School of Life Sciences

B.Sc. Forensic Science (Total Credits 135)

Programme Structure

Curriculum & Scheme of Examination

2021-2022

STAREX UNIVERSITY

GURUGRAM

HARYANA

122413

FIRST SEMESTER

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
	Introduction to Forensic Science	2	1	-	3
	Fundamentals of Crime Scene Investigation	2	1	-	3
	Biology I	2	1	-	3
	Chemistry I	2	1	-	3
	Physics I	2	1	-	3
	Forensic Practical I	-	-	6	3
ABILITY ENHANCEMENT COMPULSORY SUBJECTS (AECS)					
	EVS	2	-	-	2
SKILL ENHANCEMENT COURSE					
	Basic IT	2	-	-	2
	Total Credits				22Cr

SECOND SEMESTER

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
	Fingerprinting	2	1	-	3
	Questioned Document	2	1	-	3
	Biology II	2	1	-	3
	Chemistry II	2	1	-	3
	Physics II	2	1	-	3
	Forensic Practical II	-	-	6	3
	Cyber Forensic	2	-	-	2
ABILITY ENHANCEMENT COMPULSORY SUBJECTS (AECS)					
	English Communication	2	-	-	2
SKILL ENHANCEMENT COURSE					
	Basic Maths	2	-	-	2
	Total Credits				24 Cr

THIRD SEMESTER

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
	Forensic Ballistics & Explosives	2	1	-	3
	Forensic Biology & Serology	2	1	-	3
	Biology III	2	1	-	3
	Chemistry III	2	1	-	3
	Physics III	2	1	-	3
	Forensic Practical III	6	-	-	3
	Cyber Forensic	2	-	-	2
SKILL ENHANCEMENT COURSE					
	Forensic Photography	2	-	-	2
	Total Credits				22Cr

FOURTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
	Forensic Physics & Biometric system	2	1	-	3
	Forensic Anthropology	2	1	-	3
	Biology IV	2	1	-	3
	Chemistry IV	2	1	-	3
	Physics IV	2	1	-	3
	Forensic Practical IV	-	-	6	3
	Cyber Forensic	2	-	-	2
SKILL ENHANCEMENT COURSE					
	Research Methodology	2	-	-	2
	Wildlife Forensic	2	-	-	2
	Instrumentation	2	-	-	2
	Total Credits				22 Cr

FIFTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
	Forensic Medicine & Psychology	2	1	-	3
	Forensic Chemistry & Toxicology	2	1	-	3
	Biology V	2	1	-	3
	Chemistry V	2	1	-	3
	Physics V	2	1	-	3
	Forensic Practical V	-	-	6	3
	Cyber Forensic	2	-	-	2
DISCIPLAIN SPECIFIC ELECTIVE COURSE (DSEC)					
	Quality Management in Ethics	2	-	-	2
	Crime Scenario in India	2	-	-	2
	Total Credits				22 Cr

SIXTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
	Criminology	2	1	-	3
	Law	2	1	-	3
	Biology VI	2	1	-	3
	Chemistry VI	2	1	-	3
	Physics VI	2	1	-	3
	Forensic Practical VI	6	-	-	3
	Cyber Forensic	2	-	-	2
DISCIPLAIN SPECIFIC ELECTIVE COURSE (DSEC)					
	Project with Presentation & Evaluation	3	-	-	3
	Total Credits				23 Cr

Programme Overview

Duration: 3 years

Bachelor of Science (B.Sc.) degree program is designed to introduce the students to modern methods and principles. The students are exposed to applied laboratory techniques, critical thinking, independent and team learning and are provided with research opportunities. Related educational materials are used to support teachers in the classroom and promote hands- on learning experiences for students.

Students of all the undergraduate degree Programmes at the time of graduation will be able to:

PO1 **Scientific knowledge:** Acquire the knowledge with facts and figures related to various subjects in such as Physics, Chemistry, Mathematics, Forensic Science etc.

PO2 **Modern tool usage:** Acquire the skills in handling scientific instruments, planning and performing in laboratory experiments.

PO3 **Problem analysis:** Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using fundamental principles, and the scientific theories.

PO4 **Effective communication:** Develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

PO5 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms

PO6 **Individual and Team work:** Demonstrate the capability to work both independently and in cooperation with others

Learning Outcomes: After completing the program the student will be able to:

LO1 Develop an understanding and appreciation for the scope of Forensic Sciences.

LO2 Develop knowledge of the functions and services provided by the Forensic Laboratories and utilization of basic sciences for forensic investigations

LO3 Develop comprehensive knowledge on Crime scene reconstruction and significance of various biological, physical and chemical evidences for forensic investigations.

LO4 Provide knowledge on Procedures and scopes of Fingerprints Examination, serology, anthropology, DNA Fingerprinting, toxicology and cyber forensic etc.

LO5 Introduce students about the Sociological and Psychological aspects of crime and Criminal behavior and presentation of evidences in court of law.

Syllabus - First Semester

INTRODUCTION TO FORENSIC SCIENCE

Course Code: **Credits: 3**

Course Objective: The course focuses on the following objectives-

1. Developing an understanding and appreciation for the scope of Forensic Sciences.
2. Develop an understanding on historical development, Mobile Forensic Units and Expert's testimony.
3. Develop brief knowledge of the functions and services provided by the Forensic Laboratories

Course Contents:
Section I: Brief description of Forensic Science Definition, Description, Principles, Concept, Needs and scope. History of Forensic Science and Forensic Science Labs; Progressive development and transformation of Forensic Science Labs.
Section II: Forensic Science Laboratories Main Authority, Organizational structure of Forensic Science Laboratory – roles and responsibilities, Sections/ Divisions, Services provided, Process of report writing and submission to court. Mobile Forensic Science Laboratory – their distribution in India, functions, need and utility. Calibration of testing laboratories (ISO).
Section III: Evidence Applicability in Court Definition, Various types of evidences, Laws of evidence, Expert's testimony and admissibility of scientific evidence in Court of Law.
Section IV: Mobile Forensic Science Laboratory Mobile Forensic Science Laboratory – their distribution in India, functions, need and utility. Calibration of testing laboratories (ISO).

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

1. Bodziak, W., Footwear Impression Evidence (2nd Edn.) CRC Press, Boca Raton, Florida, 2000.
2. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; an Introduction to Criminalistics, McGraw Hill, New York, 1983.
3. Fisher, B., Techniques of Crime Scene Investigation (6th Edn.) CRC Press, Boca Raton, Florida, 2000.
4. James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
5. James, S., and Eskerc, W., Interpretation of Blood Stain Evidence at Crime Scenes, (2nd Edn) CRC Press, Boca Raton, Florida, 1999.
6. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
7. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Edn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

FUNDAMENTALS OF CRIME SCENE INVESTIGATION

Course Code: **Credits:3**

Course Objective: The course focuses on the following objectives-

1. Developing an understanding and application of Crime scene Investigation.
2. Develop an understanding on concepts of crime scene and its types.
3. Give a brief description on various techniques used for recording of the crime scene.
4. Develop comprehensive knowledge on Crime scene reconstruction and significance of physical evidences.

Course Contents:
Section I: Crime Scene and its Management Defining a crime and crime scene, Importance of crime scene, Problems associated with crime scenes (indoor and outdoor), Location and processing of Crime Scene. Introduction to Crime Scene Management, Handling clues and evidences.
Section II: Types of Crime Scenes Types of crime scenes, Primary, Secondary crime scene, Mobile, Indoor and Outdoor crime scenes; Searching techniques used for locating physical evidences at scene of crime.
Section III: Recording and Documentation of Crime scene Crime Scene documentation, Barrication of Crime Scene, Crime Scene Photography, Videography; Sketching; Notes making.
Section IV: Crime Scene Reconstruction Procedure and requirement for Crime Scene Reconstruction, Modus operandi, Expert team constitution for different crime scenes, Roles of Investigating Officer.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

A: Attendance; CT: Class Test, S/V/Q: Seminar/Viva/Quiz ;HA: Home Assignment, , EE: End Semester Examination;

Text & References:

1. Bodziak, W., Footwear Impression Evidence (2nd Edn.) CRC Press, Boca Raton, Florida, 2000.
2. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; An Introduction to Criminalistics, McGraw Hill, New York, 1983.
3. Fisher, B., Techniques of Crime Scene Investigation (6th Edn.) CRC Press, Boca Raton, Florida, 2000.
4. James, S. H. And Nordby, J. J. (Eds) Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
5. James, S., and Eskerc, W., Interpretation of Blood Stain Evidence at Crime Scenes, (2nd Edn) CRC Press.

BIOLOGY I

Course Code: **Credits:3**

Course Objective:

The given course is designed to:

1. Provide the knowledge about the fundamentals of biology.
2. To provide understanding of cell biology.
3. To develop the comprehensive understanding of study of the biomolecules, biochemistry and aspect of Genetics.

Course Contents:
Section I: The Cell Structural unit of life, History of cell, Organization of Prokaryotic & eukaryotic Cell. Cell cycle, mitosis and meiosis.
Section II: Molecules of Life Proteins - structure, properties and functions. Carbohydrates - structure, properties and functions. Lipids – structure, properties and functions. Types of micronutrients and macronutrients in the body.
Section III: Basic Genetics and Nucleic Acids Mendel's Laws, Exceptions to Mendel's Laws, DNA –structure, Watson and Crick Model, RNA– structure, function (in brief).
Section IV: Chromosome and Mutation Discovery, morphology and structural organization. Types of chromosomes; Supernumerary chromosomes, Mutations: Definition, Types: spontaneous and induced, Mutagens.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

A: Attendance:,CT: Class Test, , S/V/Q: Seminar/Viva/Quiz, HA: Home Assignment EE: End Semester Examination

Text & References:

1. I.E. Celis Cell biology Academic Press 2nd Edition.
2. Robertis & Robertis Cell & Microbiology 8th Edition.
3. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
4. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.

5. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
6. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
7. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
8. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
9. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

CHEMISTRY-I (BASIC)

Course Code: **Credits:3**

Course Objective: - The objectives of the course:

1. To focus on building a conceptual understanding of fundamental chemical principles
2. Including properties of atoms, molecules, states of matter, and chemical reactions.

Course Contents:
Section I: Atomic Structure Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass: molarity, normality, molality, percentage composition, empirical and molecular formula. de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater's rules.
Section II: Periodic Properties Periodic law and the present form of periodic table, Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, trends in periodic table (in s, p, d & f block elements). Comparative study of the elements including, diagonal relationships. **Concept of Acids and Bases** Arrhenius, Bronsted – Lowry and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases.
Section III: Organic Chemistry General introduction, Classification of hydrocarbons: Alkanes, Alkenes, Alkynes, Aromatic hydrocarbons. IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Reactive intermediates carbocations, carbanions, free radicals. Localized and delocalized chemical bond, resonance effect and its applications.
Section IV: Arenes and Aromaticity Nomenclature of benzene derivatives. Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, aromatic, anti - aromatic and non - aromatic compounds.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic And Biological Chemistry.

PHYSICS I

Course Code: **Credits:3**

Course Objective: - The objectives of the course:

1. To focus on building a conceptual understanding of fundamental principles of physics.
2. To understands basics of physics and their applications in Forensic Science.

Course Contents:
Section I: Force and Motion Definition of motion, position and displacement, average velocity, instantaneous velocity, average speed, acceleration, acceleration of freely falling body, projectile motion, Newton's laws, force, mass, friction, properties of friction, drag force and terminal speed, linear and circular motion.
Section II: Kinetic energy and work Energy, kinetic energy, work, work done by gravitational force, work done by spring force, power, work and potential energy, conservation of energy, work energy theorem.
Section III: Atomic Physics Bohr atomic model, quantum numbers, Pauli's exclusion principle, hydrogen spectrum, - series (Lyman, Balmer, Paschen, Bracket and pfund), vector atom model.
Section IV: Waves Types of waves, transverse and longitudinal waves, electromagnetic waves and electromagnetic spectrum, wavelength and frequency, speed of traveling wave, the wave equation, sound waves, speed of sound, intensity and sound level, the Doppler effect, shock waves, X Rays (continuous and characteristic), Spectra- Absorption and emission. Bragg's Law and X-ray diffraction.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester, A: Attendance

Text & References:

1. Amato, Joseph (December 1996). "The introductory calculus-based physics textbook". Physics Today 49 (12): 46–51.
2. Thomas Brody (1993.) "The Philosophy Behind Physics" pp 18–24 (Chapter 2)
3. Glimm, James; Jaffe, Arthur (1987), 'Quantum physics: a functional integral point of view'(2nd ed.), New York, [NY.]: Springer.

Information Technology Skills (IT Skills)

Course Code: **Credits:2**

Course Objective: Students will be able to use the computer for basic purposes of preparing his/her personal/professional, information from the internet (The web), sending mails, using internet banking services etc.

Course Contents
Section -1: Introduction to Computers, characteristics and limitations of computer, uses of computers, Block diagram of Computer. Servers and Super computers, Classification of computers, Types of computers, computer generations.
Section -2: Input devices and Output devices. Memory: Concept of Primary & Secondary memory, RAM, ROM, types of ROM, Cache Memory.
Section -3: Computer Networks: LAN, MAN, WAN, Router, Switch, Hub, Repeater, Bridge, Gateway, Modem. Computer Virus: Definition, types of viruses, Characteristics of viruses, Anti-virus software.
Section -4: Computer Lab work- MS Word: Getting Started Working with Microsoft Office 2010, Understanding Word Basics. Editing and Formatting Text, Documents; Microsoft Excel: Understanding Excel Basics, Formatting and Editing the Worksheet, Microsoft PowerPoint: Understanding PowerPoint Basics;Formatting and Modifying Presentations, Enhancing the Presentation.

Examination Scheme:

Components	**A**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, EE: End Semester, A: Attendance

Suggested Readings:

1. Fundamentals of Computers –P. K. Sinha; BPB Publication
2. Fundamentals of computers –V Rajaraman; Prentice Hall of India
3. Introduction to Information Technology: Leon and Leon; Leon Tech World
4. Information Technology in Business Management: MukeshDhunna& and J. B. Dixit; Laxmi Publications, New Delhi.
5. Computer Applications in Business Management: Versha Mehta, N. Kumar; Anmol Publications

Environmental Studies

Paper Code: Credits:2

Course Objective: The student will be able to understand about the environment by developing an awareness of the natural, social and cultural environment.

Course Content:
Section I Ecosystem: Ecosystem, structure and function of ecosystem Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: Forest ecosystem; Grassland ecosystem; desert ecosystem; aquatic ecosystem.
Section II Natural Resources: Renewable and Non Renewable Resources: Land resources and land use change; Land degradation, soil erosion and desertification.; Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international &inter-state).; Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs. **Biodiversity and Conservation:** Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hotspots; India as a mega-biodiversity nation; Endangered and endemic species of India; Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
Section III: Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution; Nuclear hazards and human health risks; Solid waste management: Control measures of urban and industrial waste.; Environmental legalization and implementation in India. **Environmental Policies & Practices:** Sustainability and sustainable development.; Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture; Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.; Nature reserves and human wildlife conflicts in Indian context.
Section IV: Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare.; Disaster management: floods, earthquake, cyclones and land slides.; Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.; Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. **Field Work:** Visit to an area to document environmental assets: river/ forest/ flora/fauna,etc.; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.; Study of common plants, insects, birds and basic principles of identification.; Study of simple ecosystems-pond, river, Delhi Ridge,etc.

Examination Scheme:

Components	A	CT	EE
Weightage (%)	5	5	40

CT: Class Test, EE: End Semester, A: Attendance

Suggested Books:

1. Bharucha, E. 2003, Textbook for Environmental Studies, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environmental Education and Research, Pune. 361.
2. Carson, Rachel. 1962. Silent Spring (Boston: Houghton Mifflin, 1962), Mariner Books, 2002
3. Economy, Elizabeth. 2010. The River Runs Black: The Environmental Challenge to China's Future.
4. Gadgil, M. &Ramachandra, G. 1993. This fissured land: an ecological history of India. Univ of California Press.
5. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
6. Grumbine, R. Edward, and Pandit, M.K. Threats from India's Himalaya dams. Science 339.6115 (2013): 36-37.
7. Heywood V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
8. McCully, P. 1996. Silenced rivers: the ecology and politics of large dams. Zed Books.
9. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
10. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.

FORENSIC PRACTICAL I

Course Code: **Credits:3**

Course Objective: - The students will understand & perform experiments relating to:

1. Investigation of crime scene.
2. Recording/Sketching of outdoor/ indoor scene of crime
3. Packaging and forwarding of Evidences

Course Contents:	
1.	Investigation and sketching of indoor scene of crime.
2.	Investigation and sketching of outdoor scene of crime.
3.	Crime Scene Photography: indoor, outdoor.
4.	Notes making.
5.	Searching of crime scene.
6.	Parts of camera.
7.	Packaging and forwarding.
8.	Envelop making and Druggist fold method.
9.	Sealing procedure.

Examination Scheme:

IA		**EE**	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva, A- Attendence

Text and references:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition.
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Syllabus - Second Semester

FINGERPRINTING

Course Code: **Credits:3**

Course Objective: The course focuses on following objectives-

1. Developing an understanding and appreciation for the scope of Fingerprints Examination.
2. Develop an understanding on various methods of development of Fingerprints.
3. Develop comprehensive knowledge on fingerprint patterns, fingerprint classification, the various methods of fingerprint development- physical and chemical.

Course Contents:
Section I: History and Development of Fingerprinting Origin & History of fingerprints, Principles of Fingerprint identification, Searching, location and significance of fingerprints in criminal investigation.
Section II: Introduction of Fingerprint and its characteristics Biological significance of skin pattern, Types of fingerprints, Fingerprint characteristics: class and individual, Collection, lifting and preservation of fingerprints, Photography of latent fingerprints and presentation of fingerprint evidence in court.
Section III: Classification of Fingerprints Henry's system of classification, Batley's Single Digit classification, Extension of Henry's system of classification. Primary, secondary, sub-secondary, major, Second sub-secondary, key and final Classifications, AFIS
Section IV: Fingerprint Developmental techniques Methods of lifting and developing latent fingerprints – Physical methods - Powder method (Black, silver, florescent, red, yellow), Iodine fuming etc. Chemical methods - Ninhydrin, Silver nitrate method.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
2. Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
3. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
4. James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.

5. Nanda, B. B., and Tewari, R. K., Forensic Science in India. Select Publishers, New Delhi, 2001.
6. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
7. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

QUESTIONED DOCUMENTS

Course Code: **Credits:3**

Course Objective: The course focuses on the following objectives-

1. Developing an understanding and appreciation for the scope of Handwriting Identification and Examination.
2. Develop an understanding of handwriting and their characteristics, principles of identification.
3. Give a brief description on various methods of their detection and examination.
4. Develop comprehensive knowledge on typewritten documents, common styles and their examination.

Course Contents:
Section I: Introduction to Questioned Documents Definition: Documents, questioned documents and the type of cases encountered; Importance, nature and problems of documents, Location, collection, handling and presentation of documents, adequacy of exemplars and standards.
Section II: General Equipment for Examination Hand lens, Camera, Compound Microscope, Stereo microscope, TLC, Transmitted light source, UV-IR radiation chamber and Oblique Light source, ESDA, VSC.
Section III: Handwriting Characteristics Identification – principle individual handwriting characteristics, external, internal and physical factors affecting handwriting or signature of a person, Authentic Signatures, forged signatures, disguised signatures, traced signatures, and their characteristics
Section IV: Typewritten and Computer generated documents Comparison of typewritten documents, common types of styles, detection of altered typewritten documents. Working of photocopiers and printers, scanners, examination of photocopies/ Xerox, printouts and scanned documents.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester, A: Attendance

Text & References:

1. Albert, S. Osborn, Questioned Documents, Second Ed., Universal Law Publishing, Delhi, 1998.
2. Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.
3. Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group.

4. Huber, A. R. Headrick, A. M. (1999). The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals, CRC Press, Boca Raton London.
5. James, S. H. And Nordby, J. J. (Eds), Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
6. Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.

BIOLOGY 2: CELL AND CELLULAR PROCESSES

Course Code: **Credits:3**

Course Objective:

The given course is designed to:

1. Provide the knowledge about the fundamentals of biology.
2. To provide understanding of cell biology.
3. To develop the comprehensive understanding of study of the biomolecules, biochemistry and aspect of Genetics.

Course Contents
Section I: Techniques in Biology Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Confocal microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.
Section II: Cell Organelles Mitochondria Structure, marker enzymes, composition; mitochondrial biogenesis; Semiautonomous nature; Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA **Chloroplast:** Structure, marker enzymes, composition; semiautonomous nature, chloroplast DNA **ER, Golgi body & Lysosomes:** Structures and roles. Signal peptide hypothesis, N-linked glycosylation, Role of Golgi in O-linked glycosylation. Cell secretion, Lysosome formation. **Peroxisomes and Glyoxisomes:** Structures, composition, functions in animals and plants and biogenesis **Nucleus:** Nuclear Envelope- structure of nuclear pore complex; chromatin; molecular organization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).
Section III: Cell Membrane and CellWall The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall
Section IV: Cell Cycle: Interphase, Mitosis and Meiosis Role of Cell division; Overview of Cell cycle; Molecular controls; Meiosis

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

1. I.E. Celis Cell biology Academic Press 2nd Edition.
2. Robertis & Robertis Cell & Microbiology 8th Edition.
3. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
4. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
5. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
6. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
7. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
8. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
9. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

PHYSICS- II

Course Code: **Credits:3**

Course Objective: It provides students the skill necessary to enter the profession with an eye towards accident, reconstruction, firearm ballistics and related investigative tasks.

Course Contents:
Section I: Newton's Laws of Motion Interpretation and applications of Newton's laws of motion (I, II, III), Linear and circular motion, Newtonian mechanics, Friction, properties of friction, Pseudo forces.
Section II: Elasticity & Fluid Dynamics Elastic properties of matter, elastic constants and their interrelations. Fluid dynamics, equation of continuity, Bernoulli's equation, stream line and turbulent flow, lines of flow in air foil, Poiseuille's equation.
Section III: Study of Sound Velocity of sound, noise and sound intensity measurement, echo, reverberation, Sabine's Formula, absorption coefficient, acoustics of buildings and factors affecting acoustics of buildings. Sound distribution in an auditorium, introduction to ultrasonic, production of ultrasonic waves, applications of ultrasonics.
Section IV: Study of Light Refraction through thin layers, thick lens, thin lens and lens combinations, aberrations, interference in thin films, fringes in wedge shaped films, Newton's rings, total internal reflection, Diffraction and polarization, simple table spectrophotometer.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).

CHEMISTRY-II (INORGANIC)

Course Code: **Credits:3**

Course Objective: - The objectives of the course:

1. To focus on building a conceptual understanding of fundamental chemical principles
2. Including properties of atoms, molecules, states of matter, and chemical reactions.

Course Contents:
Section I: Chemistry of s-block elements Ionic bond, Covalent bond, Coordinate bond. Valence shell electron pair repul$_2$sion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICI $^-$ and H_2O. Valence bond theory and its limitations, directional cha^{4}racteris^{4}tics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7 SO^{2-}, ClO^-). MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.
Section II: Chemistry of p-block elements **Boron family (13th group):** Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazene – chemical properties and structure. **Carbon Family (14th group):** Allotropy of carbon, Catenation, pπ– dπ bonding (an idea), carbides, fluorocarbons– general methods of preparations, properties and uses. **Nitrogen Family (15th group):** Oxides – structures of oxides of N, P. oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. **Oxygen Family (16th group):** Oxyacids of sulphur – structures and acidic strength. **Halogen Family (17th group):** Basic properties of halogen, hydro and oxyacids of chlorine – structure and comparison of acid strength. **Noble Gases (18th group):** Basic properties of noble gases, physical properties and structure of important compounds of Xenon.
Section III: Chemistry of d-block elements Definition of transition elements, position in the periodic table, General characteristics & properties of d-block elements, Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and spectral properties. **Coordination Compounds** Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral and tetrahedral complexes, factors affecting the crystal-field parameters.
Section IV: Chemistry of f-block elements **Lanthanides:** General features and Electronic structure, oxidation states and ionic radii and lanthanide contraction. **Actinides:** General features and chemistry of actinides, actinide contraction. Comparison of properties of Lanthanides and Actinides and with transition elements. Elementary idea about the transuranic elements.

Examination Scheme

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

Texts & References:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic And Biological Chemistry.

BASICS OF DIGITAL AND CYBER FORENSICS

Course Code: **Credits: 2**

Course Objective: In recent years, digital forensics has emerged as an essential source of tools and approaches for facilitating digital preservation and curation, specifically for protecting and investigating evidence from the past. Institutional repositories and professionals with responsibilities for personal archives can benefit from forensics in addressing digital authenticity, accountability and accessibility.

Course Contents:
Section I: Basics of Digital Forensic Basics of digital forensic, computer forensic, introduction to cyber forensic Computer organization, Components of computers – Input & Output devices, CPU Memory Hierarchy and types of Memory (RAM and ROM and their types) external storage devices Application Software and System Software, Introduction to IT act, ethical hacking
Section II: Data Representations Integers, real, binary, octal, hexadecimal & their conversions Logic gates – Negation, OR, AND, XOR etc. and their combinations
Section III: Introduction to Operating System Basics of Operating System, memory structure, concurrency, scheduling, synchronization & memory management, process description and control Introduction to Operating System (Batch Operating System, Distributed operating system, etc.) Introduction to Windows and Linux operating System
Section IV: Introduction to Digital evidences Collection, preservation of evidences, forensic imaging, data retrieval, mobile forensic, techniques in digital forensic.

Examination Scheme:

Components	**A**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; A: Attendance

Text & References:

1. Compute Crime and Computer Forensic by Dr. R.K. Tiwari
2. Introduction to Forensic Science in Crime Investigation By Dr.(Mrs.) Rukmani Krishnamurthy
3. Cyber Law in India by Farooq Ahmad- Pioneer Books
4. Information Technology Law and Practice by Vakul Sharma- Universal Law Publishing Co. Pvt. Ltd.
5. The Indian Cyber Law by Suresh T. Vishwanathan- Bharat Law House New Delhi
6. Guide to Cyber and E- Commerce Laws by P.M. Bukshi and R.K. Suri- Bharat Law House, New Delhi

7. Guide to Cyber Laws by Rodney D. Ryder- Wadhwa and Company, Nagpur
8. The Information technology Act, 2000- Bare Act- Professional Book Publishers, New Delhi.

ENGLISH COMMUNICATION

Course Code: **Credit:2**

Course Objective: Students will be able to develop their intellectual, personal and professional abilities.

Course Content:
Section I: Language of Communication: Theory of Communication, Types and modes of Communication; Verbal and Non-verbal (Spoken and Written)**;** Personal, Social and Business **;** Barriers and Strategies **;** Intra Personal, Inter Personal and Group Communication
Section II: Speaking Skills: Monologue; Dialogue; Group Discussion; Effective Communication/ Miss-Communication; Interview; Public Speech
Section III: Reading and Understanding: Close Reading; Comprehension; Summary Paraphrasing; Analysis and Interpretation; Translation(from Indian language to English and vice-versa); Literary/Knowledge Texts.
Section IV: Writing Skills: Documenting; Report Writing; Making notes; Letter Writing

Examination Scheme:

Components	**A**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Texts and References:

1. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brat iBiswas
2. Fluency in English Part II Oxford University Press, 2006
3. Business English, Pearson, 2008.

Forensic Practical II

Course Code: **Credit Units: 03**

Course Objective: - The students will understand & perform experiments relating to:

1. Packaging and forwarding of physical evidences.

2. Identifying fingerprints, their patterns, footprints and preparing fingerprint chart.

Fingerprints

Course Contents:
Fingerprints: 1. Prepare fingerprint card and identify the patterns. 2. Tape lifting of fingerprint. 3. Casting of foot prints/ fingerprint. 4. Ninhydrin method for fingerprint development. 5. Iodine fuming method for fingerprint development. 6. Silver nitrate method for fingerprint development. **Questioned Documents:** 1. Handwriting analysis based on class and individual characteristics. 2. Examination of documents under different light sources- transmitted, oblique, UV. 3. Identification of genuine and fake currencies. 4. Identification features of security documents.

Examination Scheme:

IA		**EE**	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition2009.
2. A. I. Vogel, Textbook of Practical organic Chemistry including Qualitative organic analysis.

3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

BASIC MATHS

Course Code: **Credits:2**

Course Objectives: The objective of this paper is to develop student's familiarity with the basic concept and tools in statistics. These techniques assist specially in resolving complex problems serve as a valuable guide to the decision makers.

COURSE CONTENTS
Section I: Basic Ideas in Statistics: Definition, Function & Scope of Statistics. Collection and Presentation of Data; Classification, Frequency Distribution, Diagrammatic and Graphic Presentation of Data; Measures of Central Tendency: Arithmetic Mean, Weighted A.M., Median, Mode, Geometric and Harmonic Means and their Merits and Demerits;
Section II: Correlation Analysis: Methods of Studying Correlation for Grouped and Ungrouped Frequency Distribution;
Section III: Regression Analysis: Equation of Regression Lines for Grouped and Ungrouped Frequency Distribution, Standard Error Estimate;
Section IV: Index Numbers: Types of Index Numbers and Methods of their Construction, Tests for Perfection Base Shifting; Introduction to Time Series Analysis;

Examination Scheme:

Components	**A**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, EE: End Semester Examination; A: Attendance

Text & References:

1. Comprehensive Statistics: D. R. Aggarwal; Vrinda Publications, New Delhi
2. Business Statistics: Levine, D.M; Pearson Education
3. Business Statistics: T. R. Jain; Luxmi Publications
4. Business Statistics: S. C. Gupta
5. Introduction to Statistics: Hooda, R.P.; Macmillan India Ltd.

Syllabus - Third Semester

Forensic ballistics and Explosives

Course Code: **Credits:3**

Course Objective: The course focuses on following objectives-

1. To understand the role of ballistics in Forensic Science
2. Classification of firearms, determination of the range of firing, methods of laboratory examination of fired cartridges and fire arms.
3. The students will also learn to reconstruct the sequence of events in cases involving firearms.
4. Provide the scientific knowledge and understanding needed in Fire and Explosion

Course Contents:
Section I: Firearms & Ammunition Definition, Indian Arms Act, Forensic Importance; Nature of firearms, parts of a firearm, classification of firearm, Types, Bullet comparisons, cartridge case examination, class and individual characteristics of identification
Section II: Range of Fire Muzzle pattern, scorching, blackening, tattooing, wad distribution, pellet patterns, GSR analysis, and primer residues, Entrance wound, exit wound and internal wound, evaluation of firearm injuries.
Section III: Analysis and Reconstruction Reconstruction of the sequence of events in a shooting case. Presentation of evidence in the court. accidental firing
Section IV: Explosives Introduction to explosives, definition, High explosives and low explosives, difference and classification, Identifying the explosives, Black and smokeless powder identification, dynamite identification, identifying other explosives, reconstructing the destructive devices.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
2. Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
3. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
4. James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
5. Nanda, B. B., and Tewari, R. K., Forensic Science

Forensic Biology and Serology

Course Code: **Credits:3**

Course Objective: The course focuses on following objectives-

1.Complete and thorough knowledge regarding the various aspects of forensic serology

2. Blood and its detailed study for identification

3. Importance of body fluids and their forensic significance

Course Contents:
Section I: Blood and its Properties The nature of blood, collection, preservation and packing of blood evidence, procedures and precautions. ABO system, Rh system and MN system; Techniques for the determination of blood groups.
Section II: Chemical and microscopic Tests used in Blood Analysis Identification of bloodstains by microscopic methods, Catalytic tests, crystal tests.
Section III: Species of Origin& Grouping of Bloodstains Application of Spectrophotometric method, chromatographic and immunological methods (Ring, Precipitin, Ouchterlony, reverse agglutination, normal/mixed agglutination).
Section IV: Introduction and analysis of Body Fluids Introduction to various body fluids, their nature and characteristics and Forensic analysis of Semen, Saliva, Urine, Sweat etc.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
2. James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
3. Saferstein, R. (1998). Criminalistics, An Introduction to Forensic Science, 6th Ed. 6th Ed. Prentice –Hall
4. Kirk, P.L., Introduction in crime investigation (2nd), John Willey and, New York, 1974.

BIOLOGY III: FOOD, NUTRITION & HEALTH

Course Code: **Credits:3**

Course Objective:

The given course is designed to:

1. Provide the knowledge about the Nutrition and healh.
2. To provide understanding of Nutritional biochemistry.

Course Contents

Section I: Introduction

Basic concept of food and nutrition

Section II: Functions of Food

Components of food-nutrients (Macro and micronutrients): their biochemical role and dietary sources. Food groups and the concept of a balanced diet. Causes of food spoilage; Food adulteration Nutrition through the life cycle- Physiological considerations, nutrient needs and dietary pattern for various groups- adults, pregnant and nursing mothers, infants, preschool and school children, adolescents and elderly.

Section III: Nutritional Biochemistry

Carbohydrates, Lipids, Proteins - Definition, Classification, Structure and properties Significance of acid value, iodine value and saponification value of lipids; Essential and Non-essential amino acids; Enzymes Definition, Classification, Properties; Coenzymes Vitamins- Fat-soluble and Water-soluble vitamins; their Structure and properties Minerals- Iron, calcium, phosphorus, iodine, selenium and zinc: their properties

Section IV: Health

Introduction to health- Definition and concept of health.

Major nutritional deficiency diseases- Protein Energy Malnutrition, Vitamin A deficiency, Iron deficiency anemia, Iodine deficiency disorders, their causes, symptoms, treatment, prevention and government programs, if any.

Life style related diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications.

Social health problems- smoking, alcoholism, drug dependence and Acquired Immuno Deficiency Syndrome (AIDS).

Common aliments- cold, cough, fevers, diarrhea, constipation- their causes and dietary treatment.

Food hygiene; Potable water- sources and methods of purification Food and Water borne infections

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Chemistry III

Course Code: **Credits:3**

Course Objective:

The given course is designed to:

1) To focus on building a conceptual understanding of fundamental chemical principles.
2) Including properties of atoms, molecules, states of matter, and chemical reactions.

Course Contents

Section I: Chemical equilibrium

Equilibrium constant and free energy, concept of chemical potential, thermodynamic derivation of law of chemical equilibrium, temperature dependence of equilibrium constant, Vant'sHoff reaction isochoric, VantHoff reaction isotherm, Le- chatelier's principle and its application, Clapeyron equation and Clausius-clapeyron equation and its application.

Section II: Distribution law

Nernst distribution law- thermodynamics derivation, modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law:

(i) distribution of degree of hydrolysis and hydrolysis constant of aniline hydrochloride.

(ii) determination of equilibrium constant of potassium tri-iodide complex and process of extraction

Section III: States of matter

Solid state: crystal, types of crystals, crystal defects, Bragg's law. Metallic bond and its characteristics. Liquid crystals: difference between solid, liquids and liquid crystals, types of liquid crystals. Applications of liquid crystals.

Liquid state: properties of liquids- surface tension, viscosity and their determination.

Gaseous state: derivation of real gases from ideal behavior. Derivation of vander wall's equation of state, explanation of behavior and real gas using vander wall's equation.

Critical phenomenon: critical pressure, critical temperature, critical volume and the determination of PV isotherms of real gases, continuity of states, isotherms of vander wall's equation.

Section IV: Ultraviolet (UV) absorption spectroscopy

Absorption laws (Beer's Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. UV spectra of conjugated enes and enons. Wood fieser rules. Applications of UV spectroscopy in structure elucidation of simple organic compounds.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Physics III

Course Code: **Credits:3**

Course Objective:

The given course is designed to:

1) To focus on building a conceptual understanding on ray optics, communication system.
2) To understand the theory and application of relativity

Course Contents
Section I: Ray optics and optical instrument Reflection of light by spherical mirror, Refraction and diffraction through a prism, Rainbow formation. Optical instrument: Microscopic and astronomical telescope and Newtonian telescope. Wave optics: Young's double slit experiment, Huygen's principles, reflection and refraction by Huygen's principles, polarization.
Section II: Communication system Elements of communication system, Block diagram, Band width of signals, Satellite communications, Modulation, Need for modulation, Amplitude modulation, Basic idea of internet and intranet
Section III: Theory of relativity Inertial and non- inertial frame of reference, Galilean transformation (velocity and acceleration), Michelson and Morley experiment and its outcome, Postulates of special theory of relativity, Lorentz transformation, Length contraction, Time dilation.
Section IV: Application of relativity Realistic transformation of velocity, frequency and wave number, Relativistic kinematics, Transformation of energy and momentum, concept of four vectors.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

References:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004).

Forensic Photography

Course Code: **Credits:2**

Course Objective:

The given course is designed to:

1) Provide foundation knowledge of photography

2) Develop an understanding and application of Photography in Forensic Science and CSI

Course Contents
Section I: Introduction Introduction to forensic photography; required equipment for photography, Importance of Forensic photography in a crime scene investigation photography in indoor and outdoor crime scene.
Section II: Types of Photography Surveillance photography – Cameras, Type and accessions for surveillance photography. Aerial photography, Underwater photography, Videography.
Section III: Photo prints Various methods for developing photographs, chemical processing, negative development, introduction and types of films, Photographic aspects of physical injuries, Use of photography in reconstruction the scene of crime (Indoor and outdoor) and its presentation in the court of law
Section IV: Guidance Documentation and High-tech Photography for Crime Scene Image magnification, U. V. and I. R. illumination in Photography, Photography of Art factual evidences (Bloodstain, fingerprint, imprints, and micro evidence). High-speed photography, legal aspects of visual evidence.

Examination Scheme:

Components	**At**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; Att: Attendance

Text & References:

1. Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Press, London, 1994.
2. Henry Horeustein; Colour Photography -A working Manual, Little Brown Co. Boston (1995)
3. B.H.E. Jacobson, Ray GG Attridge; The Manual of Photography, Focal Press, London (1988)
4. Jahne B; Digital Image Processing, Heidelberg Springer (1996)
5. H.L. Blitzer and J. Jacobia; Forensic Digital Imaging and Photography, Academic Press (2002)
6. David R. Redsicker; The Practical Methodology of Forensic Photography- 2nd Ed. CRC Press LLC (2001)
7. R.E. Jacobson, S.F. Ray, G.G. Attridge, N.R. Oxford; The Manual of Photography- Photographic and Digital Imaging, 9 Focal Press (2000)

Cyber Forensics

Course Code: **Credits:2**

Course Objective:

The given course is designed to:

1. Develop an understanding on cyber crime and IT Act

Course Contents
Section I: Introduction of cyber forensics Digital signal processing, Overview of several operating systems, html and other internet protocols, internet history, e-mail and header interpretation, virus and trojan infections, different types of attack, internet research and investigative tools.
Section II: Data Storage fundamentals Data storage devices, storage fundamentals (Sector, cluster, FAT etc), file system, concept, Data storage and recovery, Basics of operating system software.
Section III: IT Acts Provision in indian laws in dealing with cyber crimes and its critical analysis, IT act 2000, Penalties under IT act, Offences under IT act, Establishment of authorities under IT act and their functions, power etc.
Section IV: Investigation of Digital evidences Seizure of computer, Preparation to be made before seizure, Actions at the scene, Treatment of exhibits, Investigation of imaging methods, Acquisition, Collection and seizure or magnetic media

Examination Scheme:

Components	**At**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; Att: Attendance

Forensic Practical III

Course Code: **Credit Units: 03**

Course Objective: - The students will understand & perform experiments relating to:

1. Analysis of blood, biological fluids and alcohol.
2. Thin layer chromatography for poisons.

Course Contents:
1. Analyse different blood groups from the blood found at crime scene. 2. Perform catalytic test for blood 3. Perform crystal tests for blood. 4. Analyse biological fluid (saliva). 5. Analyse biological fluid (urine). 6. Analyse alcohol, acetone, chloroform 7. Separate metallic poison by thin layer chromatography (Arsenic, mercury, bismuth, Antimony).

Examination Scheme:

IA		**EE**	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition2009.
2. A. I. Vogel, Textbook of Practical organic Chemistry including Qualitative organic analysis.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Syllabus - Fourth Semester

Forensic Physics & Biometric System

Course Code: **Credits:3**

Course Objective: The Objective of this course is to introduce the students to the characteristics and properties of different evidences like glass, soil, paint, hair and fibre, which are normally encountered at the scene of crime.

Course Contents:
Section I: The Metric System Introduction to the metric system, Introduction to prevalent physical evidences (soil, glass, fibre, hair and liquids).
Section II: Glass Examination Glass: Composition (organic and inorganic elements), Analytical and chemical examination, Comparing glass fragments, glass fractures.
Section III: Forensic Paint Examination Introduction to paint chemistry, types of paints and their composition, forensic examination of paints (household and automobile).
Section IV: Soil examination Composition of soil (organic and inorganic), Properties (Colour, density, size distribution of soil particles), Collection and preservations of soil, Mineral and chemical analysis of soil, Density gradient techniques. Definition, composition, types, physical and chemical analysis of concrete and cement.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

1. Heard, B. J., Handbook of Firearm and Ballistics, Wiley & Sons, Chichester, England, 1997.
2. James, S. H., and Nordby, J. J., Forensic Science; an Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
3. Saferstein, Richard, Criminalistics, an Introduction of Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
4. Sharma, B.R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd., New Delhi, 2001.

FORENSIC ANTHROPOLOGY

Course Code: **Credits: 03**

Course Objective:
The given course is designed to:
1. Provide the knowledge about the basics about physical anthropology
2. Develop comprehensive understanding of different techniques of determining the identity of unknown remains.
3. Provide the understanding of process of forensic facial reconstruction and its utilization in personal identification

Course Contents:
Section I: Introduction to Forensic Anthropology: Definition, scope and application of Forensic Anthropology; and related sciences., importance and need and issues related to personal identification
Section II: Identification from bones: Attribution of Sex, Estimation of Age (humerus, radius, ulna, fibula, tibia, femur, pelvic bone, foot and hand).
Section III: Height and race determination Race and height determination from long bones and their medico legal implication. Establishment of Partial and Complete identity of skeletal material and dead bodies.
Section IV: Identification from Human skull Morphology of human skull, determining the age, race and sex of the skull and its medicolegal implications.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Krogman, W. M. and M. Y.Iscan: Human Skeleton in Forensic Medicine.
2. Modi: A Text Book of Medical Jurisprudence & Toxicology.
3. Nath, S.: Forensic Anthropology
4. Stewart, T. D.: Essentials of Forensic Anthropology.

CHEMISTRY-IV (ORGANIC)

Course Code: **Credits : 03**

Course Objective: - The objectives of the course:

1) To focus on building a conceptual understanding of fundamental chemical principles.
2) Including properties of atoms, molecules, states of matter, and chemical reactions.

Course Contents:

Section I: Stereochemistry of Organic Compounds

Concept of isomerism. Classification of isomerism. Optical isomerism elements of symmetry, molecular chirality, enantiomers, optical activity, chiral and achiral molecules with two stereogenic centres, diastereomers. Newmann and Fischer projection. Relative and absolute configuration, sequence rules, R & S systems of nomenclature. Geometric isomerism determination of configuration of geometric isomers. E & Z system of nomenclature.

Section II: Alkyl and Aryl Halides:

Nomenclature and classes of alkyl halides, Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions of aryl halides. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

Alcohols: Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature.

Dihydric alcohols: Nomenclature, methods of formation and its chemical reactions.

Phenols: Nomenclature, structure and bonding. Preparation of phenols, Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Mechanisms of Fries rearrangement, Claisen rearrangement, and Schotten and Baumann reactions.

Section III: Organic Chemistry

Aldehydes and Ketones: Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones. Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin and aldol, condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction.

Carboxylic Acids and Acid Derivatives: Nomenclature of Carboxylic acids, structure and bonding, acidity of carboxylic acids, effects of substituents on acid strength. Hell-Volhard-Zelinsky reaction. Mechanism of decarboxylation. Relative stability of acyl derivatives. Interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic).

Section IV: Organic Chemistry

Amines: Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1) J. R. Partington 1969 A History of Chemistry, Volume 2, Macmillan.

PHYSICS-IV

Course Code: **CreditS : 3**

Course Objective: It provide students the skill necessary to enter the profession with an eye towards accident, reconstruction, firearm ballistic and related investigative tasks.

Course Contents:
Section I: Laser & Fiber Optics Production of LASER, Types of LASER, Properties and applications of LASER, Optical fibres, Propagation of light through optical fibre, Angle of acceptance and numerical aperture, losses, Solar cells.
Section II: -Radio Activity Review of nuclear composition, nuclear properties and half-life, Radioactive decay schemes Applications of Radio Isotopes, Radiometric dating.
Section III: Electronics Circuits & Digital Electronics Basics of LR, CR, LCR circuits, Rectifier circuits, Timer circuits, Transistor and its characteristics, Introduction to OPAM, remote sensing and controlling, Photo-sensors, Logic gates and their applications, Flip- flops and counters.
Section IV: Conservation law of linear momentum, angular momentum and mechanical energy of a particle and a system of particles. Center of mass and equation of motion: Degree of freedom, scalar and vector field, Gauss law, Electric flux, Energy per unit volume.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

Text & References:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Modern Physics – R. Murugesan S. Chand & Co. (2004).
6. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
7. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

BIOLOGY-IV (Molecular Biology)

Course Code: **Credit : 3**

Course Contents:
Module I: Genetic material DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material. DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative, semi discontinuous RNA priming, Ø (theta) mode of replication, replication of linear, ds-DNA, replicating the 5´end of linear chromosome including replication enzymes
Module II: Transcription (Prokaryotes and Eukaryotes) Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; initiation, elongation and termination of RNA chains. Translation (Prokaryotes and eukaryotes): features of genetic code and deciphering, universality of genetic code and exceptions in some systems. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides
Module III: Regulation of gene expression Prokaryotes: Lac operon and Tryptophan operon ; and in Eukaryotes
Module IV: Apoptosis (Cell Death) & Cell Renewal Mechanism of apoptosis, Intrinsic and extrinsic pathways. Role of apoptosis in human diseases Stem Cells and Maintenance of adult tissues. Cancer; Relationship of the cell cycle to cancer, Genes and Cancer, Telomere shortening and Human Cancer. Chemicals and Radiations as carcinogen

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

References:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.
7. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Cyber Forensics

Course Code: **Credits:2**

Course Objective:

The given course is designed to:

1. Develop an understanding on cyber crime and IT Act

Course Contents
Section I: Windows system Artifacts Windows system Artifacts: File system, Registry, Event logs, Shortcut Files, Executables, Alternate data streams (ADS), Hidden files, Slack space.
Section II: Linux System Artifacts Linux file system : Ownership and Permissions, Hidden files, User accounts and logs
Section III: Mac OS X Systems and artifacts Mac OS X Systems and artifacts: System start up and services, Network configuration, Hidden directories, System logs and user artifacts.
Section IV: Web Browsers Web Browsers : Cookies, Favourites or bookmarks, cache, session data and plugins. Email: Types of Email and protocols, Analysing the header details and tracking the email, Spoofed mails, Virtual machine and cloud technology forensics.

Examination Scheme:

Components	**At**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; Att: Attendance

Forensic Practical IV

Course Code: **Credit Units: 03**

Course Objective: - The students will understand & perform experiments relating to:

1. Determine age, sex and stature from skull
2. Determine age, sex and stature from long bones of human body

Course Contents:
1. Identification of human skeleton system. 2. Identification of various bones (Pelvic and skull bones). 3. Estimation of height using long bones. 4. Determination of sex from skull, pelvis and mandibular bone. Determination of age using skull

Examination Scheme:

IA		**EE**	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
2. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
3. A. I. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis
4. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
5. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals Isolation and identification of Drugs by E.G.C. Clark

RESEARCH METHODOLOGY & STATISTICS

Course Code: **Credit : 2**

Course Objective: This course objective is to introduce the student with the:

1. The research process: conceiving, designing, conducting and analyzing.
2. Methods of statistical description and analysis.
3. Ethical issues about research.
4. Graphical presentation of data.

Course Contents:
Section I: Introduction Definition, concept and research in science and forensic science.
Section II: Methods of Research Introduction to Research Methodology; Experimental research and non – experimental research design. Observation, questionnaires, interview, schedules, case study methods, types of data, graphical representation of data, parts of statistical table.
Section III: Introduction to Statistics Introduction to statistics; one tailed test, two tailed test, parametric (f-test, z-test, t- test, chi square test) and non-parametric statistics (sign test, rank test).
Section IV: Descriptive Statistics Measures of central tendency: Mean, Mode, Median. Measures of dispersion: Range, Variance, Skewness Kurtosis, Quartile. Simple correlation methods (Karl Pearson method) and regression on two lines.

Examination Scheme:

Components	A	CT	EE
Weightage (%)	5	5	40

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Broota, K.D., Experimental designs in psychological research, Wiley eastern, New York, 1992.
2. Guilford, Statistics in Psychology and Education, McGraw hill, New York, 1986.
3. Katz and Kahn, Research in Behavioural Sciences, Methuen, USA, 1979.
4. Kerlinger, F., Foundations of Behavioural Research, Surjeet Publications, Delhi, 1983.
5. Rajamanickam, M., Statistical Methods in Psychological and Educational Research, Concept Publishing Co. New Delhi, India, 1983.
6. Smith, Jonathan, A. (Ed.), Qualitative Psychology: A Practical Guide to Research Methods, Sage Publications, 2003.
7. Woodworth and Schlosberg, Experimental Psychology, Methuen and co. ltd, London, 1971.

WILDLIFE FORENSICS

Course Code: **Credits: 2**

Course Objective: During the course the students will

1. Understand and appreciate the scope of wildlife forensics
2. Understand and appreciate the diversity and utility of variety of animal evidences
3. Understand the benefits of risk management & the organization structure & the role & responsibility required to drive risk management culture
4. Understand the structure of ISO 31000:2009 standard & linkage of the 11 Risk Management Principles, Risk Framework and the Process for Risk Management
5. Understand the framework of Risk Management & Risk policy implementation

Course Contents:
Section I:Introduction to wildlife forensics Introduction to Wildlife Forensics, basic elements of wildlife forensics, application of forensics in wildlife crimes. Introduction to basic analytical techniques in wildlife forensics.
Section II: Evidence examination: Identification of some endangered species of plants and animals, Wildlife life protection Act. Examination of pug marks, horn, skin, fur and hair, nail and teeth, wood etc.
Section III: Systematic Forensic examination and their reporting pattern: Important case studies, ethical issues in wildlife forensics.
Section IV : Introduction to Risk Management and its benefits Introduction Risk Management, Risk Management in organizations and risk ownership, Risk Management standards – Benefits of Risk Management.
Section: ISO 31000 - Elements of Risk Management ISO 31000 overview, PDCA cycle - Elements and Purpose, Principles of Risk Management, Relationship between Principles, Framework and Process, Understanding the components of the Risk framework, Designing the Framework with Mandate and Commitment.

Examination Scheme:

Components	**A**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, EE: End Semester Examination; Att: Attendance

Text References:

1. Simple Tools and Techniques for Enterprise Risk Management Author: Robert J. Chapman. Publisher: John Wiley & Sons (2011) India Risk Report - 2013 - FICCI + Pinkerton

2. Risk Management: A Driver of Enterprise Value in the Emerging Environment -2011- KPMG ISO 31000 - Risk management— Principles and guidelines
3. A corporate governance, risk management and compliance (GRC) handbook -Authors: Richard M Steinberg Publishers: John Wiley & Sons
4. Richard Saferstein; Forensic Science Hand Book; Ed.; Prentice – Hall, Englewood Cliff, New jersey; (1982) Biology Methods manual.

INSTRUMENTATION

Course Code: _____ **Credits : 2**

Course Objective: The objectives of the course is to provide student with practical understanding of the various instrumentation and control systems, instrumentation equipment and troubleshooting skills used in the forensic science laboratory.

Course Contents:
Section I: Spectrophotometry Electromagnetic spectrum, Sources of Radiation, their utility and limitations, difference between Atomic spectrum and Molecular spectrum.
Section II: UV-Visible spectrophotometry & AAS Types of sources and stability, wavelength selection, filters-cells and sampling devices, detectors, resolution, qualitative and quantitative methods for detection. Atomic absorption spectrometry: Principle, Instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis.
Section III: Chromatographic Techniques I Definition and Concept of Chromatography, Classification of Chromatography. Basic principle, theory, Instrumentation and Forensic Applications of Paper chromatography, Thin layer chromatography and HPTLC.
Section IV: Chromatography Techniques II Basic principle, theory, Instrumentation and Forensic Applications of Gas chromatography and HPLC.

Examination Scheme:

Components	**A**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; A: Attendance

Text & References:

1. Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.
5. Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of organic compounds, Wiley, New York, 1974.
6. Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
7. Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
8. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970

Syllabus - Fifth Semester

FORENSIC MEDICINE & PSYCHOLOGY

Course Code: **Credit Units: 03**

Course Objectives: The student will understand

1. About the scope of different types of injuries, causes and manner of death and their medico legal significance
2. About the utility of the injury assessment in medico legal cases

Course Contents
Section I: Autopsy and introduction to wounds Ante and Post – mortem examinations; external examination; internal examination; collection, preservation and packaging of viscera,Assessing and determining the time and cause of Death, Study of burned bones and bone fragments. Introduction to wounds; definition, Mechanism of wound production & healing, Determining the age of the injury, and its medico - legal aspects.
Section II: Injuries due to Blunt and sharp forces Abrasions, Bruises, Lacerations; causes, dimensions, ante – mortem & post – mortem injuries and its medico - legal aspects, Incised, Stab, Punctured wounds - causes, dimensions, ante – mortem& post – mortem injuries ante – mortem& post – mortem injuries.
Section III: Introduction to Psychology Concepts of psychology - Definition of psychology, goals of psychology Different perspectives in Psychology - Modern perspectives, Humanistic, behaviouristic, cognitive, psychodynamic.
Section IV: Psychological disorders Psychological disorders (Alcohol/Substance Abuse, Anxiety Disorders, adult Attention Deficit, Bipolar Disorder, and Depression). Altered states – Hypnosis, Meaning, Hypnotic Phenomena, Hypnotic stages Attention and awareness - Attention: Definition, characteristics, selective attention and divided attention

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

References:

1. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Third reprint, 2009, LexisNexis, Butterworth, New Delhi
2. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.
3. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
4. Keith Simpson's , Forensic Medicine
5. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

FORENSIC CHEMISTRY & TOXILOGY

Course Code: **Credit Units:**

Course Objectives: The students will understand about the chemical tests that used in Forensic Chemistry.
2: It will also provide information about the general chemistry and analysis of legal and illegal alcoholic substances, evidences related to petroleum products and drugs of abuse.
3: The students will learn about the medico legal aspects of different types of toxic

Course Contents
Section I: Forensic Chemistry Introduction, Colour & Spot test, microcrystal tests, inorganic and organic analysis. Analysis of Beverages: alcoholic and nonalcoholic beverages, country made liquor, illicit liquors, detection and estimation of ethanol. Breathe alcohol analyzer. Analysis of trace evidence – cosmetics dyes, pigments, clues of trap cases. Drug of Abuse: classification of drugs, drug of abuse in sports. Narcotic drugs and psychotropic substances such as cocaine, cannabis, barbiturates, benzodiazepines, amphetamine, opium, designers drugs. NDPS act.
Section II: Analysis of Petroleum Products: Analysis of petrol, kerosene, diesel, lubricants by BIS methods and ASTM methods. Detection of adulterants of Gasoline, Diesel and Engine oils. - including parameters like-Flash point, distillation range, density, kinematic -viscosity, smoke point, aniline point. Commodity Act & Petroleum Act. Arson Investigation: chemistry of fire, fire pattern, Extraction of fire accelerants from fire debris
Section III: Forensic Toxicology: Introduction and scope of forensic toxicology, classification of poisons, legal aspects of poisoning, types of poisoning. sign and symptoms of common poisons.
Section IV: General studies and Analysis of vegetable poisons: Abrus, Dhatura, Marking nuts, Nux-vomica, Oleander and Aconite. Snake venoms and insect poisons, Irrespirable gases, food poisoning **Insecticides and Metallic Poisons:** types of agriculture posions, Organo-phosphorous compound, organocholorinated compound, carbamats, pyrethroids, aluminium phosphite and zinc phosphite. arsenic, mercury, phosphorous: poisoning charecteristics and analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

References:

6. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Third reprint, 2009, LexisNexis, Butterworth, New Delhi
7. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.
8. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
9. Keith Simpson's , Forensic Medicine
10. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

PHYSICS V

Course Code: **Credit Units:**

Course Objectives: The students will able to learn about the geometrical optics, statistical mechanics and Its postulates.

Course Contents
Section I: Geometrical optics: Matrix method in paravial optics, effect of translation and refraction. Derivations of thin and thick lens formula, unit plane, Nudal plane, system of thin lenses. Interference: Interference by division of wave font, fressnel by prism and its application to determine of wavelength of any light. Lloyd mirror.
Section II: Statistical mechanics: some probability consideration, combination posses maximum and minimum probability. Distribution of particles in two boxes, phase space, micro state and macro states, thermodynamical probability.
Section III: Postulates of statistical mechanics: Division of phase space into cells, condition of equilibrium between two system in thermal contact, entropy, Boltzman distribution law, evaluation of Einstein coefficient, Plank's radiation law.
Section IV: Fermicdirac statistics and Bose Einstein statistics (B-E condensation), zero-point energy, electron gas in metals

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

References:

Allied Physics – Prof. Dhanalakshmi and others.

4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Modern Physics – R. Murugesan S. Chand & Co. (2004).
6. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
7. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

CHEMISTRY-V (TOXICOLOGY)

Course Code: **Credit Units: 03**

Course Objective: - The objectives of the course are:

1. The students understand the various types of drugs and toxic substances encountered in an investigation.
2. The varied toxicological signs and symptoms of different toxins on the body when administered.
3. To ensure that the students understand the nature of the toxicological investigations undertaken in forensic laboratories.

Course Contents:
Section I: Toxicology Introduction, History of toxicology and poisons, Definition, dosage, administration of poisons, Classification of poisons on analytical basis and medical basis.
Section II: Drugs of Abuse Introduction, definition, drugs, abuse, classification of drugs, Sedatives, Narcotics, Drug Addiction and their signs and symptoms, Drugs related Crime. Analysis hierarchy of seized drugs, examination, Clandestine laboratories, Stimulants and Hallucinogens, their symptoms, mode of action, dosage, examination.
Section III: Toxicology of Alcohol Ethyl Alcohol, Methyl alcohol: Nature, administration, symptoms, post-mortem findings, isolation, detection and estimation, medico-legal findings. The fate of ethyl alcohol in the body, alcohol in the circulatory system, breath test instruments, field sobriety testing, analysis of blood for alcohol.
Section IV: Corrosives and Insecticides Introduction, classifications of acids and bases. Nature, administration, symptoms, post-mortem findings, isolation, detection and estimation, medico-legal findings. Organophosphorus compounds, Organochloro Compounds and Carbamates- Nature, administration, symptoms, post-mortem findings, isolation, detection, estimation and medico-legal findings.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

Text & References:

1. Benjamin, D. M., Forensic Pharmacology. In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice-Hall, Englewood Cliffs, New Jersey, 1993.

FORENSIC PRACTICAL V

Course Code: **Credit Units: 01**

Course Objective: - The students will understand & perform experiments relating to:

1. DNA properties, extraction and quantification
2. DNA Isolation techniques

Course Contents:
1. DNA extraction (plants/ blood)
2. Centrifugation technique
3. Agrose gel electrophoresis.
4. Immunodiffusion.
5. Spectrophotometry.

Examination Scheme:

IA				**EE**	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
3. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
4. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
5. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals
6. G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989

BIOLOGY-V (BIOCHEMISTRY AND IMMUNOLOGY)

Course Code: **Credit : 3**

Course Contents:
Section I: Carbohydrate & Lipid Metabolism Carbohydrates: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism. Lipid: Biosynthesis and β-oxidation of palmatic acid
Section II: Protein Metabolism & Enzymes Transamination, Deamination and Urea cycle. Enzymes; Introduction, kinetics, mechanism of action, inhibition, allosteric enzymes and regulation
Section III: Oxidative Phosphorylation: Electron transport chain, Oxidative phosphorylation and ATP synthase
Section IV: Overview of Immune System, Antigens, Immunoglobins, HCC Historical perspective of Immunology, Early theories of Immunology, Innate, Adaptive (cell mediated and humoral) - Passive: Artificial and Natural Immunity, Active: Artificial and Natural Immunity Cells and Organs of the Immune System; Haematopoesis, Cells of the immune system, Organs of the Immune system: Primary and Secondary lymphoid organs, Lymphatic system Antigens; Properties of antigens, Adjuvants and Haptens Immunoglobulins; Basic structure, classes and function, Polyclonal sera, Monoclonal antibodies Major Histocompatibility Complex; Structure and functions Antigen Processing and Presentation; Endogenous pathway and exogenous pathway of antigen presentation

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

A: Attendance

References:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.

Cyber Forensics

Course Code: **Credits:2**

Course Objective:

The given course is designed to:

1. Develop an understanding on cyber crime and IT Act

Course Contents
Section I: Mobile Forensics Introduction to Mobile Technologies - Asynchronous Transfer Mode (ATM), Wireless Application Protocol (WAP). Cellular technologies - Advanced Mobile Phone System (AMPS), Imode, Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) and relative strengths. Subscriber Identity Module (SIM), International Mobile Equipment Identity (IMEI).
Section II: Functions of Bluetooth and security issues. Various Generation of Mobile Phone Technologies. Understanding of the mobile phone operating systems – Android, iOS, Windows. Understanding of SQLite Databases.
Section III: Phone Phreaking, Call tampering, Wireless Hack Walkthrough and Man-in-the-Middle-attacks. Overview of WEP attack. Attacks on WEP, WPA and WPA-2 Encryption, fake hotspots. Wireless Public Key Infrastructure. Securing WLAN, WEP Decryption script.
Section IV: Overview of Mobile Forensics, Seizure and Preservation of mobile phones and PDA. Types of Evidence present in mobile phones - Files present in SIM card, external memory dump, and evidences in memory card. Mobile phone evidence extraction process, Data Acquisition Methods – Physical, File System, Logical and Manual Acquisition. Mobile Forensic Investigation Toolkit. Tracking of mobile phone location.

Examination Scheme:

Components	**At**	**CT**	**EE**
Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; Att: Attendance

Forensic Practical V

Course Code: **Credit Units: 03**

Course Objective: - The students will understand & perform experiments relating to:

.

1. DNA properties, extraction and quantification
2. DNA Isolation techniques
3. Analysis of various metallic, vegetable, volatile and non-volatile poisons.
4. Perform TLC of poisons, drugs, and inks.

Course Contents:
1. DNA extraction (plants/ blood)
2. Centrifugation technique
3. Agrose gel electrophoresis.
4. Immunodiffusion.
5. Spectrophotometry
6. Analysis of metallic poisons.
7. Analysis of volatile poisons (Acetone, Alcohol).
8. Analysis of corrosive poisons (acids, Alkali).

Examination Scheme:

IA		**EE**	
A	**LR**	**PR**	**V**
10	15	60	15

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

6. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
7. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
8. A. I. Vogel Textbook of Practical organic Chemistry including Qualitative organic analysis
9. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
10. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals Isolation and identification of Drugs by E.G.C. Clark

CRIME SCENARIO IN INDIA

Course Code: **Credit Units: 03**

Course Objective: The main objective was to introduce students about the Sociological aspects of crime and Criminal behavior.

Course Contents:
Section I: Introduction to Criminology Introduction to Criminology – nature, need and function, Basics of Criminology, Historical development and scope of criminology in India.
Section II: **Crime and sociology** Sociological aspects of crime and criminals in society; Theories- Environmental, Sociological, Geographical, Biological.
Section III: Types of crime Types of crime, Causes of crime – property crimes, public order crimes, violent crimes, professional crime, cybercrimes, juvenile delinquency. Categories of crime: cognizable non cognizable crime, bailable and non bailable crime.
Section IV: India- crime Scenario Society-Criminal interaction and various types of crimes in India.

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester, A: Attendance

Text & References

1. Henry Lee's Crime Scene Handbook.
2. Crime Scene Processing and Laboratory Work Book by Patric Jones
3. Introduction to Forensic Science in Crime Investigation By Dr. (Mrs.) Rukmani Krishnamurthy
4. Crime Scene Management with Special Emphasis on National level Crime Cases by Dr. Rukmani Krishnamurthy under publishing
5. Compute Crime and Computer Forensic by Dr. R.K. Tiwari.

QUALITY MANAGEMENT AND ETHICS

Course Code: **Credit Units: 03**

Course Objective: The objectives of the course:

1. To focus on building a conceptual understanding of quality management in forensic science laboratories.
2. To understand the concept and value of ethics in forensic science.

Course Contents:
Section I: Quality Management System Quality, Total Quality, Quality assurance, Quality control, Quality Planning, Quality Audit: Internal and External Audit, Accreditation, NABL, ISO, IEC, BIS. **Quality Management of Laboratories:** General requirements for the competence of testing and calibration laboratories – Introduction, Scope, Management requirements: Organization, Quality System, Document Control.
Section II: Quality Control Process **Management Requirements:** Organizational, document control, subcontracting of tests and calibrations control of Non conforming testing / calibration work, corrective and preventive actions, Management Review. **Technical Requirements:** Test and calibration methods and their validation, measurements, standards and reference material, traceability, sampling. **Good Laboratory Practices (GLP):** Fundamental principles of GLP, Organizational Setup, Resources, Raw data and data collection, SOPs, Archives.
Section III: Ethics **Ethics:** Definition, concept of ethics, Ethics in science, Development of a Code of Ethics for Forensic Science. **Ethics in Forensic Science:** Duties of Forensic Scientist, Qualification of Forensic Scientist. Ethical duties of attorney and experts. Ethics in testimony. Criminal investigation ethics. Ethics in laboratory and in crime scene investigation.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Barnett P.D. (2001), Ethics in Forensic Science: Professional Standards for the Practice of Criminalistics, CRC press.

Syllabus – Sixth Semester

CRIMINOLOGY AND PENOLOGY

Course Code: **Credit Units: 03**

Course Objective: The course focuses on following objectives-

1. Developing an understanding and appreciation for the scope of Criminology and criminal laws.
2. Develop an understanding on concepts of crime, types of crime and criminal behavior.
3. Brief description on Juvenile delinquency, types, classification and factors responsible.
4. Develop comprehensive knowledge on Role of Police with regard to criminals, society and custodial crimes.

Course Contents:
Section I: Criminology and Criminal Behaviour Definition: Crime, Criminal and Criminology; Criminology as Science, The field and scope of Criminology; Methods and Techniques in Criminology; Concept of a criminal and classification of criminals. Organized crime; White – collar crimes/ Occupational crimes; Serial Crimes; Crime against women and children
Section II: Basics Of Code Of Criminal Procedure Bailable, and non-bailable, cognizable, non-cognizable, warrant issue, Summon, Trail before courts , Provisions related to Bail and Bonds
Section III: Components Of Indian Evidence Act Salient features of the Act ,Types of Evidence ,Fact in issue and relevant Facts, Relevancy Of state of Mind and State of body and bodily feeling , Identification , Opinion as to Handwriting(Sec 47) , Comparison of Signature , writing or seal with others admitted or proved(Sec 73)
Section IV: Components Of Indian Penal Code Elements Of Crime ,Offences related to Human Body (Sec 299 – Sec 377) , Kinds of Punishment

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

1. Ellis, L. and Walsh, Anthony, Criminology – A Global Perspective, Allyn and Bacon, Boston, 2000.
2. Morris, E. K., and Braukman, C. J. (Eds.), Behavioral Approaches to Crime and Delinquency- A Hand book of Application, Research and Concepts, Plennum Press, New York, 1987.
3. Abaadinsky, H., Organised Crime (2nd Edn.), Nelson – Hall, Chicago, 1998.
4. Adler, F., Mueller, G. O. W. and Laufer, W. S., Criminology, McGraw – Hill, Boston, 1991.
5. Maguire, M.: Morgan, R and Reiner, R., The Oxford Handbook of Criminology (3rd Edn.), Oxford University Press, Oxford, 2002.
6. Ahuja, R., Criminology, Rawat Publication, ND, 2000.
7. Bajpai, G. S., Development without Disorders. Vishwavidyala, Prakashan, Sagar (M. P.), 2002.
8. Maguire, M.: Morgan, R and Reiner, R., The Oxford Handbook of Criminology (3rd Edn.), Oxford University Press, Oxford, 2002.

CHEMISTRY-V (INSTRUMENTATION-PHYSICAL & CHEMICAL)

Course Code: _____ **Credit Units: 03**

Course Objective: The objectives of the course is to provide student with practical understanding of the various instrumentation and control systems, instrumentation equipment and troubleshooting skills used in the forensic science laboratory.

Course Contents:
Section I: Spectrophotometry Electromagnetic spectrum, Sources of Radiation, their utility and limitations, difference between Atomic spectrum and Molecular spectrum.
Section II: UV-Visible spectrophotometry & AAS Types of sources and stability, wavelength selection, filters-cells and sampling devices, detectors, resolution, qualitative and quantitative methods for detection. Atomic absorption spectrometry: Principle, Instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis.
Section III: Chromatographic Techniques I Definition and Concept of Chromatography, Classification of Chromatography. Basic principle, theory, Instrumentation and Forensic Applications of Paper chromatography, Thin layer chromatography and High Performance Thin Layer Chromatography.
Section IV: Chromatography Techniques II Basic principle, theory, Instrumentation and Forensic Applications of Gas chromatography, Liquid Chromatography and High Performance Liquid Chromatography.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
A: Attendance

Text & References:

1.Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2.Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3.Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4.Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.
5.Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of organic compounds, Wiley, New York, 1974.
6.Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
7.Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
8. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970.

PHYSICS VI

Course Code: **Credit Units:**

Course Objectives: The students will able to learn about the geometrical optics, statistical mechanics and Its postulates.

Course Contents
Section I: Thermodynamics: Thermal equilibrium and definition of heat, Internal energy and work, specific heat capacity, Isothermal process, Isochoric process, Isobaric process, First law of thermodynamics and its demerits, Heat engines, Refrigerator and heat pump, second law of thermodynamics
Section II: Kinetic theory: Equation of state of perfect gas, Behavior of gases, Ideal gas, Kinetic theory of gases, Assumption concept of pressure, Kinetic interpretation of temperature, speed of gas molecule, law of equilibrium of energy, specific heat capacity of monoatomic, diatomic and polyatomic gases, concept of free mean path.
Section III: Atoms and nuclei: Rutherford model of atom, Drawback of Rutherford model. Model of hydrogen atom, Bohr's radius, Energy level of hydrogen atoms, size of nucleons, Isotopes, Isobars, Isotones, Mass- energy relation, Nuclear binding energy, Binding energy curves.
Section IV: Electromagnetic induction: Faraday's law of EMI, Self and Mutual induction, Energy stored in magnetic field. AC circuits: AC circuit analysis using complex variables, AC circuit with (i) R and C, (ii) R-L (iii) R,L and C in series and parallel, Resonance circuit, Quality factor and its importance.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

References:

Allied Physics – Prof. Dhanalakshmi and others.

4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).

5. Modern Physics – R. Murugesan S. Chand & Co. (2004).

6. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.

7. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

BIOLOGY-VI (Applied Biology and Biotechnology)

Course Code: **Credit : 3**

Course Contents:
Section I: Human diseases Epidemiology of infectious disease, transmission, prevention and control of human diseases-Tuberculosis, Amoebiasis, Dengue, Malaria, Filariasis, Japanese encephalitis
Section II: Food and industrial microbiology Microbiology of fermented food and food-borne diseases, food preservation, Micro-organism as food (e.g. SCP), Major products of industrial microbiology-antibiotics, amino acids, organic acids, vitamins, pharmaceuticals.
Section III: **Molecular Techniques in Gene manipulation** Introduction to the concept of Recombinant DNA Technology, Cloning vectors, Restriction and modifying enzymes, Transformation techniques (microbial, plants and animals), Construction and screening of DNA libraries, Agarose and Polyacrylamide Gel Electrophoresis, Molecular analysis of DNA, RNA and Proteins (i.e. Southern, Northern and Western blotting), DNA sequencing (Maxam- Gilbert and Sanger methods), Polymerase chain reaction and DNA microarrays.
Section IV: Applications of Biotechnology Molecular diagnosis of genetic diseases (Cystic fibrosis, Huntington's disease and Sickle cell anemia), Recombinant vaccines, Recombinant DNA in medicines (Recombinant insulin and Human growth hormone), Gene therapy (ADA and Cystic fibrosis) and Stem Cells, Bioremediation, Production and applications of transgenic plants (biotic, abiotic and improvement of nutritional quality) and transgenic animals (generation of medicines and hormones), Ethics and regulation of GM organisms**.**

Examination Scheme:

Components	**A**	**CT**	**S/V/Q**	**HA**	**EE**
Weightage (%)	5	10	5	5	75

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination
A: Attendance

References:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked

phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
6. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.

Cyber Forensics

Course Code: **Credits:2**

Course Objective:

The given course is designed to:

1. Develop an understanding on cyber crime and IT Act

Course Contents
Section 1: Social media forensics I Introduction to Social Media, Security Issues in Social Media, Types of crimes of Social Media – Cyberbullying, Online Grooming, Cyberstalking. Social Media and its impact on Business, Politics, Law and Revolutions, Emerging Trends in social media.
Section II: Social media forensic II Sources for social media evidence, Types of Data Available on Social Networking Sites, Different evidence collection methods from social networking sites, Intelligence gathering from Social Media- Tools and technique for intelligence gathering– indirect method, direct method with login, direct method without login.
Section III: CRYPTOGRAPHY Introduction to Cryptography, Symmetric and Asymmetric Cryptosystem Encryption Techniques– Substitutional Cipher and Transpositional Ciphers. Types of keys – Public Key and Private Key. Advanced Encryption Techniques and Security Issues. Various types of attacks including Cipher Text-Only attack, Known-Plaintext Attack, Chosen-Plaintext Attack, Chosen-Cipher text Attack.
Section IV: Symmetric Cryptosystem Symmetric Cryptosystem – AES, DES, RC4, Blowfish. Asymmetric Cryptosystems – RSA, DSA, Elliptic Curve cryptography. Introduction to Cryptanalysis – Differential and Linear Cryptanalysis. Hashing Algorithms – MD5, SHA-1, SHA-2, SHA-3, One-Way Hash, Hash Message Authentication Code.

Examination Scheme:

Components	**At**	**CT**	**EE**

Weightage (%)	5	5	40

CT: Class Test, , EE: End Semester Examination; Att: Attendance

FORENSIC PRACTICAL VI

Course Code: **Credit Units: 01**

Course Objective: - The students will understand & perform experiments relating to:

1. GSR analysis
2. Identifying parts of firearm, explosives

Course Contents:
1. Spot test for GSR (Nitrate test, sulphate and chlorate test)
2. Identification of parts of firearm (Shotgun, rifle and pistol)
3. Filter test for petroleum products
4. TLC for flammable liquids (Kerosene and diesel).

Examination Scheme:

IA				**EE**	
A	**PR**	**LR**	**V**	**PR**	**V**
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Text and references:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
3. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
4. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
5. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals
6. G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York, 1989

PROJECT

Course Code: **Credit Units: 03**

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks
Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks
Chapter 3: Presentation, Analysis & Findings -- 25 marks
Chapter 4: Conclusion & Recommendations -- 10 marks
Chapter 5: Bibliography -- 05 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

- **a)** ***Introduction:*** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.
- **b)** ***Conceptual Framework / National and International Scenario*****:** (relating to the topic of the Project).
- **c)** ***Presentation of Data, Analysis and Findings*** **:**(using the tools and techniques mentioned in the methodology).
- **d)** ***Conclusion and Recommendations:*** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

STEP I: Selection of the topic for the project by taking following points into consideration:

1. Suitability of the topic.
2. Relevance of the topic
3. Time available at the disposal.
4. Feasibility of data collection within the given time limit.
   Challenges involved in the data collection (time & cost involved in the data collection,

possibility of getting responses, etc.)
STEP II: Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.
STEP III: Collection of information and data relating to the topic and analysis of the same.
STEP IV: Writing the report dividing it into suitable chapters, viz.

Chapter 1: Introduction,
Chapter 2: Conceptual Framework / National & International Scenario,
Chapter 3: Analysis & Findings
Chapter 4: Conclusion and Recommendations.
Chapter 5: Bibliography
STEP V: The following documents are to be attached with the Final Project Report.
Approval letter from the supervisor (Annexure-IA)
Student's declaration (Annexure-IB)
Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for evaluation:

1. Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
2. Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
3. Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
4. No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
5. Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate. The evaluation scheme shall be as follows:

Project Report	**Power Point Presentation & Viva**
75 marks	25 marks