	M	L	L	M	L	L	S	S
CO-03	M	M	M	S	M	M	L	L	M	L	L	S	S

CO-04	M	S	M	S	S	S	L	L	S	L	L	S	S
CO-05	M	S	M	S	M	M	L	L	S	L	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Determination of density of given liquid
2. Determination of viscosity of given liquid
3. Determination of surface tension of given liquid
4. Standardization of given liquid by primary standard
5. Determination of strength of given acid (Titrimetry)
6. Determination of hardness of water sample
7. Determination of chloride content of water sample
8. Determination of alkalinity of water sample
9. Inorganic micro / semi micro qualitative analysis (Demonstration only)
10. Identification of organic compound (Demonstration only)

TOTAL: 30 HOURS

BS3682	**General Physics Laboratory**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**2**

OBJECTIVES

The objective of the course is to develop the basic knowledge of physics among the forensic science students and application of physics and its technological aspects in forensic science.

Course Outcome-COs **At the end of the course, students will able to**		**Cognitive skill**
CO-1	Determine fly wheel	U, A
CO-2	Perform Y by uniform bending	U, A
CO-3	Gain basic knowledge of refractive index of liquid	U, A
CO-4	Gain basic knowledge sound parameter	U, A
CO-5	Gain basic knowledge of laser and its application	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-02	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-03	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-04	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-05	S	S	S	M	S	L	L	L	M	L	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Fly wheel
2. Y by uniform bending
3. ŋ of Posseuli Method
4. Spectrophotometer (determination of angle of prism A)
5. Refractive index of liquid by using LASER
6. Ultrasonic interferometer
7. Sound Intensity measurement
8. Laser Parameter
9. Transistor (CE) characteristics
10. Dc morgan's theorems

TOTAL: 30 HOURS

SEMESTER II

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	EG3602	English- II	3	1	0	4
2	MS36F2	French II	3	0	0	3
3	GE3605	Human Values & Professional Ethics	2	0	0	2

4	FS3602	Basics of Forensic Science	3	0	0	3
5	BS3613	General Biology	3	0	0	3
6	FS3603	Forensic Psychology	3	0	0	3
PRACTICAL						
7	FS3671	Basics of Forensic Science Laboratory	0	0	2	2
8	BS3683	General Biology Laboratory	0	0	2	2
TOTAL			17	1	4	22

EG3602	**English-I**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVES

To make the learners acquire basic knowledge in English with communicative competence, enable them to communicate effectively in English and assimilate the genres of poetry, prose, and short story and grammar for language enrichment

Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Course Outcome-COs **At the end of the course, students will able to**		**Cognitive Skill**
CO-01	Understand English prose. That will help them to improve their vocabulary and writing skill.	U, A
CO-02	Learn how to analyze a poem and they will be able to find out the poetic devices using in a poem.	An
CO-03	Understand the structure of a short story, and it will also help to enrich their vocabulary and reading skill.	A, U
CO-04	Get an idea about grammar and they learn to use parts of speech, it will help to improve their reading and writing skill. It will enable the learner to communicate effectively in English.	U, A
CO-05	Understand non-verbal communication. They can apply this in their day today life, it will improve their communication skill.	A

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-K	PO-L	PO-M
CO-01	S	M	M	L	S	M	L	S	S	S	M	N	M
CO-02	M	S	L	S	N	M	S	L	N	M	M	N	S
CO-03	S	S	L	L	N	M	S	L	M	N	L	S	S
CO-04	S	S	M	S	S	M	N	S	L	N	S	L	S
CO-05	S	M	L	L	M	M	S	N	S	L	S	S	N

Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Prose: A Galaxy of Precious Prose: (detailed) **12**

1. On Saying Please – A. G. Gardiner
2. My visions for India – A. P. J. Abdul Kalam
3. Water the Elixir of Life – C. V. Raman
4. An Astrologer's Day – R. K. Narayan
5. Hazards of Sensual Drugs – Hardin B. Jones

Unit II: Poetry: Harmony (detailed) **12**

1. La Belle Dame Sans Merci – John Keats
2. All the World's a Stage – William Shakespeare
3. Palanquin Bearers – Sarojini Naidu
4. Tithonus – Alfred Lord Tennyson
5. If – Rudyard Kipling

Unit III: Short Story: Popular Short Stories(non–detailed) **12**

1. The Necklace – Guy De Maupassant
2. The World-Renowned Nose – Vaikkam Muhammad Basheer
3. The Selfish Giant – Oscar Wilde

Unit IV: Grammar **12**

1. Functional english – tense, active voice, passive voice, conditional clauses, direct speech, indirect speech
2. Vocabulary – Homonyms, Homophones, Word Formation – Derivatives

Unit V: Non-Verbal Communication **12**

Facial Expressions – Eye Contact – Posture – Gestures – Paralanguage – Proxemics – Use of Body – Body Movements or Kinesics – Physiological Changes

TOTAL: 60 HOURS

TEXTBOOKS

1. A Galaxy of Precious Prose, ed. Dr. Rao, Syamala B. , Madras. Blackie Books, 2001.
2. Harmony : An Anthology of Poems, ed. Tripathy, Biyot K. , OUP India, 1997.
3. Popular Short Stories, ed. Board of Editors, Oxford Press, 1997.

REFERENCE BOOKS

1. English for Competitive Examinations: ed. R.P. Bhatnagar, Rajul Bhargava. Chennai. Macmillan, 2002.
2. Living English Structure (Practice Book for Foreign Students and Key): Stannard Allen. London. LongMans, Green and Co., 1956.

GE3605	Human Values & Professional Ethics	L	T	P	C
		2	0	0	2

OBJECTIVES

To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings

Course Outcome-COs At the end of the course, students will able to		Cognitive skill
CO-1	Gain basic Knowledge of moral issues	U
CO-2	Gain basic Knowledge of concept of ethics	U
CO-3	Gain basic knowledge of principles of ethics and morality	R
CO-4	Gain basic knowledge of harmony in nature and its existence	A
CO-5	Gain basic knowledge of professional & professional ethics	A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-02	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-03	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-04	S	S	S	M	S	L	L	L	M	L	L	S	S
CO-05	S	S	S	M	S	L	L	L	M	L	L	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit 1: Introduction to Human Education **6**

Definition, concept and need for Value Education, Self-exploration as the Process for Value Education: Natural acceptance, Experiential Validation, Basic Human Aspirations: Happiness and Prosperity, Method to Fulfil the Basic Human Aspirations

Unit II:Harmony in the Human Being, Nature and Existence **6**

Understanding Myself as Co-existence of the Self and the Body (Human being is more than just the Body). Discriminating between characteristics and needs of Self ('I') and 'Body' Harmony of the Self ('I') with the Body: correct appraisal of Physical needs, meaning of Prosperity. Human Being as Co-existence, Harmony with Self, Body, Family, Society, Nature. Universal Human Values & Ethical Human Conduct. Understanding Existence as Co-existence of mutually interacting.

Unit III: Harmony in the Family and Society **6**

Family – the Basic Unit of Human Interaction, Values in Human to Human Relationships: 'Trust' as the Foundational value and 'Respect" and basis of respect: Affection, Care, Guidance, Reverence, Glory, Gratitude and Love, Harmony in the Society (an extension of family): Comprehensive Human Goal: The Five dimensions of Human Endeavour, Visualizing a universal harmonious order in society-Undivided Society- Universal Order- from family to world family

Unit IV: Concept of Ethics **6**

Ethics – Meaning, Integrity, Honesty, Personality, Character. Respect for Others – Work culture, Social responsibility, Responsibilities as a citizen, Cooperation and commitment. Customs and practices – Self-interest, Fear, Deception, Ignorance, Ego, Uncritical acceptance of authority.Ethical Principles like Utilitarianism, Rights & Duties, Justice & Fairness, Integration among Principles. Ethics and Organizations, Employee Duties and Rights.

Unit V: Profession & Professional Ethics **6**

Profession – Meaning, Occupation & Profession, Characteristics of Professional. Competence and professionalethics - Competence in professionalethics, Augmenting universal human order, The implications of value-based living at all four levels ofliving, Contradictions and dilemmas in professionallife, Evaluation of holistictechnology, Strategy for transition to universal humanorder.

TOTAL: 30 HOURS

TEXTBOOKS

1. Gaur, R. R., Sangal, R., and G P Bagaria. (2008) A foundation course in Human Values and professional Ethics, Excel books, New Delhi
2. Naagarazan, R. S. (2006) A Textbook of Professional Ethics & Human Values**,**New Age Publisher, New Delhi.
3. Kiran, D, R. (2014) Professional Ethics & Human Values, 2nd Edition, McGraw Hill, New Delhi.
4. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

REFERENCE BOOKS

1. A N Tripathy, 2003, Human Values, New Age International Publishers.
2. Bajpai.B.L., Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted, 2004
3. S. B. Gogate. Human Values & Professional Ethics, Vikas Publication House Pvt. Ltd. 2019.

FS3602	Basics of Forensic Science	L	T	P	C
		3	0	0	3

OBJECTIVES

The course objective is to make the student to understand the concept of crime and role of forensic science in detection of crime and development of forensic science filed.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO-1	Attain basic Knowledge of history of forensic science	U, R
CO-2	Gain basic knowledge of principles of forensic science	U, R
CO-3	Acquire basic knowledge of historical development of forensic science	U, R
CO-4	Gain basic knowledge of organisation of forensic labs	U, R
CO-5	Get basic knowledge of crime scene investigation	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	M	M	S	M	M	M	M	M	S	M
CO-02	S	M	M	M	M	S	S	M	M	M	S	M	M
CO-03	M	M	S	S	M	M	M	S	M	S	M	S	M
CO-04	M	M	S	S	M	S	M	S	M	S	M	M	S
CO-05	M	S	S	S	L	M	S	M	S	M	M	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit 1: Historical timeline of Forensic Science **9**

Introduction, Scope, Relationship with other Social Sciences. Historical aspects of forensic science and Pioneers. Branches of forensic science: Forensic biology, Forensic chemistry and toxicology, Forensic anthropology, Fingerprints, questioned document examination, Forensic ballistics, Digital and Cyber forensics, Forensic audio analysis, Forensic psychology.

Unit 2: Principles of Forensic Science **9**

Basic principles of forensic science. Frye Principle and Daubert standard. Duties of forensic scientists. Code of conduct for forensic scientists. Qualifications of forensic scientists. Terminologies used in

Forensic: Accused, witness, victim, modus operandi, corpus delicti, Expert, Testimony, Chain of custody.

Unit 3: Crime Scene Investigation **9**

Scene of crime - Meaning of scene of crime, Primary & secondary scene of crime. Types of scene of crime, Search methods at scene of crime. Sketching of scene of crime -Types of sketch, general guidelines for sketching, methods for determination of location, rough sketch, finished sketch, projection sketch, importance of sketch. Handling of evidence - Meaning of evidence, type of evidences, handling, packing and forwarding of evidences to forensic lab

Unit 4: Historical Development of Forensic Science **9**

Historical development of forensic lab in India, Hierarchical set up of Central Forensic Science Laboratories, Government Examiners of Questioned Documents, National Crime Records Bureau, Police & Detective Training Schools, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories

Unit 5: Organizational Set Up of Forensic Science Laboratories **9**

Forensic science in international perspectives - including set up of INTERPOL and FBI. Hierarchical set up of State Forensic Science Laboratories, Fingerprint Bureaus, Police Academies. Police dogs. Services of crime laboratories. Basic services and optional services.

TOTAL: 45 HOURS

TEXTBOOKS

1. Anthony J. Bertino, Patricia Nolan Bertino. Forensic Science: Fundamentals and Investigations. Cengage Learning. 2008.
2. B R Sharma. Forensic Science in Criminal Investigation and Trail. Universal Law Publishing. 2020.
3. B. S. Nabar. Forensic Science in Crime Investigation. Asia Law House. 2019.

REFERENCE BOOKS

1. H.B. Baldwin and C.P. May in, Encyclopedia in Forensic Science, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).
2. V.J. Geberth, Practical Homicide Investigation, CRC Press, Boca Raton (2006).

BS3613	General Biology	L	T	P	C
		3	0	0	3

OBJECTIVES

It deals with basic concepts of cell, taxonomy, instrumentation, genetic materials

Course Outcome-COs At the end of the course, students will able to		Cognitive skill
CO1	Basic knowledge on various functions of cell structure on organisms.	U, R

CO2	Basic knowledge of Plant cell structure and morphology	U, R
CO3	Basic knowledge of Animal cell structure and morphology	U, R
CO4	Familiarized with structural organization of genetic material.	U, A
CO5	Basic knowledge of microbiology & Immunology	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	M	S	L	L	S	S	L	M	S	S
CO-02	S	S	M	N	L	S	S	S	S	S	M	S	S
CO-03	M	S	S	S	S	S	S	S	M	L	L	N	S
CO-04	S	M	N	S	S	M	L	S	S	S	S	S	S
CO-05	M	S	M	S	S	S	S	S	S	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Introduction to Biology **9**

Origin of life and geological time scale. Cell: definition of cells, Cell Theories, Classification and Significance of cells. Morphology of prokaryotes and eukaryotes (Yeast & Mould).

Unit 2: Plant Biology **9**

Basic Plant Biology- plant cell structure and function, basic plant tissues, modes of plant reproduction, plant morphology and anatomy.Plant based drugs- plants as evidence, Common poisonous plant & types of plant toxins.

Unit 3: Animal Biology **9**

Basics in animal biology- animal cell structure and function. Basic concept in brief for anatomy and physiology of digestive, respiratory, circulatory, nervous, excretory reproductive, skeletal system and

formation of bones. Blood components and body fluids; its structure and identification.

Unit 4: Biomolecules **9**

Carbohydrates – Sources & Classification, Protein – Sources & Classification, Lipid – Sources & Classification. Basic of genetic materials; DNA, RNA. Structural organization and function of DNA and RNA. Types of DNA & RNA. Sources of DNA samples, method of extraction.

Unit 5: Microbiology and Immunology **9**

Basics of Microbiology and Biochemistry: Basic principle of Microscopy and types of Microscopy, Structure and interaction of antigen and antibody, ELISA, Blotting techniques. Types and identification of microbial organisms of forensic significance (bacteria, virus, fungus, protozoans).

TOTAL: 45 HOURS

TEXTBOOKS

1. R C Dubey, D K Maheshwari, A Textbook of Microbiology, Revised Edition 2013, S Chand & Co. New Delhi,
2. Joanne Willey, Prescott's Microbiology. 10th Edition 2013, MC Graw Hill.
3. U Satyanarayana. Biochemistry and techniques. Revised Edition 2007. Books & Allied (P) Ltd. Kolkatta.
4. Jain- genetics
5. Robert Henry. Animal biology. 1933, MC Graw Hill Publications. USA.
6. Ralph Rapley, David white house. Molecular Forensics. 2007. John Wiley & Sons. New Jersey.
7. Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts, James D Watson, Molecular Biology of the cell. 3rdEdition 1994. Garland Series. New York.
8. Forensic Botany (2016)- Jane H and David o Norris.
9. Jane H. Bock and David O. Norris. Forensic Plant Science. 2016.Elesiver.

REFERENCE BOOKS

1. Kleinzeller, A. 1999. Charles Ernest Overton's concept of a cell membrane.
2. In: Membrane permeability: 100 years since Ernest Overton (ed. Deamer D.W., Kleinzeller A., Fambrough D.M.), pp. 1–18, Academic Press, San Diego.
3. Sharp, L. W. (1921). Introduction to Cytology. New York: McGraw Hill, p. 42

FS3603	Forensic Psychology	L	T	P	C
		3	0	0	3

OBJECTIVES

Students will learn the application of subject knowledge of psychology to aid the criminal justice system

Course Outcome-COs At the end of the course, students shall be able to		Cognitive Skill
CO1	Gain knowledge of general psychology	U, R
CO2	Acquire basic understanding on the concept of mind and criminality	U, R
CO3	Attain basic knowledge of criminal behaviour	U, A

CO4	Apply the subject knowledge in detection of deception	U, A
CO5	Gain knowledge of application of subject knowledge in legal aspects	U, A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO -K	PO-L	PO-M
CO-01	S	S	S	M	M	S	M	M	M	M	M	S	M
CO-02	M	M	M	M	M	S	S	M	M	M	S	M	M
CO-03	M	M	S	S	M	M	M	S	M	S	M	M	M
CO-04	M	M	S	S	M	S	M	S	M	S	M	M	M
CO-05	M	M	S	S	L	M	M	M	S	M	M	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit 1: Basics of Psychology & Forensic Psychology **9**

Introduction to Concept of Psychology & its definition, Concepts of psychology – Sensation, Attention, perception, learning, Thinking, Motivation. History, Definition and fundamental concepts of forensic psychology, Ethics of forensic psychology, Models of Legal System.

Unit 2: Understanding the Criminal Mind **9**

Mensrea, Criminal Responsibility, Competency to Stand Trial, Self Defence & Syndrome Testimony. Criminal profiling meaning, its process, Three Famous Profiling, Serial murderers, Characteristic of serial killers.

Unit 3: Criminal Behaviour & Psychology **9**

Origin of Criminal Behaviour – Social Factor, Biological Factor, Learning Factor. Psychopathy disorder – Meaning, Characteristics, Core Factors, Psychological Assessment and its Importance. Juvenile delinquency – Meaning, Definition, Theories and Prevention Intervention. Child Abuse – Meaning, Characteristics and Psychological Effect. Psychology of terrorism -

Unit 4: Detection of Deception **9**

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

Unit 5: Legal Aspects of Forensic Psychology **9**

Psychology and law. Plea Bargaining, Interrogation and Confession: Reid Techniques in Interrogation of Suspects and PEACE Model, Insanity definition in Indian Penal Code (IPC section 84): Legal and

medical insanity, Psychological tests & Forensic Assessment in the court room, Writing report on a psychology related cases.

TOTAL: 45 HOURS

TEXTBOOKS

1. Lenore E. A. Walker and David L. Shapiro. Introduction to Forensic Psychology-Clinical and Social Psychological Perspectives, Springer Science Business Media, 2003.
2. Curt M Bartol& Anne M. Bartol. Criminal Behaviour – A Psychological Approach, 11th Edition 2017.
3. Irving B. Weiner & Randy K. Otto, The Handbook of Forensic Psychology, 4th Edition, Wiley 2013.
4. Mark Costanzo & Daniel Krauss, Forensic and Legal Psychology, Worth Publishers 2012.
5. Ken Manktelow, Thinking and Reasoning: An Introduction to the Psychology of Reason, Judgment and Decision Making, Psychology Press, 2012. London.
6. Dennis Coon, John O. Mitterer, Introduction to Psychology Gateways To Mind And Behavior,Cengage Learning, 12th Edition 2010, Cannada.
7. RussilDurrant, An Introduction to Criminal Psychology, Routledge,2nd Edition 2018, New York.

REFERENCE BOOKS

1. Evans, R. B. (1972). E. B. Titchener and his lost system. Journal of the History of the Behavioral Sciences, 8, 168–180.
2. Fancher, R. E. (1987). The intelligence men: Makers of the IQ controversy. New York, NY: W.W. Norton & Company.
3. Fancher, R. E., & Rutherford, A. (2011). Pioneers of psychology: A history (4th ed.). New York, NY: W.W. Norton & Company.

FS3671	Basics of Forensic Science Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

It deals with the examination of crime scene, collection, packaging and preservation of evidence

Course Outcome-COs At the end of the course, students will able to		Cognitive Skill
CO1	Gain knowledge of Crime scene examination	U, A
CO2	Understand methods of sketching crime scene	U, A
CO3	Gain knowledge of handling and packing evidence	U, A
CO4	Acquire knowledge of packing and forwarding of evidence	U, A
CO5	Collect and preserve different evidences	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	L	M	L	M	L	M	M	M	L	M	M	S	S
CO-02	L	M	L	M	L	M	M	M	L	M	M	S	S
CO-03	L	M	L	M	L	M	M	M	L	M	L	N	S
CO-04	L	M	L	M	L	M	M	M	L	M	S	S	S
CO-05	L	M	L	M	L	M	M	M	L	M	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. To cite examples of crime cases in which apprehensions arose because of Daubert standards.
2. To Examine the different crime scenes (Homicide, Suicide, Theft/Robbery, Accident, Arson, Explosion)
3. Sketching of an Indoor Crime Scene using Triangulation method.
4. Sketching of a Crime Scene using Baseline method
5. To acquire knowledge of handling the evidence
6. To acquire knowledge of packing and forwarding the evidence
7. Collection and Preservation of Petroleum and other samples in a case of Arson.
8. Collection and Preservation of evidences in a simulated Murder crime scene.
9. Collection and Preservation of simulated Hit and Run crime scene.

TOTAL: 30 HOURS

BS3683	**General Biology Laboratory**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**2**

OBJECTIVES

It deals with the analysis of body fluids and determination of cells.

Course Outcome-COs **At the end of the course, students will able to**		**Cognitive Skill**
CO1	Gain knowledge of observation and determination of cells	U, A
CO2	Understand methods of dissection techniques	U, A
CO3	Gain knowledge of analysis of body fluids	U, A
CO4	Acquire knowledge of conducting qualitative analysis	U, A
CO5	Isolate bacteria	U, A

R-Remember, U-Understand, A-Apply, An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	M	S	L	L	S	S	L	M	S	S
CO-02	S	S	M	N	L	S	S	S	S	S	M	S	S
CO-03	M	S	S	S	S	S	S	S	M	L	L	N	S
CO-04	S	M	N	S	S	M	L	S	S	S	S	S	S
CO-05	M	S	M	S	S	S	S	S	S	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Observation of distinguishing features of prokaryotic and eukaryotic cells
2. Staining Techniques
3. Dissection of plant material
4. Preparation of microscope slide for leaf section
5. Differential counts of leukocytes
6. Analysis of body fluids
7. Qualitative analysis of Carbohydrate, Protein & Lipid
8. Isolation of DNA from Plant
9. Preparation of media & sterilization
10. Isolation of bacteria from soil samples

TOTAL: 30 HOURS

SEMESTER III

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	FS3604	Forensic Physics & Criminalistics	3	1	0	4
2	FS3605	Forensic Serology	3	1	0	4
3	FS3606	Instrumentation Techniques in ForensicScience	3	1	0	4
4	FS3607	Forensic Medicine	3	0	0	3
5	FS3608	Introduction to Computers and Cyber Crime	2	0	0	2

PRACTICAL						
7	FS3672	Forensic Physics & Criminalistics Laboratory	0	0	2	2
8	FS3673	Forensic Serology Laboratory	0	0	2	2
9	FS3674	Instrumentation Techniques in Forensic Science Laboratory	0	0	2	2
TOTAL			14	3	6	23

FS3604	**Forensic Physics and Criminalistics**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVES

To enable the students to understand the basic concepts of Crime Scene Management and get familiarized with the techniques involved in the analysis of various evidences encountered in the Physical division of a Forensic Laboratory.

Course Outcome-COs **At the end of the course, students will be able to**		**Cognitive Skill**
CO-01	Get basic understanding on Crime Scene Management	U, A
CO-02	Gain basic knowledge on types of evidences generally encountered at the scene of crime that helps in investigation and linking suspect and victim to the crime scene.	U, A
CO-03	Attain basic knowledge on importance of Soil and Paint evidence with respect to Forensics	U, R
CO-04	Acquire basic understanding on importance of Glass and Fibre evidence with respect to Forensics.	U, A
CO-05	Gain basic knowledge on Cement and Tool Marks evidence with respect to forensics	U, R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	M	S	S	M	S	M
CO-02	L	M	M	S	S	M	S	S	M	L	S	S	S
CO-03	M	M	S	S	M	M	M	M	S	S	M	M	M
CO-04	S	S	S	S	S	L	L	M	S	S	S	S	M
CO-05	S	S	M	M	M	S	S	S	M	M	S	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Crime Scene Management **12**

Types of crime scene: primary and secondary crime scene, Crime scene management- Initial respondents, role of first responding officer (FRO), duty management, Investigating officer (IOs) and their assigned role and duties, forensic scientists, role of police and judiciaries, fire brigade, medico legal officers and other experts. Protecting the scene of crime- various steps involved.

Unit II: Types of Evidences **12**

Physical evidence, types and importance in criminal investigation, Recovery, Collection and preservation of samples from crime scene- Biological, Toxicological, petroleum, explosives, trace items, projectile and bullets, contamination issues, Reconstruction of crime scene and problems encountered at the scene of crime.

Unit III: Soil and Paint **12**

Soil**:** Types of soil and colour of soil, Forensic examination of soil, particle size distribution, turbidity test, microscopic examination, density gradient analysis, collection and preservation of soil evidence. Paint**:** Types of paint and composition, forensic examination of paint (macroscopic and microscopic), Analysis of paint by micro chemical analysis, physical matching, solubility test, Raman spectroscopy, Fourier Transform Infrared spectroscopy (FTIR).

Unit IV: Glass and Fibre **12**

Glass**:** Composition of glass, measuring and comparing density and refractive index of glass, glass fractures, collection and preservation of glass evidence, forensic examination of glass (rib marks, hackle marks, cone fractures, wavy, backward fragmentation, concentric and radial fractures, becke line, colour, fluorescence and physical measurements).Fibre**:** Types, Identification and comparison of natural and manmade fibres, forensic examination of fibres (refractive index, birefringence, dye analysis),

Unit V: Cement and Tool Marks **12**

Cement**:** Types of cement and composition, determination of adulterants in cement, physical and instrumental methods of cement analysis. Tool Marks**:** Types of tool mark. Forensic examination and

comparison of class and individual characteristics of tool marks. Restoration of erased or obliterated marks (method of marking cast, punch and engraved, methods of obliteration- etching, magnet electrolytic method and recording of restored marks on different surfaces.)

TOTAL: 60 HOURS

TEXTBOOKS

1. David R. Redsicker; The Practical Methodology of Forensic Photography- II Ed. CRC Press, New York 2001.
2. Caddy. B. (2001). Forensic Examination of Glass and Paint: Analysis and Interpretation ISBN: 0784 05749.
3. Houck, M.M & Siegel, J. A; Fundamentals of Forensic Science, Academic Press, London, 2006.
4. Hara, C.E.O and Osterburg, J.W. (2010). An Introduction to Criminalistic Blomington: Indiana University Press.

REFERENCE BOOKS

1. Saferstein, R. (2014). Forensic Science Handbook. Vol I & II.
2. Shaw, D; Physics in the prevention and detection of Crime, Contem Phys. Vol.17,1976
3. Guharaj, P. V., Chandran M. R. (2006) Forensic Medicine, 2nd Ed., Universities Press (India)Pvt. Ltd., Hyderabad.

FS3605	Forensic Serology	L	T	P	C
		3	1	0	4

OBJECTIVES

Students will learn the functions of blood, blood groups, Identification of blood stains, serological techniques and markers.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO-01	Get a deep knowledge about the composition and functions of blood and blood group.	U, R
CO-02	Acquire knowledge about the concept of body fluids and itsidentification	U
CO-03	Gain understanding about forensic serology	R
CO-04	Learn about the techniques involved in serology	A, R
CO-05	Obtain information about the markers used in forensic serology.	U, R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	M	S	S	M	S	M
CO-02	L	M	M	S	S	M	S	S	M	L	S	S	S
CO-03	M	M	S	S	M	M	M	M	S	S	M	M	M
CO-04	S	S	S	S	S	L	L	M	S	S	S	S	M
CO-05	S	S	M	M	M	S	S	S	M	M	S	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Blood Components **12**

Blood: composition, histology, functions of blood. Antigen definition, structure, function and characteristics of antigen. Antibody: definition, structure and function. Blood groups – history, biochemistry and genetics of ABO, Rh, Mn and other systems such as Duffy, Kell, Kidd, Lewis, Bombay blood group. Collection and preservation of blood evidence. Distinction between human and non-human blood.

Unit II: Body Fluids **12**

Types of body fluids, composition, formation and function of body fluids. Collection, preservation and evaluation of biological fluids from crime scene. Different methods for examination of body fluids Morphology and structure of sperm. Origin of species: determination of human and animal origin from blood, semen, saliva,sweat,tear, vomit etc

Unit III: Analysis of Blood Stain **12**

Collection, packaging and preservation of blood stains. Examination of blood stains: Presumptive tests- Benzidine test, Phenolphthaleinest, Leucomalachite test, Tetra- Methylbenzidine test and O-Tolidine, Luminoltest. Confirmatory tests- Haemochromogen test, Haematin test and Haemin test. Blood stain pattern identification and analysis. Types of blood spatter.

Unit IV: Serological Techniques **12**

Primary binding assay: enzyme linked immunosorbent assay (ELISA), Immunochromatographic assays. Secondary binding assays, precipitation-based assays: immunodiffusion, electrophoretic methods. Agglutination based assays: direct agglutination assay, passive agglutination assay, agglutination inhibition assays. Various antigen-antibody reactions (agglutination and precipitation), titer, rouleaux formation.

Unit V: Serological Markers **12**

Significance of markers in forensic science, characteristics of polymorphic enzyme like PGM, EsD, GLO-I, EAP, AK, ADA, - its typing. HP, HLA System. Paternity disputes: causes, various serological and biochemical markers. Calculation of paternity index and probability for paternity and maternity. Forensic application biochemical markers.

TOTAL : 60 HOURS

TEXT BOOKS

1 W.G. Eckert and S.H. James (1989) Interpretation of Bloodstain Evidence at CrimeScenes. CRC Press, Boca Raton

2. G.T. Duncan and M.I. Tracey(1997) Introduction to Forensic Sciences. W.G. Eckert (Ed.),CRC Press, Boca Raton .

3. R. Saferstein, (2004) Criminalistics. Prentice Hall, New Jersey

4. Edmund Sinhott; "Principles of Genetics", McGraw Hill Publications, 1950.

REFERENCE BOOKS

1. T. Bevel and R.M. Gardner, (2008) Bloodstain Pattern Analysis: CRC Press, Boca Raton

2. G.T. Duncan and M.I. Tracey in, (1997) Introduction to Forensic Science: W.G. Eckert (Ed.), CRC Press, Boca Raton

3.Giblett, Eloise R.; "Genetic Markers in Human Blood", Blackwell Scientific Publications, 1969.

FS3606	Instrumentation Techniques in Forensic Science	L	T	P	C
		3	1	0	4

OBJECTIVES

Students will learn the basics concept of instruments used in forensic science and its principle, working and the applications.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive skill
CO1	Acquire gain knowledge of different types of microscopes	U, R
CO2	Attain information on different chromatographic techniques	U, R
CO3	Gain knowledge of basic concepts of spectroscopy	U, R
CO4	Procure information on neutron activation analysis, X-ray techniques and electrophoresis	U, R
CO5	Obtain basic understanding on concepts of photography and videography	U, R

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	M	M	S	S	S	M
CO-02	S	M	M	S	M	M	M	S	S	M	M	S	M
CO-03	M	M	M	M	S	S	S	L	M	M	M	M	S
CO-04	M	M	M	L	S	M	M	L	M	M	M	M	M
CO-05	S	S	S	M	M	M	M	M	M	S	L	M	M

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Basic Concepts of Microscope **12**

Microscope: Introduction, Image formation, Magnification and Resolution, Lens aberrations, Distortion of image and curvature of field. Types of microscopes- Simple, Compound, Comparison, Fluorescence, Polarized, Stereo: basic principles, working and forensic Applications. Electron Microscopy: Introduction, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Theory and basic principles, Instrumentation and forensic applications.

Unit II: Chromatographic Techniques **12**

Chromatography: Introduction and basic principles. Types of chromatography- paper chromatography, Thin layer chromatography, High performance thin layer chromatography.

Gas chromatography, Pyrolysis GC, GC-MS: Principles, instrumentation and Forensic Application.

Liquid Chromatography, HPLC, LC-MS: Principles, instrumentation and Forensic Application.

Unit III: Basic concepts of Spectroscopy **12**

Colorimetric analysis: Principle and its applications. UV/VIS-Spectroscopy: Introduction, Principle, Instrumentation and its applications. IR-Spectroscopy: Introduction, Principle, Instrumentation and its applications. Atomic Spectroscopy: AAS Introduction, Basic principles, Instrumentation and applications. AES Introduction, Principles, Instrumentation and applications.

Unit IV: Neutron Activation Analysis, X-ray techniques and Electrophoresis **12**

Neutron Activation Analysis: Introduction, Basic theory and principles, Instrumentation and Forensic Applications. X-ray Techniques: Introduction, Types: X-ray Diffraction (XRD), X- ray Fluorescence (XRF): Basic theory and principles, Instrumentation and Forensic application. Electrophoresis – fundamental principles and forensic applications.

Unit V: Basic Concepts of Photography and videography **12**

Introduction to Forensic Photography and videography, Photographic equipment: camera, different lenses, filters, shutter, image sensors – film and digital, ALS. UV photography, IR photography and digital photograghy. Crime scene photography and videography: indoor andoutdoor crime scenes –

exterior and interior overall photographs, midrange and close-up photographs. Evidence photography: bloodstain patterns, fingerprints, questioned documents,tyre and footwear impressions.

TOTAL: 60 HOURS

TEXT BOOKS

1. Peterson: Clinical and Forensic Application of Capillary Electrophoresis, 2001.
2. Brown, P.R: Advance in chromatography, 2004.
3. Grahm D.: The use of X-ray Techniques in Forensic Investigation, 1973.
4. Settle, F.A.: Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.

REFERENCE BOOKS

1. Nick Marsh; Forensic Photography – A Practitioner's Guide, Wiley Blackwell(2014).
2. Alternate Light Source Imaging – Forensic Photography, Anderson Publishing(2013).
3. Edward M. Robinson; Crime Scene Photography – 2nd ed., Academic Press(2010).

FS3607	Forensic Medicine	L	T	P	C
		3	0	0	3

OBJECTIVES

Students will learn the basics knowledge forensic medicine, forensic pathology and forensic odontology.

Course Outcome-COs At the end of the course, students shall be able to :		Cognitive Skill
CO-01	Get better understanding of Forensic medicine	U
CO-02	Attain basic knowledge of Forensic Pathology & Thanatology	U
CO-03	Gain basic knowledge of Infanticide & Sexual Offences	R, A
CO-04	Acquire basic knowledge of Injuries.	R, A
CO-05	Attain basic knowledge of Forensic Odontology	R, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	S	S	S	S	S	M	M	S
CO-02	M	S	S	S	M	S	M	S	S	M	S	M	S

CO-03	S	L	M	S	M	S	L	S	M	S	S	S	S
CO-04	S	M	S	S	M	S	M	S	S	S	S	M	S
CO-05	S	M	S	S	M	S	S	S	M	S	S	M	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction to Forensic Science **9**

History of forensic medicine, Definition, Medical jurisprudence, Medical Council of India (MCI). Inquest and its types. Summons and Warrants, Oath and affirmations. Dying declaration and dying deposition. Ethics of medical practice. Court evidence- Oral, documentary, medical evidence, recording of evidence conduct of doctor in witness box. Definition of witness and its types.

Unit II: Forensic Thanatology and Pathology **9**

Death- Definition and manner of death, causes of death in asphyxia- starvation, electrocution, accidental death Medico legal aspects of death. Definition of post mortem examination. Earlyand late changes after death, Destruction of body and tissues. Sudden death, post-mortem demonstration of myocardial infarction, Suspended animation, moment of death. Causes, classification and mechanism of traumatic death.

Unit III: Infanticide and Sexual Offences **9**

Definition of Infanticide, Foeticide, and still birth, signs of intrauterine death, live birth, viability of foetus, age determination of foetus, demonstration of ossification center, precipitate labour, Hasse's rule, maceration, sudden infants, death syndrome, and Munchausen syndrome by proxy. Introduction to Sexual Offences, rape, adultery, Unnatural sexual offences and sodomy. Medico-legal Aspects of Sexual Offences (Perversions, Natural,Unnatural).

Unit IV: Injuries **9**

Definition of injury, classification of injuries and medico legal aspects of injuries. Mechanical injuries, Vehicular injuries, railway injuries and aircraft injuries, thermal injuries.Chemical trauma Injuries, artificial injuries and firearm injuries. Types of impact causing injuries.

Unit V: Forensic Odontology **9**

Definition and Scope of Forensic Odontology, basic structure of human teeth, types of teeth and determination of age from teeth using various methods. Dental anomalies and their rolein Personal Identification. Bite marks: Types, analysis and forensic importance. Role of Forensic Odontology in mass disaster victim identification. Dental Charting. Comparison of Ante-mortem and post-mortem dental records.

TOTAL: 45 HOURS

TEXT BOOKS

1. R.Shepherd;Simpson's forensic medicine, Oxford University press,(2003)
2. B.V.Subramanyam;Modi's Medical jurisprudence, Lexis Nexisbutterworth,(1988)
3. Text book of Forensic Medicine and Toxicology: V.V, Pillay, 15th Ed, paras medicalpublishing 15th Ed Hyderabad, 2010

REFERENCE BOOKS

1. Text book of Forensic Medicine Toxicology, Anil Aggrawal, Avichal Publishing Company, 2014

2. Parikh's Textbook of Medical jurisprudence, Forensic Medicine and Toxicology: C.K. Parikh, CBS P publishers & Distributors Pvt. Ltd, India, 1999

3. Fundamentals of Forensic Science, Max M. Houck, Jay A. Siegel, Academic press publishers, 2010.

FS3608	Introduction to Computers and Cyber Crime	L	T	P	C
		2	0	0	2

OBJECTIVES

Students will learn the basics knowledge of Computer and Cyber Crimes.

Course Outcome-COs At the end of the course, students shall be able to		Cognitive Skill
CO-01	Gain basic knowledge of Computer	U, R
CO-02	Attain basic knowledge of cyber crimes	U, R
CO-03	Procure basic knowledge on types of Cyber crimes	U, R
CO-04	Acquire better understanding of Cyber Forensic Investigation &Technical issues	U, R
CO-05	Attain information of Information Technology Law	U

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	S	M	M	M	M	S	S	S	S
CO-02	S	S	S	S	S	M	M	M	S	S	S	M	M
CO-03	M	M	M	M	M	M	S	S	S	S	S	M	M
CO-04	S	S	S	S	M	M	M	M	M	M	L	M	S
CO-05	M	M	M	M	M	S	S	L	S	M	S	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction to Computer **6**

Applications of computers in forensic science, The computer system and CPU – Types of computers– Computer organization: Memory – Input and Output devices. Concepts of hard ware and software, secondary storage devices – Storage devices and media – storage characteristics – tracks and sectors – storage media – floppy disks, HDD, optical discs, CDs, pen drives.

Unit II: Introduction to Cyber Crime **6**

Cybercrime- Concept and theory, Conventional and cybercrime (classification),Reason for cyber-crime, cyber-criminal(characteristics, Mode and manner of committing cybercrime, General classification of cybercrime, Preventive measures-individual, organization and government.

Unit III: Types of Cyber Crimes **6**

Crimes targeting computers/individual, Unauthorized access, Packet sniffing, Malicious codes, Infringement of privacy, Harassment/ Cyber stalking, Identity theft, Phishing and its variants, Web spoofing and email spoofing, Web defacement, Cyber-squatting , Internet time theft, Email bombing, Child pornography, Cyber terrorism, ATM, credit card and bankfrauds**,** Cryptography, AI system, Social media and crime

Unit IV: Cyber Forensics Investigation and Evidence Collection **6**

Cyber Forensic Investigation: Introduction, search and seizure of computers and relatedevidences, collection, handling, preservation of digital evidences, Crime scene investigation and analysis of cybercrimes, documenting the Scene- Chain of Custody. E-mail Tracking, IP Tracking and E-mail recovery. Cloning- Live System versus Dead System- Hashing.

Unit V: Information Technology Law **6**

IT Act-2000: Introduction, Scope and Objectives, 79A IT Act, Digital signature-Creation, Recognition and Verification, E-governance, electronic records- attribution, acknowledgement and dispatch, securing. Cyber Appellate Tribunal- structure and function, Penalties with case studies- Sections- 43, 65-B, 66A, 66C-F, 67, 69.

TOTAL: 30 HOURS

TEXT BOOKS

1. Deepti Chopra & Keith Merrill; Cyber Cops, Cyber Criminals & Internet, IlkInternational, New Delhi, 2002.
2. John R Vacca; Computer Forensics, Firewall Media Pub. New Delhi, 2002.
3. Albert J.Marcell Jr. and Robert S. Green Field; Cyber Crime, A Field manual for collecting examining and preserving Evidence of Computer Crime. CRC Press, 2002.

REFERENCE BOOKS

1. Harlan Carvey; Windows Forernsic Analysis Toolkit, Syngress, 2012.
2. Eoghan Corey; Computer Crime Investigation, Academic Press, 2002.
3. Miller M.,Easy Computer Basics, Windows Visita Edition Que 2008.

FS3672	Forensic Physics and Criminalistics Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students will learn the basics concept**s** of Forensic physics andcriminalistics.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO1	Attain information of Indoor and Outdoor Crime scene	U, A
CO2	Understand methods of analysis of glass and paint samples	U, A
CO3	Acquire information on methods of analysis of soil and fibre samples	U, A
CO4	Attain knowledge on different types of techniques	U, A
CO5	Have better understanding on different types of evidences with respect to forensics	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	S	S	S	S	S	L	M	L	S
CO-02	S	S	S	M	M	L	S	M	L	S	S	S	S
CO-03	S	S	S	M	L	S	M	L	S	S	S	M	L
CO-04	S	S	S	M	L	S	S	S	S	S	L	M	M
CO-05	M	L	S	S	L	S	S	M	L	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Prepare a report on evaluation of crime scene.
2. Reconstruction of crime scene (outdoor and indoor).
3. Comparison of soil samples by density gradient method.
4. Comparison of paint samples by physical matching method.
5. Comparison of glass samples by refractive index method.
6. Identification and comparison of tool marks.
7. Physical and microscopic examination of automobile paints and its spot test analysis.
8. Tool marks examination using comparison / stereo microscope.
9. Comparison of glass samples by physical matching method.

10 Fiber analysis using microscope.

TOTAL : 30 HOURS

FS3673	Forensic Serology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

Students will learn the various concepts and technique used in forensic serology.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO-01	Get a deep knowledge about the basic concepts of blood.	U, R
CO-02	Acquire knowledge about the concept of body fluid identification.	E
CO-03	Gain understanding about forensic serology	R
CO-04	Learn about the serological techniques.	An, R
CO-05	Obtain information about the serological markers.	U, R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	S	S	S	S	S	L	M	L	S
CO-02	S	S	S	M	M	L	S	M	L	S	S	S	S
CO-03	S	S	S	M	L	S	M	L	S	S	S	M	L
CO-04	S	S	S	M	L	S	S	S	S	S	L	M	M
CO-05	M	L	S	S	L	S	S	M	L	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Determination of blood group from fresh blood samples.
2. Determination of blood group from dried blood sample.
3. Crystal test on a blood sample.
4. Correlation between impact angle and shape of bloodstain.
5. Identification of blood samples by chemical tests.
6. Immunoelectrophoresis.
7. Immunodiffusion.
8. Semen analysis- Morphology, Biochemical analysis
9. Microscopic examination of body fluids
10. Identification of the given stain as saliva/urine.

TOTAL: 30 HOURS

FS3674	Instrumentation Techniques in Forensic Science Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

To study the various Instrumentation techniques used in forensic science.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO1	Understand the concentration of a coloured compound	U, A
CO2	Understand the separation of a compound.	U, A
CO3	Gain knowledge of analysis of drug sample.	U, A
CO4	Acquire knowledge of working of microscope.	U, A
CO5	Acquire knowledge of crime scene videography and photography	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	M	L	M	S	S	S	S	S	L	M	L	S
CO-02	S	S	S	M	M	L	S	M	L	S	S	S	S
CO-03	S	S	S	M	L	S	M	L	S	S	S	M	L
CO-04	S	S	S	M	L	S	S	S	S	S	L	M	M
CO-05	M	L	S	S	L	S	S	M	L	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Determination of the concentration of a colored compound by colorimetry analysis.
2. Analysis of an ink samples using thin layer chromatography.
3. Separation of organic compounds by paper chromatography.
4. Identification of drug samples using UV-Visible spectroscopy.
5. Qualitative analysis of DNA by Gel-Electrophoresis
6. Examination of hair Samples using microscope.
7. Comparison of bullet samples using comparison microscope.
8. Analysis of country liquor and denatured spirit by Gas Liquid Chromatography.
9. Photography of a crime scene at different angles.
10. Videography of a crime scene.

TOTAL: 30 HOURS

SEMESTER IV

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	FS3609	Forensic Dermatoglyphics	3	1	0	4
2	FS3610	Digital and Cyber Forensics	3	1	0	4
3	FS3611	Forensic Ballistics	3	1	0	4
4	FS3612	Criminal Law	3	0	0	3
5	FS3613	Forensic Audio Video Analysis	2	0	0	2
PRACTICAL						
7	FS3675	Forensic Dermatoglyphics Laboratory	0	0	2	2
8	FS3676	Forensic Ballistics Laboratory	0	0	2	2
9	FS3677	Digital & Cyber Forensics Laboratory	0	0	2	2
TOTAL			14	3	6	23

FS3609	Forensic Dermatoglyphics	L	T	P	C
		3	1	0	4

OBJECTIVES

Students will be able to gain knowledge of types and importance of fingerprinting and understand the methods to develop the fingerprints and learn about the other types of impressions found in the crime scene.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive skill
CO1	Gain knowledge of basics of fingerprints	U, R
CO2	Information on identification and detection of fingerprints	U, R
CO3	Learn methods of development of fingerprints and classification of fingerprint pattern	U, R
CO4	Understand the concept of analysis of fingerprints and methods of recording fingerprints	U, R
CO5	Gain knowledge of the significance of foot print, palm print, lip prints and ear print.	U, R

R-Remember-Understand, A-Apply, An-Analyze-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO A	PO-B	PO-C	PO D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	M	M	S	S	S	M
CO-02	S	M	M	S	M	M	M	S	S	M	M	S	M
CO-03	M	M	M	M	S	S	S	L	M	M	M	M	S
CO-04	M	M	M	L	S	M	S	N	M	M	M	M	M
CO-05	S	S	S	M	M	M	M	M	M	S	L	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit 1: Basics of fingerprints **12**

Fingerprints: Introduction, History, Principle of Fingerprint Identification, Friction Ridge Skin. Types of fingerprints found at the scene of crime, Classification of Fingerprints for Comparison purposes: Pattern area, Core, Delta, Type lines, ridge characteristics, Fingerprint Pattern Types. Presentation of expert evidence on fingerprints in court and judicial acceptance of miscellaneous prints.

Unit 2: Identification and detection of Fingerprints **12**

Identification of latent print: Identification and Individualization by Osborn grid method, Seymour method, Photographic strip method, Polygon method, Overlay method, Osterburg method and microscopic triangulation method. Powder method for detection of latent Fingerprints. Chemical method for detection of fingerprints.

Unit 3: Development and Classification of Fingerprint **12**

Developments of fingerprints from the deceased. Classification of fingerprint pattern – Henry classification: - Primary, Secondary, Sub – secondary, Key and Final. Preservation of developed fingerprints. Digital imaging for fingerprint enhancement. Application of light sources in fingerprint detection.

Unit 4: Fingerprint Analysis and Record of Fingerprints **12**

Automated Fingerprint Identification System. Friction ridge identification process: Analysis, Comparison, Evaluation and Verification. Significance of Poroscopy and Edgeoscopy. Method for fingerprint record keeping.

Unit 5: Foot Prints and other Impressions **12**

Introduction-Forms of footwear impressions-Information from footwear impressions, Castingof foot prints, Electrostatic lifting of latent foot prints. Palm prints and their historicalimportance. Lip Prints - Introduction and Application in crime detection. Ear Prints- Introduction and its importance.

TOTAL: 60 HOURS

TEXT BOOKS

1. Bridges, B.C; Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting expert Testimony, Opinion Evidence., Univ. Book Agency, Allhabad,2000
2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

REFERENCE BOOKS

1. E. Roland Menzel; Fingerprint Detection with Loseres; Second edition;Marcel Dekker, 1999.
2. James F. Cowger; Friction Ridge skin CRC Press London, 1993.
3. Cossidy, M.J; Footwear Identification, Royal Canadian, Mounted Police,1980

FS3610	Digital and Cyber Forensic	L	T	P	C
		3	1	0	4

OBJECTIVES

Students will learn the basics knowledge of digital forensics, malwares, Antiforensics, Network forensics and forensic tool.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO-01	Attain basic knowledge on technical concepts of Digital Forensic.	U
CO-02	Acquire knowledge on different types of malwares	U, R
CO-03	Gain basic knowledge on Windows System, Anti forensics.	U, R
CO-04	Procure information on Network Forensics.	U
CO-05	Attain basic knowledge on Forensic Tools	U, R

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	S	S	S	S	S	S
CO-02	S	S	S	S	S	S	M	M	M	M	M	S	M

CO-03	M	M	S	S	S	S	S	S	S	M	M	S	M
CO-04	S	S	S	S	S	M	M	M	S	S	S	M	S
CO-05	M	M	S	S	S	S	S	M	M	M	M	S	S

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction, Key Technical Concepts **12**

Introduction -Types of Computer Forensics Evidence Recovered - Skills to be Possessed by a Computer Forensics Investigator -The Importance of Computer Forensics -Job Opportunities Digital Forensics- Uses of Digital Forensics- Cardinal Rules of Cyber Forensics- Steps in Cyber Forensics - File Extensions and File Signatures- Storage and Memory- Computing Environments- Data Types- File Systems- Allocated and Unallocated Space.

Unit II: Malware **12**

Malicious Code: Self- Replicating Malicious Code- Evading Detection and Elevating Privileges- Rootkits-Spyware-Attacks against Privileged User Accounts and Escalation ofPrivileges- Token Kidnapping – Virtual Machine Detection- Stealing Information and Exploitation: Form Grabbing- Man-in-the-Middle Attacks- DLL Injection.

Unit III: Windows System Artifacts, Antiforensics **12**

Windows System Artifacts- Deleted Data- Hibernation File- Registry- Print Spooling- Recycle Bin- Metadata- Thumbnail Cache- Most Recently Used (MRU)- Restore Points and Shadow Copy- Prefetch- Link Files- Antiforensics- Introduction- Hiding Data- Password Attacks-Cryptography, Steganography- Data Destruction.

Unit IV: Network Forensics, Mobile Device Forensics **12**

Network Forensics- Introduction- Network Fundamentals- Network Security Tools- Network Attacks- Incident Response- Network Evidence and Investigations- Mobile Device Forensics- Introduction- Cellular Networks- Operating Systems- Cell Phone Evidence- Cell Phone Forensic Tools- Global Positioning Systems (GPS)- Challenges of digital forensics - Standards and Controls.

Unit V: Forensic Tools **12**

Computer Forensics Tools: ProDiscover Forensics- CAINE- SANS SIFT- SlueuthKit (Autopsy). Digital Forensics Tools: RAM Capturer- Wireshark- Encrypted Disk Detector- Mobile Check- SIMXtractor- NeSA-Cyber Check- Windows Based Tools: Win-LiFT- Password Recovery Tools: Dialupass-WebBrowserPassView. Network Tools: SmartSniff- DNSDataView.

TOTAL: 60 HOURS

TEXT BOOKS

1. M. Reith, C. Carr, and G. Gunsch, "An examination of digital forensic models,"International Journal of Digital Evidence, vol. 1, no. 3, Fall 2002
2. E. Casey, Digital Evidence and Computer Crime: Forensic Science, Computers andthe Internet. San Diego, CA: Academic Press, 3rd edition, 2011,
3. Multimedia Forensics and Security, Chang-Tsun Li, Taylor and Francis,2013.
4. The Indian Cyber Law by Suresh T. Vishwanathan- Bharat Law House New Delhi

REFERENCE BOOKS

1. Digital Forensics- Matthew N. O. Sadiku, Mahamadou Tembely, Vol 7, Issue 4, 4April 2017.
2. Hakima knavicius, Maryline Laurent-Maknavicius; Wireless and Mobile NetworkSecurity, Wiley, 2007
3. Dan Kusnetzky; Virtualization: A Manager's Guide, O'Reily, 2011.

FS3611	**Forensic Ballistics**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVES

Students will learn the basics concepts of ballistics with respect to Forensicsand techniques involved in identification.

Course Outcome-COs At the end of the course, students shall be able to:		**Cognitiv eSkill**
CO-01	Gain basic Knowledge on types of Firearms and Ammunitions	U
CO-02	Procure basic knowledge on types of ammunition and bullets.	U, R
CO-03	Attain basic knowledge on Internal and External ballistics	U, R
CO-04	Acquire basic knowledge on Terminal ballistics	U
CO-05	Understand about firearm evidence and gunshot residues.	U, R

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	M	M	S	S	S	M
CO-02	S	M	M	S	M	M	M	S	S	M	M	S	M
CO-03	M	M	M	M	S	S	S	L	M	M	M	M	S
CO-04	M	M	M	L	S	M	S	N	M	M	M	M	M
CO-05	S	S	S	M	M	M	M	M	M	S	L	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction to Firearms and Ammunitions **12**

Fire Arms and Ammunition: Fire arms - Early hand cannons, The matchlock, The wheel lock, The shaphaunce, The flintlock, The percussion system, Rifling, Revolver, Pistols, Rifle, Shotgun, Sub machine gun, Machine gun, zip guns (Improvised Firearms). Introduction to Ammunitions**,** bullets, primer and propellant.

Unit II: Types of Ammunitions and Bullets **12**

Types of ammunitions- classification and constructional features of different types of cartridges, types of primers and priming composition, propellants and their compositions, velocity and pressure characteristics under different conditions. Various types of bullets and compositional aspects.

Unit III: Internal and External Ballistics **12**

Definition, ignition of propellants, shape and size of propellants, manner of burning, various factors affecting the internal ballistics: lock time, ignition time, barrel time, erosion, corrosion and gas cutting, principal problems of exterior ballistics, vacuum trajectory, effect of air resistance on trajectory, base drag, yaw, shape of projectile and stability, trajectory computation, ballistics coefficient and limiting velocity.

Unit IV: Terminal Ballistics **12**

Effect of projectile on hitting the target: function of bullet shape, striking velocity, striking angle and nature of target, tumbling of bullets, effect of instability of bullet, effect of intermediate targets, influence of range. Cavitation and its types. Ricochet and its effects. Wound Ballistics; preparation of gel block, penetration of projectiles in gel block

Unit V: Firearm Evidence and Gunshot Residues **12**

Matching of bullets and Cartridge Cases in regular firearms, Identification of firearms.Automated method of bullet and cartridge case comparison. Determination of range of fire and time of fire. Gunshot Residues- formation and collection of Gunshot residues and analysis of Gunshot residues

TOTAL: 60 HOURS

TEXT BOOKS

1. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
2. Sharma, B.R.; Firearms in Criminal Investigation and Trials, IVth Ed, Universal Law Publishing Co Pvt Ltd, New Delhi, 2011
3. W.J. Tilstone, M.L. Hastrup and C. Hald, Fischer's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013)
4. Schooeble, A.J. & Exline, L.D; Current methods in Forensic Gunshot Residues Analysis, CRC Press, New York, 2000

REFERENCE BOOKS

1. Carlucci, D.E.& Jacobson, S.S; Ballistics, CRC Press, London, 2008
2. Wilber; Ballistics Science for the Law Enforcement Officer, Charles C. Thomas, USA, 1977.
3. Di Maio, JM; Gunshot Wounds, CRC press, New York, 1999.

FS3612	Criminal Law	L	T	P	C
		3	0	0	3

OBJECTIVES

Students will learn the basics knowledge of Criminal Law.

Course Outcome-COs At the end of the course, students shall be able to		Cognitive Skill
CO-01	Acquire basic knowledge on basically of crime	U
CO-02	Attain basic knowledge on various types of crimes	U, R
CO-03	Procure information Major criminal acts.	U, R
CO-04	Get basic knowledge on Social Legislations and Minor Acts.	U
CO-05	Attain basic knowledge on Local and Special Law.	U, R

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	M	S	S	S	S	S	M	M	S
CO-02	M	M	M	M	S	S	S	M	M	M	S	S	M
CO-03	M	S	S	S	S	S	M	M	M	M	M	S	S

CO-04	M	S	S	M	S	S	M	M	M	S	M	S	S
CO-05	S	S	S	M	M	S	M	S	S	S	M	M	M

S-Strong, M-Medium, L-Low, N-Not relevant

Unit I: Introduction to crime **9**

Basic of crime: Definition of crime, Nature of crime, Essentials of crime, Criminals and society, Classification of crime, cognizable and non-cognizable offence, bailable and non-bailable offence, compoundable, non-compoundable offences and punishments.

Unit II: Types of crimes **9**

Various types of crime under IPC, Crime against state, Crime against army, navy and air force, crime against public Tranquility, crime relating to public servant, Offences relating to election. False evidence and Offence against public justice, Offence relating to coin and Government stamps, Offence relating to weight and measures, Offence relating to religion

Unit III: Criminal Major Acts **9**

Indian Penal Code: salient features, sections-23, 24, 25, 39, 44, 52,76-79,84-86, 232 - 235, 246, 247, 279, 287, 304A, 337, 338, 425, 427, 440. Criminal Procedure Code: salient features, sections- 2, 6-35, 41-60, 61-90,154, 176, 293, 294. Indian Evidence Act: salient features, sections- 3, 24-30, 45, 60 - 65, 73, 74, 135-138, 141. Expert testimony

Unit IV: Social Legislations and Minor Act **9**

Prevention of Atrocities Act 1989, Protection of Civil Rights Act, 1976, Dowry prohibition Act 1961, Immoral Traffic (Prevention) Act–1956, Prevention of Domestic Violence Act, 2005, The Sexual Harassment of Women at Workplace, 2013.The Protection of Children from Sexual Offences Act (POCSO Act) 2012, Juvenile Justice Act, 2015. Legislations relating to the welfare of weaker sections and other minor acts.

Unit V: Local and Special Law **9**

KAAPA, 2007. Objectives of Economic Legislations such as FERA, COFEPOSA, NDPS Act, Prevention of Corruption Act. Food and Adulteration Act, Drugs and Cosmetic Act, Arms Act, Explosives Act (Sections: 4, 17)., Information Technology Act 2000 (Sections: 2r, 2t, 3, 4, 7, 13, 79), Wildlife Protection Act, Environment Protection Act.

TOTAL : 45 HOURS

TEXT BOOKS

1. Rattan Lal & Dhiraj Lal; The Indian Penal Code, 28th Ed. Wadhwa & Co. Nagpur, 2002
2. Vipa P. Sarthi, Law of Evidence, 6th Edition, Eastern Book Co, Lucknow (2006)
3. (Chief Justice0 M. Monir, Law of Evidence,6th Edition, Universal Law Publishing Co. Pvt. Ltd, New Delhi (2002).
4. The Code of Criminal Procedure (1973) Amendment Act, (2001); Universal Law Publishing Co., 2002

REFERENCE BOOKS

1. The Indian Evidence Act (1872), Amendment Act (2002); Universal Law Publishing Co.,2003.
2. Houck, M.M &Seigal, J.A; Fundamentals of Forensic Science, Academic Press, London,2006.
3. D.A. Bronstein, Law for the expert witness, CRC press, Boca Raton (1999).

FS3613	Forensic Audio Video Analysis	L	T	P	C
		2	0	0	2

OBJECTIVES

Students will learn the basics of audio video analysis and speakeridentification.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO-01	Acquire knowledge on basics of electric circuits.	R, U
CO-02	Attain information on mechanism of speech production.	R, U
CO-03	Procure basic knowledge on audio and video analysis.	R, U
CO-04	Get better understanding on Forensic Speaker Identification.	R, U
CO-05	Procure information on documentation of audio and video evidences.	R, U

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate,S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-K	PO-L	PO-M
CO-01	S	S	S	M	M	S	M	M	M	M	M	S	M
CO-02	M	M	M	M	M	S	S	M	M	M	S	M	M
CO-03	M	M	S	S	M	M	M	S	M	S	M	M	M
CO-04	M	M	S	S	M	S	M	S	M	S	M	M	M
CO-05	M	M	S	S	L	M	M	M	S	M	M	S	S

S-Strong, M-Medium,L-Low,N-Not relevant

Unit I: Introduction to Analog and Digital **6**

Noise characteristics: Properties of Noise, Acoustic Characteristics of Environments- Diffraction, Reverberation and Diffusion. Recording formats- Analog and Digital, Audio video file formats, Linear and Non-linear editing. Concept of Digital water marking. Visual examination technique on video frame image. Facial Image recognition from video frame image.

Unit II: Mechanism of Speech Production **6**

Speech Anatomy, Mechanism of speech Production, Acoustic Properties of Vocal Tract, Uniqueness in person's voice, interspeaker and intraspeaker variation. Articulation- Manner & Place of Articulation, Phonemes, Vowel, Consonant and Glides, Phonetics in Speaker Identification, IPA (The International Phonetic Alphabets) and its symbolic representation. Forensic Phonetics and its importance, Effect of context, Supra-segmental (Prosodic features). Audio-enhancement, Sound Recording/Playback Devices: Analog Tape recorders, Digital recorder, Microphone types, Digital audio formats

Unit III: Introduction to Audio Video Forensic **6**

Introduction to Forensic audio video analysis: A basic understanding of forensic audio and video technology. Audio and video Evidence handling procedures. Authentication of recorded audio and video. Scientific methodology of forensic audio- video analysis. Recovery of digital audio- video / deleted video and audio files recovery. Exporting evidence as video or still image files. Software used for audio and video analysis. Admissibility of audio and video evidence in court.

Unit IV: Forensic Speaker Identification **6**

Introduction and scope of forensic speaker identification, speaker identification vs. speaker verification. Methods of speaker identification - open and close set, sound spectrograph and its analysis, analysis of vowel and consonant sound. Voice evidence: collection of voice sample, examination and formation of opinion in terms of probability scale, presentingevidence in court of law in view of forensic speaker identification. Recent advancements- Automated speaker identification: text dependent and text independent approach.

Unit V: Authentication and Analysis **6**

Authentication of audio recording: Type of alterations, Auditory Examination by Critical Listening. Waveform analysis, Speech Spectrographic analysis, Magnetic developing, Optical Method. Authentication of video recording, Visual examination technique on video frame sequence, Video image analysis- object, costumes, Facial image recognition from videoframe image, Video signal analysis.

TOTAL : 30 HOURS

TEXT BOOKS

1. Forensic Speaker Identification, Philip Rose: CRC Press Book, (2002).
2. Gloria J. Borden et. al.; "Speech Science Primer (Physiology, Acoustics and perception of Speech)", 6th Ed, a Wolters Kluwer Company, USA, (2011)
3. Musburger, B. Robert & Michael R. Ogden; "Single Camera Video Production", Focal Press, (2014).

REFERENCE BOOKS

1. Reference 1 A Simplified Guide to Forensic Audio and Video Analysis (PDF Notes).

2. Harry Hollien; "Forensic Voice Identification", Academic Press, London. (2001)

3. Musburger, B. Robert & Michael R. Ogden; "Single Camera Video Production", Focal Press, 2014.

FS3675	Forensic Dermatoglyphics Laboratory	L	T	P	C
		0	0	2	2

OBJECTVES

To learn about the various technique used in forensic to identify the fingerprint patterns, lip print pattern and footprint pattern.

Course Outcome-COs At the end of the course, students shall be able to:		Cognitive Skill
CO1	Understand the fingerprint patterns	U, A
CO2	Gain knowledge ridge counting and ridge tracing	U, A
CO3	Attain knowledge of detection of fingerprints using powdermethod and chemical method.	U, A
CO4	Acquire knowledge of lip print pattern	U, A
CO5	Procure knowledge of development of footprint.	U, A

R-Remember,U-Understand,A-Apply,An-Analyze,E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	M	M	S	M	M	M	M	S	M	S	M	S
CO-02	M	M	M	S	S	M	M	S	M	M	M	M	M
CO-03	M	M	M	M	S	M	M	M	S	S	M	M	S
CO-04	M	M	M	S	S	S	S	S	M	M	M	M	S
CO-05	M	M	M	S	M	S	M	M	S	M	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Taking plain and rolled prints on an FBI card.
2. Identification of fingerprint patterns.
3. Identification of core and delta from fingerprint pattern.
4. Ridge tracing and ridge counting from fingerprint pattern.
5. Henrys classification of fingerprints.
6. Development of latent fingerprints using powders.
7. Detection of fingerprint using chemical methods.
8. Use different light sources for enhancing developed fingerprints.
9. Lip print pattern identification.
10. Development of footprints.
11. Casting of Sunken footwear impression.

TOTAL: 30 HOURS

FS3676	**Forensic Ballistics Laboratory**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**2**

OBJECTIVES

To gain fundamental knowledge on firearms, velocity of bullets and strikingangles, gun short residues and firearm injuries.

Course Outcome-COs At the end of the course, students shall be able to:		**Cognitive Skill**
CO1	Gain knowledge on striking angle and velocity of bullets with respect to targets.	U, A
CO2	Understand types of cartridge cases.	U, A
CO3	Attain information on gunshot residues	U, A
CO4	Gain knowledge on nature of injury.	U, A
CO5	Attain knowledge on photography and sketching of crime scene involving firearms.	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	S	M	M	M	M	M	M	S	M	S
CO-02	S	M	M	M	M	S	M	M	S	M	S	M	S
CO-03	M	M	M	M	M	M	S	M	S	M	M	M	S
CO-04	S	M	M	M	M	M	M	M	M	M	M	M	S
CO-05	S	M	M	M	S	S	S	S	S	M	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Firing mechanisms of different types of firearms with the aid of diagram.
2. Correlate velocity of bullet with the impact it produces on the target.
3. Correlate striking angle of bullet with the impact on the target.
4. Estimate range of fired bullets.
5. Carry out comparison of fired bullets.
6. Carry out comparison of fired cartridge cases.
7. Identification of gunshot residue.
8. Correlate the nature of injuries with distance from which the bullet was fired.
9. Differentiation of contact wounds, close range wounds and distant wounds with theaid of diagram.
10. Photography and sketching of crime scene involving firearms.

TOTAL: 30 HOURS

FS3677	Digital & Cyber Forensic Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

To learn about the various ethical hacking tools and techniques and toidentify the different vulnerability occur in the network system.

Course Outcomes-COs At the end of the course, students shall be able to		Cognitive Skill
CO1	Understand hacking tools	U, A
CO2	Gain knowledge of SQL injection attack.	U, A
CO3	Understand on spoofing	U, A
CO4	Define on port scanning	U, A
CO5	Gain knowledge on sniffing	U, A

R-Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S-Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	M	M	M	S	L	M	M	M	M	M	L	L	M
CO-02	M	M	M	L	L	M	M	M	M	M	L	M	M
CO-03	S	M	S	M	M	M	M	M	S	M	M	L	M
CO-04	M	M	M	M	S	M	M	M	M	L	S	S	M
CO-05	M	M	M	M	M	M	M	S	S	L	L	L	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. To learn about the various hacking tools and skills.
2. Perform SQL Injection Attack.
3. Capture network traffic and analyze it using WireShark.

4. Use Google and Whois for Reconnaissance.
5. Using Nmap scanner to perform port scanning of various forms – ACK, SYN, FIN, NULL.
6. To study about System Hacking and implement it.
7. Perform Wireless Hacking.
8. To study about sniffing and their tools.
9. Use Crypt Tool to encrypt and decrypt passwords using RC4 algorithm.
10. Detect ARP spoofing using open-source tool ARPWATCH.

TOTAL : 30 HOURS

SEMESTER V

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	**FS3614**	Questioned Documents Examination	4	0	0	4
2	**FS3615**	Forensic Anthropology	4	0	0	4
3	**FS3616**	DNA Fingerprinting	4	0	0	4
4	**FS3617**	Statistics & Research Methodology in Forensics	2	0	0	2
5	**FS36XX**	Elective 1	3	0	0	3
PRACTICAL						
7	**FS3678**	Questioned Documents Examination Laboratory	0	0	2	2
8	**FS3679**	Forensic Anthropology Laboratory	0	0	2	2
9	**FS3680**	Basics of DNA Fingerprinting Laboratory	0	0	2	2
TOTAL			17	0	6	23

FS3614	Questioned Documents Examination	L	T	P	C
		4	**0**	**0**	**4**

OBJECTIVES

At the end of the course the students will learn the examination of handwriting. Students also will analyse the document whose authenticity is questioned.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO1	Gain knowledge of basics of questioned document	U, R
CO2	Acquire basic understanding on the concept of handwriting examination	U, R

CO3	Attain basic knowledge of comparison of paper and ink	U, A
CO4	Apply the subject knowledge in comparison of handwriting	U, A
CO5	Gain knowledge of application of subject knowledge in examination of questioned document	U, A

Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO – L	PO-M
CO-01	S	S	S	M	M	S	M	M	M	M	M	S	M
CO-02	M	M	M	M	M	S	S	M	M	M	S	M	M
CO-03	M	M	S	S	M	M	M	S	M	S	M	M	M
CO-04	M	M	S	S	M	S	M	S	M	S	M	M	M
CO-05	M	M	S	S	L	M	M	M	S	M	M	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Nature and scope of questioned document **12**

Definition of questioned document, Preliminary examination of questioned document, Classes of questioned document, Scope of questioned document, Basic tools used in document analysis – ultraviolet, visible, infrared and fluorescence spectroscopy, photomicrography, microphotography, VSC and ESDA.

Unit II: Principle of handwriting Identification **12**

Introduction to handwriting, principles of handwriting, Factors influencing handwriting – training, race & nationality, heredity, gender, muscular functioning and reflex action, class characteristics of handwriting – writing movement, pen pressure, pen position, slant, writing speed and Size, Individual characteristics of handwriting.

Unit III: Comparison of paper and ink **12**

Introduction to manufacturing and examination of paper, Classification and examination of ink, comparison of typed document, comparison of photocopied document, determining the age of a document

Unit IV: Comparison of handwriting **12**

Introduction to comparison of handwriting, methods of collection of handwriting samples, examination of anonymous letter, Forensic stylistics, definition of forgery, types of forgery, forgery detection

Unit V: Examination of questioned document **12**

Alteration in document: addition and overwriting, erasure, obliteration, secret writing, rubber stamp and seal, charred and torn documents, counterfeiting currency notes and passports, Security features of Indian currency notes, digital documents and water marks, expert opinion in questioned document examination.

TOTAL: 60 HOURS

TEXT BOOKS

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

REFERENCE BOOKS

1. Jan Seaman Kelly and Brian S. Lindblom (2006), "Scientific Examination of Questioned Documents", CRC Press, Boca Raton, 2nd edition.
2. Katherine M. Koppenhaver (2007), "Forensic Document Examination: Principles and Practice", Humana Press, Kindle Edition.
3. Dr. B. R. Sharma (2016), "Handwriting Forensic", Universal Law Publishing - An imprint of Lexis Nexis, 2nd Edition.
4. O. Hilton (1982), "Scientific Examination of Questioned Documents", CRC Press, Boca Raton.

FS3615	Forensic Anthropology	L	T	P	C
		3	1	0	4

OBJECTIVES

To study the application of anthropology in forensic science in identification of living and dead human being and to identify the skeleton remains.

Course Outcome – COs At the end of the course, students should able to learn		Cognitive Skill
CO1	The concept of Forensic Anthropology	U,R
CO2	Somatoscopy and somatometery identification	U,A
CO3	Principle of facial reconstruction	U
CO4	Know the Craniometric technique.	U, R
CO5	Know about the techniques in recovery of skeletal remains	U, A

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis\

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO – L	PO -M
CO-01	M	M	M	S	L	M	M	M	M	S	S	M	S
CO-02	M	S	M	L	M	M	M	M	L	S	S	M	S
CO-03	S	S	M	M	S	M	M	M	L	M	S	M	S
CO-04	S	M	M	M	S	S	S	L	L	S	S	M	S
CO-05	S	S	M	S	L	L	M	M	M	M	M	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction to Forensic Anthropology **12**

Scope of forensic anthropology. Study of human skeleton. Nature, formation, and identification of human bones. Comparative skeletal anatomy of human and non- human bones. Determination of age, sex, stature from skeletal material.

Unit II: Somatoscopy and Somatometry **12**

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

Unit III: Portrait Parle and Facial reconstruction **12**

Portrait Parle/ Bertillon system. Photo fit/identity kit. Facial superimposition techniques. Craniofacial super imposition techniques - photographic super imposition, video superimposition, Roentgenographic superimposition.

Unit IV: Reconstruction and Craniometry **12**

Use of somatoscopic and craniometric methods in reconstruction. Importance of tissue depth in facial reconstruction. Genetic and congenital anomalies - causes, types, identification and their forensic significance. Role of Forensic Anthropology in Mass disasters.

Unit V: Techniques for recovering **12**

Genetic traits of forensic significance. Identification of the recently dead and decomposed bodies. Techniques for recovering skeletonised human remains. Laboratory analysis of skeletal and decomposing remains; maceration, skeletal analysis.

TOTAL: 60 HOURS

TEXT BOOKS

1. Fundamentals of Forensic Anthropology, Linda L. Klepinger (2006). Wiley-Liss.
2. Introduction to Forensic Anthropology (3rd Edition) 2007 Steven N. Byers.

REFERENCE BOOKS

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

FS3616	DNA Finger Printing	L	T	P	C
		3	1	0	4

OBJECTIVES

It deals with the concepts and usage of the tools and techniques of DNA finger Printing in Forensic Science.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO-01	Know about the molecular basis of life	An,R
CO-02	Learn about the tools for DNA finger printing.	U
CO-03	Know about various techniques for DNA finger printing.	U,A,An
CO-04	Study about the Applications of DNA finger Printing.	E,A
CO-05	Learn the Critical Issues in DNA finger Printing.	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	L	N	N	N	S	M	L	L	S	M
CO-02	M	S	M	S	N	S	S	M	M	L	N	N	L
CO-03	S	M	S	S	S	M	M	M	M	S	S	M	M
CO-04	S	S	S	S	S	S	S	M	M	M	S	M	M
CO-05	M	M	M	S	S	S	S	M	M	M	M	M	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Molecular basis of life **12**

An introduction. Structure of DNA and RNA, Watson and Crick model of DNA and other forms for DNA (A and Z), Types of RNA (mRNA, tRNA, rRNA), Functions of DNA and RNA. Experimental Proof of DNA as genetic material (Griffith's experiment, Avery, MacLeod and McCarty's experiment, Hershey-Chase experiment), Experimental Proof of RNA as genetic material.

Unit 2: Tools for DNA finger printing **12**

DNA manipulative enzymes – Restriction enzymes and DNA Ligases. Gene cloning vector – Plasmids. Separation of DNA by Agarose Gel Electrophoresis, Amplification of DNA- Polymerase chain reaction (PCR). RFLP and RAPD analysis. Gene Libraries

Unit 3: DNA finger printing **12**

History and Evolution of the DNA finger printing. Principle of DNA finger printing. Steps in DNA finger printing. Special Tools for DNA Finger printing: Mini satellite based, Micro satellite based. Blotting techniques – Southern, Western and Northern blot.

Unit 4: Application of DNA **12**

Application of DNA in finger printing- Technological developments in DNA finger printing. Forensic application of DNA fingerprinting- In homicidal cases, Criminal cases, Missing body cases, Child abuse\ sexual assault cases, Identification of mutilated remains, Diagnosis of inherited disorders. Collection, Packaging and Preservation of DNA samples.

Unit 5: Critical issues in DNA fingerprinting **12**

Case studies: Historic cases, erratic cases, Application oriented case studies, Critical issues related case studies. DNA testing in disputed paternity. Mendelian laws of parentage testing. Mitochondrial DNA analysis in Forensic investigation, Y-STR analysis and its significance in establishing paternal relationships, Touch DNA.

TOTAL: 60 HOURS

TEXT BOOKS

1. Glick, B.T and Pastermak J.J (1998) Molecular biotechnology, Principles and application of recombinant DNA. Published by Washington D. C. ASM press.
2. Howe, C. (1995) Gene cloning and manipulation, Cambridge University Press, USA.
3. Rigby, P.W.J. (1987) Genetic Engineering. Published by Academic Press Inc., Florida, USA.
4. Christopher H. (2005), Gene cloning and manipulating, Published by Cambridge University Press.
5. Nicholl D.S.T (1994) An Introduction of Genetic engineering. Published by Cambridge University.

REFERENCE BOOKS

1. Lewin, B., Gene VI New York, Published by Oxford University Press.
2. Sambrook et al (2000), Molecular cloning volumes I, II & III, Cold spring. Published by Harbor Laborator Press, New York, USA.
3. Walker J.M and Gingold E. B (1983) Molecular Biology and Biotechnology (Indian Edition), Royal Society of Chemistry, U.K.
4. Old R.W and Primrose S.B. (2005) principles of Gene manipulation, An introduction to Genetic Engineering (3rd edition) . Published by Black Well Scientific Publications.

FS3617	Statistics and Research Methodology in Forensics	L	T	P	C
		2	0	0	2

OBJECTIVES

To give students a brief knowledge about the various methods of organization of statistical data and its presentation. To gain knowledge in experimental design and data collection

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO-01	Understand the basics of biostatistics such as tabulation, graphical and diagrammatic representation.	U,R
CO-02	Calculate and interpret measures of central tendency and basics of testing hypothesis in statistical data.	A,AP
CO-03	Understanding on various kinds of research, objectives of doing research, research process, research designs and sampling.	U,R
CO-04	Identify and demonstrate facility in data collection strategies that are most appropriate to a particular research project.	A
CO-05	Provide knowledge on conducting survey and data interpretation and to develop skill in identification of research problem, thesis writing and publication in journal.	R,AP

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	L	L	N	M	N	N	S	S	S	S
CO-02	S	S	M	L	M	L	M	L	L	S	S	M	S
CO-03	S	S	M	M	M	N	M	L	L	M	M	M	S
CO-04	M	S	L	S	M	M	S	L	L	S	S	S	S
CO-05	M	S	M	M	M	L	M	L	N	S	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Biostatistics **9**

Definition - scope of biostatistics - Population and Sample - collection, classification, and tabulation of data - graphical and diagrammatic representation - scale diagram - histograms - pie diagrams - frequency polygon - frequency curves.

Unit II: Descriptive Statistics **9**

Measures of central tendency - arithmetic mean, median, and mode, Measure of dispersion - standard deviation, Basics of testing hypothesis, Level of significance- students t-test, chi-square test, Analysis of Variance (one-way and two-way), Statistical softwares: SPSS, EpiInfo, SAS, STRATA.

Unit III: Research methodology **9**

Research methodology: An introduction – meaning, objective and types of research. Defining research problem – selection of problems. Sampling design – random sample. Measurement and scaling techniques, error in measurement.

Unit IV: Data collection **9**

Methods of data collection – primary data – interview method, questionnaire, secondary data, and case study method. Online data base library. Computer and its role in research, Plagiarism, tools to avoid plagiarism.

Unit V: Scientific documents **9**

Preparation of scientific documents: Data management, Research papers, review articles, format of journals – proof reading. Journals: Standard of research journals, impact factor, citation index, methods of citation. Oral presentation, poster presentation, bibliography, thesis writing.

TOTAL: 45 HOURS

TEXT BOOKS

1. Introductory Biostatistics, by Lee T, 2007 Wiley – Interscience Publishers.
2. Statistical methods, by Stephen W Looney, 2002 Humana publications.
3. Fundamentals of Biostatistics, by Khan and Khanum, 2004 Ukaaz Publications.
4. Research Methodology: Methods and Techniques, by Kothari CR and Garg G, 2019 New Age International Publishers, ISBN: 978-9386649225, 4th Edition.
5. Research Methodology for Biological Science, by Gurumani N, 2006 MJP Publishers, Chennai.

REFERENCE BOOKS

1. Biostatistics: A Methodology for the Health Sciences, by Gerald Van belle, 1903 Wiley – Interscience publication, 2nd Edition.
2. Biostatistics- A foundation for health Sciences, by Daniel WW,1983 John Wiley Publications.
3. Biostatistical analysis, by Jerrold H Jar, 2009 Pearson Publications, 5th Edition.
4. Communicate Science Papers, Presentations, and Posters Effectively, by Patience GS, Boffito DC, Patience P, 2015 Academic Press, ISBN: 978-0128015001.
5. Successful Scientific Writing: A Step-by-Step Guide for the Biological and Medical Sciences, by Matthews JR and Matthews RW, 2014 Cambridge University Press ISBN: 978-1107691933, 4th Edition.

FS3678	Questioned Documents Examination Lab	L	T	P	C
		0	0	2	2

OBJECTIVES

The objective of this course is to acquire knowledge in comparison of handwriting, detection of forgery, alteration obliteration and erasures, examination of currency note, passport, secret writing and rubber stamps.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO-01	Acquire knowledge in handwriting comparison and the natural variations in handwriting	A
CO-02	Understand to detect the forgery in handwriting	U,A
CO-03	Learn the alteration, obliteration and erasures in handwriting	A
CO-04	Understand the security features of currency note and passports.	U
CO-05	Acquire knowledge in detection of secret writing and examination of rubber stamps.	U,A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	S	M	S	S	S	L	S	S	L	M
CO-02	M	M	M	N	S	S	S	S	S	S	M	S	L
CO-03	L	S	M	M	S	M	M	S	S	M	M	S	M
CO-04	S	M	S	S	M	M	S	M	L	L	S	N	L
CO-05	M	S	S	M	S	S	M	M	M	S	L	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. To identify handwriting characters
2. To study natural variations in handwriting
3. To compare handwriting samples
4. To detect simulated forgery
5. To detect traced forgery
6. To study alteration, obliteration and erasures in handwriting
7. To examine the security features of currency notes
8. To examine the security features of passports.
9. Examination of secret writing
10. Examination of rubber stamps.

TOTAL : 30 HOURS

FS3679	Forensic Anthropology Laboratory	L	T	P	C
		0	0	2	2

OBJECTIVES

To study the application of anthropology in forensic science in identification of living and dead human being and to identify the skeleton remains.

Course Outcome – COs At the end of the course, students can able to		Cognitive Skill
CO-01	Apply the concept of Forensic Anthropology	U,A
CO-02	Determine gender from pelvis morphology and skull	U,E,A
CO-03	Gain knowledge in the identification of long bones.	A
CO-04	Prepare the portrait parle	U,A
CO-05	Determine animal bones and human bones.	U,A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	S	M	M	M	L	S	M	S	S	M
CO-02	M	M	M	M	M	M	M	M	S	M	M	M	M
CO-03	S	M	M	M	M	M	M	M	M	M	M	M	M
CO-04	S	M	L	M	M	M	M	M	S	M	S	M	S
CO-05	S	S	S	M	M	M	M	M	L	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1.Determination of sex from skull
2.Gender determination from pelvis morphology
3.Portrait Parle/ Identification method of Bertillon system
4.Visual examination of long bones
5.Identification and description of long bones
6.Determination of stature
7.Differentiation between human and animal bones
8.Age estimation from skull sutures, and sacrum
9.Age estimation from teeth.
10.Case study of Forensic anthropology
11. Hair analysis.

TOTAL: 30 HOURS

FS3680	**Basics Of DNA Finger Printing Lab**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**2**

OBJECTIVES

The objective of this course is to acquire knowledge in the tools, Techniques and steps of DNA finger Printing.

Course Outcome – COs **At the end of the course, students should able to**		**Cognitive Skill**
CO-01	Know about the isolation protocols	An,R
CO-02	Learn about the Estimation procedure for DNA.	U
CO-03	Know about various techniques for DNA finger printing.	U,A,An

CO-04	Study about the Amplification process.	E,A
CO-05	Demonstrate the cases in DNA finger Printing.	A

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	L	N	N	N	S	M	L	L	S	M
CO-02	S	S	M	S	N	S	S	M	M	L	N	N	L
CO-03	S	M	S	S	S	M	M	M	M	S	S	M	M
CO-04	S	S	S	S	S	S	S	M	M	M	S	M	M
CO-05	S	M	M	S	S	S	S	M	M	M	M	M	L

S- Strong, M- Medium, L-Low, N- Not Relevant

Practicals

1. Isolation of DNA from Animal tissue
2. Isolation of DNA from blood
3. Isolation of DNA from Saliva
4. Isolation of plasmid DNA
5. Estimation of DNA by DPA method
6. Gel Electrophoresis
7. RFLP
8. Gel documentation and photography
9. PCR
10. Demonstration: DNA profiling for paternity and maternity disputes
11. Methods used to preserve the biological specimen for DNA analysis.

TOTAL: 30 HOURS

SEMESTER VI

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	**FS3618**	Forensic Chemistry & Toxicology	3	1	0	4
2	**FS3619**	Arson & Explosives	3	1	0	4
3	**FS36XX**	Elective II	2	1	0	3

PRACTICAL						
4	**FS36P1**	Dissertation/Minor Project	0	1	5	6
5	**FS36P2**	Internship	0	0	2	2
TOTAL			8	4	7	19

FS3619	**Forensic Chemistry and Toxicology**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVES

To study the different types of toxics and identification of such toxics and toxins and analysing.

Course Outcome – COs **At the end of the course, students should able to**		**Cognitive Skill**
CO1	Understand the significance of chemistry in Forensic science	U,R
CO2	Learn about the analytical techniques	U
CO3	Know about the search methods for drugs.	U, E
CO4	Understand the significance of toxicological findings.	U, A
CO5	Know about the poison and its mode of actions.	U, E

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / **CO**	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO-L	PO-M
CO-01	M	M	M	M	L	S	M	M	S	S	M	M	S
CO-02	M	S	M	M	M	S	M	M	M	S	S	M	S
CO-03	M	S	M	M	S	S	M	M	M	M	S	M	S
CO-04	S	M	M	S	S	S	S	M	M	S	S	M	S
CO-05	S	S	M	S	M	M	M	M	S	M	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Forensic Chemistry **12**

Introduction to Forensic Chemistry – Types of cases -Definition and Scope, Beverages. Alcoholic and non - alcoholic illicit liquors. Analysis and identification of ethyl alcohol – Blood alcohol content (BAC). Definition of narcotics, drugs and psychotropic substances. Broad classification - Narcotics, stimulants, depressants and hallucinogens. Food adulteration: Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food and other material cases. Sampling of food, Determination of moisture, ash, pH and Sodium chloride, Butter water, salt, curd, lactose, fat, ash

Unit II: Analysis of Drugs **12**

Isolation techniques for purifying narcotics, drugs and psychotropic substances - thin layer chromatography, gas - liquid chromatography and high performance liquid chromatography. Colour tests and Screening tests for basic drugs, Narcotics and Psychotropic substances

Unit III: Search for drugs/Narcotics/psychotropic substances **12**

Crime scene search for narcotics, drugs and psychotropic substances - searching a suspect, searching a dwelling, searching a vehicle. Clandestine drug laboratories. Collection and preservation of drug evidence

Unit IV: Toxicology **12**

Introduction to Toxicology, History, Classification of toxicology - Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis and chemical intoxication tests. Post-mortem Toxicology. Human performance toxicology. Dose -response relationship. Accidental, suicidal and homicidal poisonings.

Unit V: Poisons **12**

Signs and symptoms of common poisoning and their antidotes. Collection and preservation of viscera, blood and urine for various poison cases. Application of immunoassays in forensic work. Animal poisons. Snake venom. Mode of action. Carbon monoxide poisoning. Vegetable poisons. Poisonous seeds, fruits, roots and mushrooms.

TOTAL: 60 HOURS

TEXT BOOKS

1. Poklis, Forensic toxicology in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
2. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
3. F.G. Hofmann,A Handbook on Drug and Alcohol Abuse, 2ndEdition, Oxford University Press, New York(1983).

REFERENCE BOOKS

1. S.B. Karch, The Pathology of Drug Abuse, CRC Press, Boca Raton (1996).
2. A.W. Jones, Enforcement of drink-driving laws by use of per se legal alcohol limits: Blood and/or breath concentration as evidence of impairment, Alcohol, Drug and Driving, 4, 99 (1988).
3. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995)
4. Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry, Springer

FS3620	Arson And Explosives	L	T	P	C
		3	1	0	4

OBJECTIVES

To facilitate the students to understand the methods of analyzing trace amounts of petroleum products in crime scene evidence, The method of searching, collecting, preserving and analyzing arson evidence, The techniques of locating hidden explosives, Provisions related to Petroleum Act, Explosive Substances

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO1	Define fire and Arson cases and its Investigation	U
CO2	Illustrate the standard methods of analysis of petroleum products in forensic exhibits.	U, An
CO3	Define Explosives and Identify the Classification of Explosives	U, E
CO4	Understand different Explosive agents and overall rules of evidence collection	U.E, A
CO5	Know more about investigate the Explosive scene	U, E, An

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO – L	PO -M
CO-01	S	M	M	M	L	M	M	N	N	S	M	M	S
CO-02	M	S	M	L	M	M	M	N	L	S	S	M	S
CO-03	M	S	M	M	S	N	M	N	L	M	S	M	S
CO-04	S	M	M	S	S	S	S	L	L	S	S	M	S
CO-05	S	S	M	S	S	L	M	N	N	M	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction to Fire **12**

Definition of Arson-Characteristics of Arson, Fire Triangle, Chemistry of fire, conditions of fire, fire scene Patterns, Location of point of ignition. Causes of Fire, Recognition of types of fire. Searching of the fire scene, Collection and preservation of arson evidence. Analysis of fire debris. Analysis of ignitable liquid residue. Scientific investigation and evaluation of clue materials. Information from smoke staining.

Unit II: Petroleum Products **12**

Compositions of Petroleum Products, Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products, Petroleum act & Explosives act.

Unit III: Explosives **12**

Introduction-Explosives, Role of Forensic Science in Explosives, Types of Explosions- Mechanical, Chemical, nuclear, Electrical, Classification of explosives - Low explosives, High Explosives, Homemade Explosives, Military Explosives, Booby Traps. Improvised explosive device - Letter Bomb, Dirty Bomb, Homemade Explosive- Molotov Cocktail

Unit IV: Explosive Agents **12**

Pyro techniques, Synthesis and characteristics of TNT, PETN and RDX. Bomb scene management. Documentation of bomb scene, Searching the scene of explosion. Mechanism of explosion, Blast injuries. Detection of hidden explosives, Overall, Rules for evidence collection

Unit V: Investigation of Explosion Scene **12**

Investigation of explosives, Post blast residue collection, packaging and forwarding of explosive evidence, Post blast residue analysis- Chemical Tests for inorganic Anions and Cations- Water Extract, Famous case studies in explosion and court testimony.

TOTAL : 60 HOURS

TEXT BOOKS

1. Nabar B S, "Forensic Science in Crime Investigation", Asia Law House, 2nd Edition, 2010.
2. Saferestein Richard, "Criminalistics", Pearson Prentice Hall, 13th Edition 2015.

REFERENCE BOOKS

1. J.D. Deham, Kirks Fire Investigation, 3rd Ed. Printice Hall, New Jersey, 1991.
2. A.A.Moenssens, J. Starrs C.E. Henderson & F E Inabu, Scientific Evidence in Civil &Criminal Cases, 4thEd. The Foundation Press, Inc, NewYork, 1995.
3. Yallop, H. J: Explosion Investigation, Forensic Science Society & Scottish Academic Press, 1980.
4. Feigl; Spot Test In Inorganic Analysis, Elsevier Pub. New Delhi
5. Silverman; Organic Chemistry Of Drug Design & Drug Action, Elserier Pub. New Delhi

		L	T	P	C
FS36P1	**Project**	**0**	**1**	**5**	**6**

		L	T	P	C
FS36P2	**Internship**	**0**	**0**	**2**	**2**

OBJECTIVES

To allow young academic talent to be associated with the scientific works of Forensic Science Laboratory and **t**he student Interns will also have opportunity to know about the functioning of a Government/ Private Forensic Science Laboratory and its importance in criminal investigation system.

Guidelines

- Internships are mandatory
- Duration: 30 days (During 6th semester)
- Internship can be done at District police office, Police stations, State forensic science laboratory, Regional forensic science laboratory and Private forensic science lab etc.
- Maintenance of records by students: Every student shall maintain records of the attendance and the report of the work they do in different areas in forensic science. This should be certified by the head of the institutions or his/her nominee where the students is undergoing internship.
- Leave: Candidates should have an attendance of at least 90% during the internship period.
- Grading and evaluation of students: All internees will be assessed based on their attendance and the viva conducted by the examiner during the submission of internship report.
- Certification: The institutes will award a certificate after successful completion of the internship.
- The university shall award the degree only after the successful completion of internship.

LIST OF ELECTIVES

SL. NO.	COURSE CODE	COURSE TITLE	L	T	P	C
ELECTIVES						
1	**FS36A1**	Wildlife Forensics and Forensic Entomology	3	0	0	3
2	**FS36A2**	Human Physiology and Anatomy	3	0	0	3
3	**FS36A3**	Accident Investigation and Forensic Photography	3	0	0	3
4	**FS36A4**	Artificial Intelligence	3	0	0	3
5	**FS36A5**	Environmental Science	3	0	0	3

FS36A1	**Wildlife Forensics and Forensic Entomology**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES

At the end of the course the students will learn the basic concept of forensic biology and its importance in crime scene investigation. Students will also apply the knowledge of forensic entomology in death. Students can acquire the basics of wildlife forensics.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO1	Interpret the significance of forensic biology	U, R,A
CO2	Gain basic knowledge regarding the concepts of forensic botany	U, A
CO3	Acquire basic knowledge of wildlife forensic.	U, R,A
CO4	Get basic knowledge regarding the importance of forensic entomology in death investigation	U,R
CO5	Apply the knowledge of entomology in law	U, A

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	S	M	S	S	M	S	M	M	S	S	M
CO-02	S	S	M	M	M	S	S	M	M	M	S	M	M
CO-03	M	M	S	S	S	M	M	S	M	S	M	S	M
CO-04	M	M	S	S	S	S	M	S	M	S	M	M	S
CO-05	M	M	S	S	L	M	S	M	S	M	S	S	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction to Forensic Zoology **9**

Forensic biology: Introduction, historical development and significance, Structure of human hair. Comparison of hair samples. Morphology and biochemistry of human hair. Comparison of human and animal hair, Significance of hair evidence.

Unit II: Forensic Botany **9**

Forensic Botany: Introduction, historical development, botanical evidence encounter in forensic investigation: Wood and leaves, Forensic Palynology: Forensic analysis of pollen grains, algae. Investigation of ornamental, imported, stolen, endangered plants. Forensic Limnology: collection, examination, comparison and identification of diatoms.

Unit III: Wildlife Forensics **9**

Fundamentals and significance of wildlife Forensic. Protected and endangered species of animals and plants, Definition of Molecular wildlife, Morphometric, illegal trading in wildlife items such as skin, fur,

bone, horn, teeth, flowers and plants. Identification of animals by teeth, claws, ivory, antlers, furs, skins, bite marks, pugmarks. CITES, Census of wild life population, Smuggling and poaching, Wildlife protection act.

Unit IV: Forensic Entomolgy **9**

Basics of Forensic Entomology, Forensic Importance of insects, Collection of entomological evidence during death investigations. Role of entomology in determination of PMI, Determining the age of blow fly life cycle stages by various methods.

Unit V: Forensic Entomology and Law **9**

Entomology and Law, Insects as forensic indicators. Aquatic insects in forensics. Insects in abuse cases, Insects in crime solving and legal proceedings. Current trends in forensic entomology. Examine marks on the bodies of victims and identification and examination of bite marks.

TOTAL:45 HOURS

TEXT BOOKS

1. Heather Miller Coyle (2004), "Forensic Botany: Principles and Applications to Criminal Casework", CRC Press, Boca Raton.
2. Jason H. Byrd, James L. Castner (2009), "Forensic Entomology: The Utility of Arthropods in Legal Investigations", CRC Press, Boca Raton, 2nd Edition.
3. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
4. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).

REFERENCE BOOKS

1. Richard Li (2015), "Forensic Biology", CRC Press, Boca Raton, 2nd Edition.
2. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

FS36A2	Human Physiology and Anatomy	L	T	P	C
		3	0	0	3

OBJECTIVES

To give students a brief knowledge about the various terminologies and for better knowledge about the anatomy of human body.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO-01	Understand the Structural organization and basic anatomical terminology of human body.	U,R
CO-02	Understands about the Integumentary System and terminologies	U,R
CO-03	Understanding on the composition of Blood and body fluids	U,R
CO-04	Understand on peripheral nervous system of human body	U,R
CO-05	Understanding about Cardiovascular system of Humans.	U

R- Remember, U-Understand, A-Apply, An-Analyze, E-Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO-I	PO-J	PO-k	PO-L	PO-M
CO-01	S	S	M	M	L	N	M	M	S	S	S	S	S
CO-02	S	M	M	M	M	L	M	L	L	S	M	M	S
CO-03	S	S	S	M	M	M	M	M	L	M	M	M	S
CO-04	M	M	L	S	M	M	S	L	L	S	S	S	S
CO-05	S	S	M	M	M	L	M	M	N	L	S	L	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit 1: Introduction to Human Body **9**

Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology. Cellular Level of Organization Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal mol- ecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine Tissue Level of Organization Classification of tissues, structure, location and functions of epithelial, muscular and nervous and con- nective tissues.

Unit II: Integumentary System **9**

Structure and functions of skin Skeletal System Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appen- dicular skeletal system Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction Joints, Structural and functional classification, types of joints movements and its articulation

Unit III:Body fluids and blood **9**

Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system. Lymphatic system Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit IV: Peripheral nervous system **9**

Classification of peripheral nervous system: Structure and functions of sympathetic and parasympa- thetic nervous system. Origin and functions of spinal and cranial nerves Special senses Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V: Cardiovascular system **9**

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

TOTAL: 45 HOURS

TEXTBOOKS

1. Anatomy and Physiology for Healthcare by Paul Marshall; Beverly Gallacher; Jim Jolly; Shupikai Rinomhota. Atlas of Human Anatomy by Frank H. Netter. References
2. The Netter Collection of Medical Illustrations by Frank H. Netter; Richard Parker

REFERENCE BOOKS

1. A.K.Jain, Human Physiology and Biochemistry for Physical Therapy and Occupational Therapy,1st Ed. Arya Publication.
2. Dr.Venkatesh.D and Dr.SudhakarH.S.Basic of Medical Physiology, 2nd Ed., Wolter- Kluwer Publication.
3. Chaudhari (Sujith K) Concise Medical Physiology 6th Ed. New Central B

FS36A3	Accident Investigation and Forensic Photography	L	T	P	C
		2	1	0	3

OBJECTIVES

To gain knowledge of different types of accidents and its characteristics to understand the accident and to prepare the reports and to facilitate the students to learn and understand the Basics of Photography and its importance in Forensic Science, Various types of camera, Working of SLR & DSLR Cameras, Scope and significances of photography in various disciplines of forensic science

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO1	Explain the features of Photography	U
CO2	Understand the concepts of Accident	U
CO3	Discuss and analyse the accident scenes	U, An
CO4	Will be able to define the accident and its mode	U.R,A
CO5	Will be able to prepare forensic report of Accident	U, E

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO – L	PO-M
CO-01	S	M	M	M	S	M	M	M	S	S	M	M	S
CO-02	M	S	M	L	M	S	M	M	S	S	S	M	S

CO-03	M	S	M	M	S	S	M	S	S	M	S	M	S
CO-04	S	M	M	S	S	S	S	L	M	S	S	M	S
CO-05	S	S	M	S	L	L	M	M	M	M	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Photography **9**

History and development of photography, Types of cameras, Features of camera, Working of SLR & DSLR Cameras, Introduction- Forensic Photography, Types of Forensic photography, Scope and significances of photography in various disciplines of forensic science

Unit II: Introduction to Accident **9**

Motor Vehicle Accidents - Accident scene. Sources of forensic information. Eyewitness accounts. Extent of vehicle damage. Visibility conditions. Photographs of accident site. Estimation of speed. Tire marks, skid marks, scuff marks, Traffic awareness.

Unit III: Accident Scene Investigation **9**

Accident Analysis - Pre-crash movement - post-crash movement - Collision model - Gauging driver's reaction - Occupants's kinematics - Types of injuries resulting from accident - Biomechanics of injuries - Hit and run investigations - Trace evidence at accident sites.

Unit IV: Mode of Accidents **9**

Maintenance of vehicles - Abandoned vehicles - Importance of air bags - Railway accidents. Air Accidents- Introduction, classifications, sources of information, Types of failure, primary steps to investigation, eye witnesses.

Unit V: Forensic Report **9**

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

TOTAL: 45 HOURS

TEXT BOOKS

1. Edward M. Robinson (2010), "Crime Scene Photography", Academic Press is an imprint of Elsevier (AP), London, 2nd Edition.

2. C. P. Nakra (2016), "Basic of Automobile Engineering", Dhapat Rai Publishing Company, New Delhi, 20th Edition.

3. Michel P. Burke (2006), "Forensic Medical Investigation of Motor Vehicle Incidence", Taylor & Francis Inc CRC Press Publishers, 1st Edition.

REFERENCE BOOKS

1. Harold Franck and Darren Frank (2015), "Forensic Engineering Fundamentals", Taylor & Francis Inc CRC Press Publishers, 1st Edition.

2. K. M. Gupta (2002), "Automobile Engineering Vol- I and II, Umesh publications", New Delhi.

3. John Freeman (2010), "Photography The New Complete Guide to Taking photographs", Collins and Brown publisher, London.

4. Helmut Gernsheim (1986), "A concise history of photography", Dove publications, New York, 3rd Edition.
5. Michael Langford (2015), "Basic Photography", Focal Press, Routledge publisher, 10th Edition.

FS36A4	Artificial Intelligence	L	T	P	C
		2	1	0	3

OBJECTIVES

To gain knowledge on scope, characteristics and applications in the field of Artificial Intelligence.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO1	Explains the characteristics and agents in artificial intelligence	U,R
CO2	Understanding search strategies and problem-solving techniques	U,R,
CO3	Acquire knowledge on Programing and ontological engineering	U, A
CO4	Gain knowledge about software and agent communication in artificial intelligence.	U.R,A
CO5	Understand about the applications and hardware perceptions	U, E

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO - I	PO-J	PO-k	PO - L	PO-M
CO-01	S	S	M	M	S	M	M	M	S	S	M	M	M
CO-02	S	S	M	L	M	S	S	M	S	M	S	M	S
CO-03	M	S	M	M	S	S	M	S	S	S	S	M	S
CO-04	S	M	L	S	S	S	S	M	M	S	S	M	S
CO-05	S	S	M	S	S	L	M	M	M	M	S	M	S

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Introduction on Artificial Intelligence **9**

Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

Unit II: Problem Solving **9**

Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics –Local Search Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games

Unit III: Programming **9**

Knowledge Representation First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -Reasoning with Default Information

Unit IV: Software Agents **9**

Software Agents Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

Unit V: Applications **9**

Applications AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware –Perception – Planning – Moving

TOTAL: 45 HOURS

TEXT BOOKS

1. Machine Learning for Dummies, John Paul Mueller and Luca Massaron
2. Artificial Intelligence and Machine Learning,Vinod Chandra S. S

REFERENCE BOOKS

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2. Artificial Intelligence: A Modern Approach, 4th Edition, Stuart Russell, peter Norvig University of California at Berkeley, Pearson education, 2020.
3. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011.

FS36A5	Environmental Science	L	T	P	C
		2	1	0	3

OBJECTIVES

To gain knowledge about the natural resources and bio-geographical classification.

Course Outcome – COs At the end of the course, students should able to		Cognitive Skill
CO1	Explains the significance of natural resources and associated problems	U
CO2	Understanding on structure and functions of ecosystem	U,R
CO3	Acquire knowledge on bio-geographical classification and biodiversity.	U
CO4	Will gain knowledge about the pollutions and control measures	U.R,A
CO5	Will understand about the environmental ethics and urban problems	U, E

R- Remember, U – Understand, A – Apply, An – Analyze, E – Evaluate, S- Synthesis

Mapping of Course Outcome with Programme Outcome

PO / CO	PO-A	PO-B	PO-C	PO-D	PO-E	PO-F	PO-G	PO-H	PO – I	PO-J	PO-k	PO – L	PO-M
CO-01	M	M	S	M	S	S	M	M	M	L	M	M	M
CO-02	M	M	M	L	M	S	S	M	S	M	S	M	S
CO-03	S	S	S	M	M	S	M	L	S	M	S	S	S
CO-04	S	M	M	M	S	M	S	M	M	S	S	M	M
CO-05	S	M	M	S	M	L	M	M	M	M	M	M	M

S- Strong, M- Medium, L-Low, N- Not Relevant

Unit I: Natural resources **9**

Definition, scope and importance. Natural resources and associated problems: Forest, Water, Minerals, Food, Energy, Land. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles lectures.

Unit II: Conservation of Natural Resources **9**

Forest Resources Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles lectures. Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem .Ecological succession. Food chains, food webs and ecological pyramids.

Unit III: Ecosystem Diversity **9**

Introduction- Definition: Genetic, species and ecosystem diversity. Biogeographical classification of India. Value of Bio-diversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Bio-diversity at global, National and local levels. Hot- spots of Bio-diversity Threats to Bio-diversity: habitat

loss, poaching of wildlife, man- wildlife conflicts. Endangered and endemic species of India. Conservation of Bio-diversity: In-situ and Ex-situ conservation of Bio-diversity.

Unit IV: Pollutions and Control Measures **9**

Definition, Causes, effects and control measures of: (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise Pollution, (f) Thermal pollution, (g) Nuclear hazards. Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides.

Unit V Environmental ethics and management **9**

Urban problems related to energy Water conservation, rain water harvesting, and watershed management. Environmental ethics: issues and possible solutions. Urban problems related to energy Water conservation, rain water harvesting, watershed management Environmental ethics: issues and possible solutions. Population growth, variation among nations. Population explosion-Family Welfare programme. Environment and human health Human Rights.

TOTAL: 45 HOURS

TEXT BOOKS

1. Dictionary of Environment and Ecology by Peter Collin, 2010
2. Conservation and Environmentalism by Robert C. Paehlke , 1995

REFERENCE BOOKS

1. Suryakanta, Community medicine with recent advances, 4th edition
2. Essentials of community medicines for allied health sciences, JSS university publications,2015
3. Bhalwar R, Public health and community medicine, Pune, 2nd edition, 2012