COURSE STRUCTURE AND SYLLABI

of

B.Sc.-M.Sc. Forensic Science Program

(Syllabus, Teaching & Evaluation Schemes)

(W.E.F. Academic Year **2022**)

Centurion UNIVERSITY

Shaping Lives... Empowering Communities...

SCHOOL OF FORENSIC SCIENCES

Affiliated with

National Forensic Sciences University

An Institution of National Importance (Ministry of Home Affairs, Government of India)

Gujarat Campus

Sector – 9, Gandhinagar, Gujarat – 382007

NFSU

विद्यया अमृतं अश्नुते

PROGRAM OBJECTIVE

The Universal Declaration of Human Rights directs the member nations to create such

conditions under which the ideals of free human beings, enjoying civil and political freedom from fear and want, can be achieved. The Constitution of India, through its various articles, strives to ensure security and safety of citizens in accordance with the principles of Universal Declaration of Human Rights. However, crime is a violation of these principles.

In a country like India, where majority of population is uneducated, social set up is heterogeneous, public-police relations are not very cordial, poverty is rampant and unemployment widespread, it is not surprising that crime rate is increasing exponentially.

If we have to create conditions conducive to harmonious development, we must mitigate the crime rate. This can best be achieved by relying on the support of forensic science system. Unfortunately, in our country, forensic science is not viewed as a core investigative skill in crime detection. In fact, there is a lack of understanding of the forensic process itself. In majority of serious crime cases, hi-tech measures are being adopted by perpetrators of crime. The counter measures have to be more sophisticated to surpass them.

This calls for strengthening the foundations of forensic science at national level.

Our mission as a Forensic science program is to develop professional, ethical graduates whose competence in problem-solving, legal analysis and application, quantitative reasoning, investigation and scientific laboratory procedures can be applied to immediate employment or advanced study.

PO (Programme Outcomes): B.Sc. Forensic Science

PO1	**Basic and Discipline specific knowledge:** Apply the knowledge of basic and applied sciences, engineering, social sciences and arts in various forensic problems**.**
PO2	**Problem Analysis:** Identify and analyze forensic problems using standard methods based on scientific approach**.**
PO3	**Modern tool usage:** Understand, select, and apply appropriate techniques, resources, and modern scientific techniques with an understanding of its merits and limitations**.**
PO4	**Effective Communication:** Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology**.**
PO5	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the forensic practices.
PO6	**Forensic practices for society and criminal Justice setup:** Understand and analyze the impact of forensic solutions to the society and criminal justice setup.
PO7	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in a multidisciplinary setting.
PO8	**Lifelong learning**: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of Technological change.

PSO

PSO 1: To develop the undergraduate level students with the specific knowledge of handling different types of evidences and their examinations.

PSO2: To develop the laboratory skills in examining different types of evidences found at the crime scene.

PSO3: To prepare the students to compete for employment in State and central level Organizations**.**

Teaching Scheme

Semester I							
Sr. No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**C**	**TCH**
1	CUTM2450	Introduction to Forensic Science	3	0	0	3	3
2	CUTM2451	Crime Scene Management & Criminal	3	0	0	3	3
3	CUTM2452	Crime and Society	3	0	0	3	3
4	CUTM2453	General Physics-I	3	0	0	3	3
5	CUTM2454	General Chemistry-I	3	0	0	3	3
6	CUTM2455	General Biology-I	3	0	0	3	3
7		Skill Based Elective - I	2	0	0	2	2
8	CUTM2456	Practical I	0	0	8	4	8
Total Credit & Total						**24**	**28**

Semester II							
Sr. No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**C**	**TCH**
1	CUTM2457	Criminal and Evidence Law	3	0	0	3	3
2	CUTM2458	Fingerprint Science	3	0	0	3	3
3	CUTM2459	Questioned Document	3	0	0	3	3
4	CUTM2460	General Physics-II	3	0	0	3	3
5	CUTM2461	General Chemistry-II	3	0	0	3	3
6	CUTM2462	General Biology-II	3	0	0	3	3
7		Skill Based Elective - II	2	0	0	2	2
8	CUTM2463	Practical II	0	0	8	4	8
Total Credit & Total						**24**	**28**

Semester III							
Sr. No.	**Subject Code**	**Subject Name**	**L**	**T**	**P**	**C**	**TCH**
1.	CUTM2464	Forensic Psychology	3	0	0	3	3
2.	CUTM2465	Forensic Chemistry-I	3	0	0	3	3
3.	CUTM2466	Forensic Physics-1	3	0	0	3	3
4.	CUTM2467	Basics of Computer &	3	0	0	3	3
5.		Core Elective – I (From Elective Group A)	2	0	0	2	2
6.		Skill Based Elective - III	2	0	0	2	2
7.	CUTM2468	Practical III	0	0	8	4	8
Total Credit & Total						**20**	**24**

List of Core Elective – Group A (For Semester 3, 4 and 5)

Sl. No. 1 to 4 can be selected in ODD SEMESTER while Sl. No. 5 to 6 can be selected in EVEN SEMESTER

Sr. No.	Group A	Subject Code	Subject Name	L	T	P	Credits
1	Group A	CUTM247	Anti-dope Forensics	2	0	0	2
2	Group A		Incident Response and Management	2	0	0	2
3	Group A		Multimedia Forensics	2	0	0	2
4	Group A		Forensic Statistics	2	0	0	2
5	Group A		Accident Investigations	2	0	0	2
6	Group A		Immunology and Immunological Techniques	2	0	0	2

List of Core Elective – Group B (For Semester 6 and 7)

Sl. No. 1 to 3 can be selected in EVEN SEMESTER while Sl. No. 4 to 6 can be selected in ODD SEMESTER

Sl. No.	Group B	Code	Course Title	L	T	P	Credits
1	Group B		Clinical Toxicology	2	0	0	2
2	Group B		Forensic DNA Analysis	2	0	0	2
3	Group B		Forensic Engineering	2	0	0	2
4	Group B		Applied Cryptography	2	0	0	2
5	Group B	`	Data Science & Artificial	2	0	0	2
6	Group B		Forensic Photography	2	0	0	2

List of Skill Based Elective – (From Semester 1 to 4)

Sl. No.	Code	Course Title	L	T	P	Credits
1	CUTM2469	Communication Skills	2	0	0	2
2	CUTM2470	English	2	0	0	2
3	CUTM2471	Yoga and its benefits-I	2	0	0	2
4	CUTM2472	Yoga and its benefits-II	2	0	0	2

Total Credits: 222

L: Lecture **T:** Tutorial **P:** Practical **TCH:** Total Credit Hours

1 C = 1 Hour of Lecture / Tutorial and 1 C = 2 Hours of Practical / Project.

Syllabus

Semester I

CUTM2450: Introduction to Forensic Science

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives

1. To help students learn basic principles of Forensic science
2. To learn about the development of forensic science
3. To learn about the organizational setup of Forensic Science
4. To understand about the various academic institutions and government agencies involved in criminal investigations.
5. To help students develop a basic understating about Forensic Science

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To describe the fundamental principles, development and functions of forensic science along with its significance in the human society.
CO-2	To illustrate the organizational setup in a forensic science laboratory and its functional aspects.
CO-3	To understand the working of the forensic establishments in India and abroad.

MODULE -1 History and Basic principles of Forensic Science Teaching Hours: 15 Hours

History of Development of Forensic Science in India. Functions of forensic science. Historical aspects of forensic science. Definitions and concepts in forensic sciences. Scope of forensic science. Various contemporary disciplines of forensic sciences and their applications in different approaches with theoretical concepts. Need of forensic science. Basic principles of forensic science.

MODULE-2 Functional aspects of Forensic Science Teaching Hours: 15 Hours

Contemporary development in the academic and practices in forensic sciences-advantage of scientific investigations- Tools and Techniques in Forensic Science- Branches of forensic science. Forensic science in international perspectives, including set up of INTERPOL, and FBI. Duties of forensic scientists. Code of conduct for forensic scientists. Qualifications of forensic scientists. Data depiction. Report writing.

MODULE-3 Organizational setup in Forensic Science **Teaching Hours: 15 Hours**

Academic institutions involvement- Organizational set up of Forensic Science Laboratories in India Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, NIA, CCNTS, Bureau of Police Research & Development, Directorate of Forensic Science and Mobile Crime Laboratories. Police Academies. National investigation agency and other agencies involved in the criminal investigations- agencies referred for the additional information and requisite examinations.

References and Suggested Readings:

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

CUTM2451: Crime Scene Management & Criminal Profiling

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives

1. To make students understand about the crime and its types.
2. To learn about the techniques behind management of different crime scenes.
3. To understand about the importance of evidences and its correct collection & handling.
4. To learn about the concept of chain of custody & its importance.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To demonstrate the art of collecting, packaging and preserving different types of physical and trace evidence at crime scenes.
CO-2	To attain skills in using various tools and techniques for analysis of different types of crime scene evidence.
CO-3	To understand the significance of criminal profiling and victim profiling in crime scene investigation

MODULE-I Crime Scene Evidence Teaching Hours: 15 Hours

Introduction to the crime scene, Types of crime scene, Evaluation and processing of crime scene, securing the scene of crime, documenting the crime scene: Note making, sketching

Searching techniques of Crime scene, Processing of physical evidence-discovering, recognizing and examination of physical evidences

Collection, Safety measures for evidence collection, Preservation, Packaging, sealing, labelling and forwarding of physical evidences, maintaining the chain of custody, Probative value of physical evidences, Reconstruction of scene of crime

Photography: Photography (Cameras-SLR &DSLR, lenses, filters, films, exposing, development & printing, different kinds of developers and fixers. Specialized photography-UV, IR, close up. Photography using scientific equipment, role of the first arriving officer at the crime scene, Digital Imaging of Crime Scene, 3-D scanning technique, videography of crime scene

MODULE-2 Physical Evidences Teaching Hours: 15 Hours

Introduction to physical evidences, Types of physical evidences, Classification and Role of physical evidences in Criminal Investigations & Trails.

Crime Detection Devices: UV, IR, X-Rays, their nature and applications, Detective Dyes, Neutron Radiography, Speed Detection Devices, Tools: Basic Kits, Investigator's Kit, Tools used in Mobile laboratory. Digital Imaging of Crime Scene, 3-D scanning technique, Tele forensic Technology for crime scene investigation, Information, Manpower, and logistics management of crime scene , Technology innovation in crime scene management, Case studies & report writing of crime scene visits. National and International scenario of crime scene management

MODULE-3 Criminal Profiling Teaching Hours: 15 Hours

History of Profiling, Behavioural Evidence Analysis, Criminal motivation, Crime scene investigation, Victim profiling, Psychological Autopsy, Sexual Offences, Geographical Profiling, Criminal behaviour on the internet, Case studies.

References and Suggested Readings:

1. J.Walls; Forensic Science-An Introduction to Scientific Crime Detection 2nd Ed.,Universal, 1st Indian Reprint (2002).
2. Richard Saferstein; Criminalistics-An Introduction to Forensic Science 5th Ed., Prentice Hall (1995).
3. Jay A.Siegel, Pekka J Saukko and Geoffrey C. Kooupfer; Encyclopedia of Forensic Science, Academic Press (2000).
4. E.R.Mengel; Forensic Physics in 2002 year book, McGraw hill Encyclopedia of Science & Technology.
5. Jenkins and White; Fundamentals of Optics; Mc Graw Hill; Fourth Ed, (I) James, S.H. And Nordby, J. J.; Forensic Science; An Introduction to Scientific And Investigative Techniques, CRC Press USA
6. M. Byrd, Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence, CRC Press, Boca Raton (2001).
7. T.J. Gardener and T.M. Anderson, Criminal Evidence, 4th Ed., Wadsworth, Belmont (2001).
8. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
9. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

CUTM2452: Crime & Society

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Mark	Hrs	
					Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. The importance of criminology.
2. The causes of criminal behavior.
3. The significance of criminal profiling to mitigate crime.
4. The consequences of crime in society.
5. The elements of criminal justice system.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To explain the importance of criminology and causes of criminal behaviour.
CO-2	To analyse the significance of criminal profiling in alleviating crimes.
CO-3	To demonstrate an understanding of the elements of criminal justice system and the consequences of crime in society.

MODULE-I Crime Teaching Hours: 15 Hours

Introduction to Crime, Essentials of Crime (Actus reus and mens rea), Causes and consequences of crime, Crimes against Property and Person. Types of crime- traditional crimes, modern crimes white collar crimes, Economic crimes, Political crime, Cyber-crime, Terrorism and Insurgency, Crime and Politics. Hate crimes, Transnational crimes; Offences in CrPC and IPC; Media, technology and crime; Juvenile Delinquency; Social change and crime; Psychological disorders and criminality; Situational crime prevention. Types of criminals- Adult offenders, children in conflict with law, recidivists, Violent offenders, occupational offenders; Criminal Profiling.

MODULE-2 Fundamentals of Criminology & Victimology Teaching Hours: 15 Hours

Criminology Definition, aim and scope. Schools of Criminology. Criminology and other social sciences; Criminological Theories: Pre-classical, Classical, Neo-classical, Positivist; Causation of crime - Psychological theories of crime, sociological theories of crime, Biological theories of crime; Feminist Criminology. Crime Prevention, Modus Operandi, Criminal profiling. Basic concepts of Victimology.

MODULE-3 Criminal Justice System Teaching Hours: 15 Hours

Broad components of criminal justice system. Structure of Criminal Justice System in India; Role of Legislature and Law making; Coordination among Criminal Justice System, Policing styles and principles. Police's power of investigation. Compoundable and Non-compoundable offences; Investigation of Crimes; Complaint, F. I. R. Arrest, Search, Seizure, Police Custody, Role of prosecution, judiciary- Judicial Remand and Bail; Types of Evidence, Admissibility of Confession, Dying declaration, Filing of criminal charges. Community policing. Policing a heterogeneous society. Correctional measures and rehabilitation of offenders. Human rights and criminal justice system in India.

References and suggested Readings:

1. Ahuja ,Ram. (2000). *Criminology*. Rawat Publication
2. Barnes, H. E. & Teeters, N. K. (1959). *New horizons in criminology*. (2nd ed.). New York, NY: Prentice-Hall.
3. Beccaria, Cesare. (1764). *On Crimes and Punishments*. Richard Davies, Cambridge University Press.
4. Bonnie, S. Fisher & Steven, P. La.,(2010). *Encyclopedia of Victimology and Crime Prevention*. SAGE Publications, Inc.
5. David, Kauzlarich and Hugh D. Barlow. (2009) *Introduction to criminology* (9th ed.) Rowman&Littlefield Publishers.
6. John, Martyn Chamberlain.(2015). *Criminological Theory in Context: An Introduction*. SAGE Publications Ltd . Southampton University
7. Paranjape, N.V. (2009). *Criminology and Penology*. Central Law Publications.
8. Reid, Sue Titus. (2006). *Crime and Criminology*. Mc. Graw Hill.
9. Sutherland ,E. H. and Cressey, Donald. (1992), *Principles of Criminology*. (11thed). Lanham, Md.: Alta Mira Press
10. Tappan, Paul. (1960). *Crime, Justice ,and Correction*. McGraw-Hill Book Company ,Inc. New york ,Toronto, London.
11. Viano, Emilio.(1987). *Crime and its Victims*. Hemisphere Publishing Corporation, New York
12. Kocsis, RN (2006) *Criminal Profiling- Principles and Practices*. Humana Press, New Jersey
13. Roger G. Dunham (Author), Geoffrey P. Alpert (Author), Kyle D. McLean (2015). *Critical Issues in Policing: Contemporary Readings*. Waveland Press
14. N. Prabha Unnithan (2013). *Crime and Justice in India*. Sage Publications
15. H.R. Bhardwaj (2019). *The Criminal Justice system in India*. Konark Publishers Pvt Ltd
16. Adam Sutton, Adrian Cherney, Rob White, Garner Clancey. (2021) *Crime Prevention 3ed-Principles, Perspectives and Practices*. Cambridge University Press
17. Manish Dwivedi (2011) *Juvenile Justice System in India*. Adhyayan Publishers & Distributors.
18. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).

19. D.E. Zulawski and D.E. Wicklander, *Practical Aspects of Interview and Interrogation*, CRC Press, Boca Raton (2002).
20. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
21. J.L. Jackson and E. Barkley, *Offender Profiling: Theory, Research and Practice*, Wiley, Chichester (1997).
22. R. Gupta, *Sexual Harassment at Workplace,* LexisNexis, Gurgaon (2014).

CUTM2453: General Physics-I

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives

1. To learn about the various laws of motion.
2. To make students understand about the waves and its properties.
3. To build concept about the various aspects of radioactivity and atomic structure.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To describe the concepts of motion and elasticity.
CO-2	To illustrate the concepts of thermodynamics.
CO-3	To explain the concepts involving properties of waves and optics.

MODULE-I Mechanics **Teaching Hours: 15 Hours**

Laws of motion: Motion and its physical interpretation, Newton's law of motion, Law of conservation of linear momentum and its applications. Static and kinetic friction, laws of friction. Circular motion: Centripetal and Centrifugal force, Projectile motions and its application.

Simple Harmonic Motion and Elasticity: Simple Harmonic Oscillations. Differential equation of SHM and its solution. Kinetic energy, potential energy, total energy and their time-average values. Elastic and inelastic collisions between particles. Elasticity, stress, strain, and Relation between the Elastic constants.

MODULE-2 Thermal Physics Teaching Hours: 15 Hours

First Law of Thermodynamics: Thermodynamic Variables, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics & Concept of Temperature, Concept of Work & Heat, State Functions, First Law of Thermodynamics and its differential form, Internal Energy, various thermodynamic processes, Relation between CP and CV, Work Done during Isothermal and Adiabatic Processes.

Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot engine &

efficiency, Kelvin-Planck and Clausius Statements. Concept of entropy.

Kinetic theory of gases and Theory of Radiation: Real and Ideal gas, Maxwell-Boltzmann Law of Distribution of velocities. Mean, RMS and Most Probable Speeds. Mean Free Path. Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement.

MODULE-3	Wave and Optics	Teaching Hours: 15 Hours

Wave: Wave motion, Wave equation, longitudinal and transverse waves, Plane Progressive (Travelling) Waves, Nature and properties of electromagnetic waves, Speed of sound wave in different media and their properties, Velocity of Transverse Vibrations of Stretched Strings, Newton's hypothesis, Laplace correction in speed of sound.

Optics: Electromagnetic spectrum, Interference, Reflection, refraction polarization and diffraction of light. Young's double slit experiment, Refractive index and total internal reflection of light. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers. Physical and Chromatic aberrations.

Reference books:

1. NCERT Physics Part 1 And part 2.
2. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
3. Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
4. Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
5. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
6. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill.
7. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
8. Optics, Ajoy Ghatak, 2008, Tata McGraw Hill.

CUTM2454: General Chemistry-I

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To learn about different bonding theories.
2. To learn about Structure of ionic solids.
3. To learn about periodic trends.
4. To learn about basics of organic chemistry.
5. To learn about basics of physical chemistry.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To explain the different bonding theories and structure of ionic solids.
CO-2	To attain basic understanding of concepts relating to organic chemistry.
CO-3	To describe the concepts relating to physical chemistry.

MODULE-I Structure and Bonding Teaching Hours: 15 Hours

Atomic Structure: Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrodinger wave equation; H atom; Radial and angular wave functions. Quantum numbers and their significance, Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number, Molecular orbital theory and shapes of s, p, d and f Orbitals.

Chemical Bonding: VB and MO approach of H2 molecule; MO treatment of homonuclear and heteronuclear (CO & NO) diatomic molecules; Concept of HOMO and LUMO. VSEPR theory; Structure of simple molecules and ions of main group elements

Ionic Solids: Close packing, Radius ratio rule and crystal coordination number. Examples of MX and MX2 type ionic solids (NaCl and TiO2)

Metallic Bonding: theories of bonding in metals; Free electron, VB and Band theories.

Weak Interactions: Hydrogen bonding and van der Waal's interactions

Periodic trends and properties: Size, Ionization Energy, Electron Affinity, Electronegativity, Lattice and Hydration Energies, Use of redox potential and reaction

feasibility.

MODULE-2	Basics of Organic Chemistry	Teaching Hours: 15 Hours

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Racemic mixture and resolution. Chemistry of aliphatic, aromatic hydrocarbons and Cycloalkanes. Aromaticity and Huckel rule - A general concept. Molecular orbital picture of benzene.

MODULE-3	Basics of Physical Chemistry	Teaching Hours: 15 Hours

Gaseous State: Kinetic theory of gases, ideal gas laws based on kinetic theory. Collision in a gas- mean free path, collision diameter, collision number. Behaviour of real gases - the van der Waal's equation.

Liquid State: Surface tension of liquids - capillary action, experimental determination of surface tension, temperature effect on surface tension. Viscosity of liquids, experimental determination of viscosity coefficient, its variation with temperature.

Thermodynamics: Enthalpy, heat changes at constant volume and constant pressure, heat capacities (CV, CP) and their relationship for ideal gases. Thermodynamic quantities (w, q, ΔU, ΔH) for isothermal and adiabatic reversible expansion of ideal gases and their comparison. Change in internal energy (ΔU) and enthalpy (ΔH) of chemical reactions, relation between ΔU and ΔH, variation of heat of reaction with temperature (Kirchhoff's equation).

Reference Books:

1. Basic Inorganic Chemistry, F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995), John Wiley & Sons, New York.
2. Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
3. Physical Chemistry, P. Atkins and J. De Paul, 8th Edition (2006), International Student Edition, Oxford University Press.
4. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.
6. Vogel, A.I. A Textbook of Quantitative Inorganic Analysis, ELBS.
7. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd.(Pearson Education).
8. Physical Chemistry, P. C. Rakshit, 5th Edition (1988), 4th Reprint (1997), Sarat Book House, Calcutta.
9. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, and M. S. Pathania, 37th Edition (1998), Shoban Lal Nagin Chand & Co., Jalandhar.
10. Physical Chemistry, K. J. Laidler and J. M. Meiser, 3rd Edition, Houghton Mifflin Comp., New York, International Edition (1999).

CUTM2455: General Biology-I

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE						
					Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. Understanding of Cell structure and function
2. Knowledge of Microbial world
3. Conceptualization of various aspects of genetics

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To describe the cellular organization and the process of cell division.
CO-2	To gain knowledge about the microbes and their general characteristics.
CO-3	To attain basic understanding of genetics.

MODULE-I Cellular Organisation **Teaching Hours: 15 Hours**

Cell and cellular organelles, The cell theory, Prokaryotic and Eukaryotic cells, Eukaryotic sub- cellular components: Nucleus, chromosomes, plasma membrane, endoplasmic reticulum, lysosomes, peroxisomes, Golgi apparatus, mitochondria, chloroplast, cytoskeleton. Cell cycle and its control; Cell division-amitosis, mitosis and meiosis.

MODULE-2 Introduction to Microbiology **Teaching Hours: 15 Hours**

Bacteria: General characteristics, cell structure of bacteria and their components, Classification of bacteria (Outline), mode of nutrition, mycoplasma, archaebacteria, cyanobacteria. Fungi: General characteristics and classification Viruses: General characteristics and classification.

MODULE-3 Basic of Genetics **Teaching Hours: 15 Hours**

Introduction to genetics, pre-Mendelian, Mendelian and non-Mendelian inheritance, genetic linkage, recombination and crossing over, chromosomal basis of inheritance, mutations and mutagenesis, genetic basis of sex determination, extra-nuclear inheritance, exchange of genetic material-Conjugation, Transformation and Transduction.

References and Suggested Readings:

1. Nelson DL, Cox MM (2017) Lehninger Principles of Biochemistry, 7th Edition. W. H. Freeman
2. Stryer L, Berg JM, Tymoczko JL. Gatto GJ. (2015) Biochemistry, 8th Edition. W. H. Freeman
3. Voet DV, Voet JG. (2011) Biochemistry, Wiley
4. Pelczar Mi J., Chan, E.C.S., Krieg, NR, (2009). Microbiology, McGraw-Hill publisher
5. Satyanarayana U, (2013), Biochemistry Elsevier
6. Snustad DP, Simmons MJ. (2015) Principles of Genetics, 7th Edition , Wiley.
7. Albertis B, Jhonson A, Lewis L, Morgan D, Raff M, Roberts K, Emeritus, Walter P (2014) Molecular Biology of the Cell. 6th Edition, Garland Science

CUTM2469: Communication skill

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
2	0	0	2	2	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To learn about importance of communication
2. To learn about the techniques to face interview, do group discussions, etc.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To develop interpersonal communication skills.
CO-2	To improve their listening, reading and writing skills

MODULE-I Importance and process of Communication Teaching Hours: 15 Hours

Verbal and Non-verbal process of Communication, How to face an interview, Group Discussion, How plan and conduct the Interviewer, importance of body language and gesture in interview, eye contact and appearance during interview process.

MODULE-2 Different skills and its importance Teaching Hours: 15 Hours

Listening, Developing Reading Skills, Developing Conversational skills, Technical Writing skills.

References and Suggested Readings:

1. Sreevalsan, MC; Spoken English, Vikash Publishing House, New Delhi.
2. Communication Skills; Sanjay Kumar, Pushphate, Oxford.
3. Krishna Mohan, Meera Banarjee, Developing Communication Skills.
4. Frank O' Connor, Phonetics, Pengiun.
5. Business Correspondence and Report Writing- Sharma and Krishna Mohan- Tata Mgraw.

CUTM2456: Practical-1

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
0	0	8	4	8							100	6:00	100

Course Objectives:

At the end of course, students will be gaining the hands on training in the following courses;

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To elucidate the history, development and organizational setup of different central and state organizations in India.
CO-2	To acquire skills in processing and reconstruction of a crime scene, preparing report and establishing chain of custody. The students will be able to elucidate cases related to sections of IPC, CrPC and IEA.
CO-3	To demonstrate aspects of velocity, acceleration, thermal conductivity. They will be able to determine anions and cations by chemical tests; to understand stages of cell division under microscope.

MODULE-I Introduction to Forensic Science

1. To study the history of crime cases from forensic science perspective.
2. To write report on different type of crime cases.
3. To review how the Central Fingerprint Bureau, New Delhi, coordinates the working of State Fingerprint Bureaus.
4. To examine the list of projects undertaken by the Bureau of Police Research and Development and suggest the thrust areas of research in Police Science.
5. To compare the code of conduct prescribed by different establishments for forensic scientists.

MODULE-2 Crime Scene Management

1. To prepare a report on evaluation of crime scene.
2. To establish chain of custody and note taking at crime scene.
3. To reconstruct an indoor crime scene.
4. To reconstruct an outdoor crime scene.
5. Collection, Packaging and Preservation of the evidences.

MODULE-3 Crime & Society

1. To review crime cases where criminal profiling assisted the police to apprehend the accused.
2. To evaluate how rising standards of living affect crime rate.
3. To review the recommendations on modernization of police stations and evaluate how far these have been carried out in different police stations.
4. To prepare a report on interrogation cells and suggest improvements.

MODULE-4 General Physics-I

1. To determine force, velocity and acceleration of moving object.
2. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation
3. To find the refractive index of a liquid by using convex lens and plane mirror.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method.
5. To study the variation of Thermo Electric EMF with temperature using the thermocouple using the kit.

MODULE-5 General Chemistry-I

1. Determination of anions by chemical tests
2. Determination of cations of group 0, 1, & 2 by chemical tests.
3. Determination of melting point of organic solids.
4. Determination of viscosity of sugar solution
5. Determination of effect of temperature on viscosity of solution.

MODULE-6 General Biology-I

1. Visualization of animal cells under microscope
2. Visualization of bacterial cells under microscope
3. Visualization of mitosis in plant cell
4. Isolation of bacteria from soil/water sample
5. Mendelian inheritance using seeds of different colour/sizes of any plant

Semester II

CUTM2457: Criminal and Evidence Law

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		
					TA-1 & TA-2		MSE						Total
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To develop concepts about law and legal procedures, courts, IPC, CrPC & IEA.
2. To learn about police, police organizations at national & international levels.
3. To learn about NDPS Act, Explosives Act, Environment Protection Act, etc.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To explain the concepts involving elements of Indian Penal Code, Criminal Procedure Code and Indian Evidence Act related to forensic science.
CO-2	To elucidate on the police organizational structure and their function under the central and the state government.
CO-3	To understand the acts governing socio-economic crimes and environmental crimes.

MODULE-1 Law **Teaching Hours: 15 Hours**

Definition of Law, Court, Judge, Basic Terminology in Law, Introduction to Criminal Procedure Code, FIR, Difference between civil and Criminal Justice, Object of Punishment, Kinds of Punishment, Primary and Sanctioning Rights Primary and Secondary functions of Court of Law. Law to Combat Crime-Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts.

Criminal Procedure Code. Cognizable and non-cognizable offences. Bailable and nonbailable offences. Sentences which the court of Chief Judicial Magistrate may pass.

Laws specific to Forensic Science: Indian Penal Code pertaining to offences against persons –

Sections 121A, 299, 300, 302, 304A, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359,
362. Sections 375 & 377 and their amendments.

Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136,

137, 138, 141. CrPC – Sections 291,291A, 292 & 293 in the code of criminal procedure.

MODULE-2 Police Science **Teaching Hours: 15 Hours**

Definition and scope----Police organization under central government: general information about their structure and function BPR&D, CBI, IB, RAW, NCRB, NICFS, NPA, UT Police Force International Police Organization: INTERPOLE- history, structure general and special notices State Police organization: general organization of police at state and range level. Police organization at district level.

MODULE-3 Acts Relating to Socio-economic and Environmental Crimes Teaching Hours: 15 Hours

Narcotic Drugs and Psychotropic Substances Act. Essential Commodity Act. Drugs and Cosmetics Act. Explosive Substances Act. Arms Act. Dowry Prohibition Act. Prevention of Food Adulteration Act. Prevention of Corruption Act. Wildlife Protection Act. I.T. Act. Environment Protection Act. Untouchability Offences Act

References and Suggested Readings:

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

CUTM2458: Fingerprint Science

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		
					TA-1 & TA-2		MSE						Total
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To learn about fingerprint science, its development and various aspects.
2. To learn about various classification systems of fingerprints.
3. To learn about development and analysis of fingerprint by various physical and chemical methods.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To explain the concepts involving the fundamental principles on which the science of fingerprinting is based
CO-2	To demonstrate the pattern types and the different systems of fingerprints classification.
CO-3	To acquire the skills relating to the physical and chemical techniques of developing fingerprints on crime scene evidence.

MODULE-1 History and Basics of Fingerprints Teaching Hours: 15 Hours

History of Fingerprint Science, main function of Fingerprint bureau, main function of Fingerprint bureau, Development of Fingerprint Science, Composition of sweat and secretion of sweat, Pattern types & Ridge characteristics, Ridge tracing, Ridge counting.

MODULE-2 Classification Methods of Fingerprints Teaching Hours: 15 Hours

Various systems for Fingerprint classification, Henry classification system, numerical value, symbol, primary classification, secondary classification, sub-secondary classification and final classification, NCIC classification, AFIS classification.

MODULE-3 Development and Analysis of Fingerprint Teaching Hours: 15 Hours

Development, Identification & Presentation of Fingerprint, Known prints & Rolled impressions, Direct or Inked prints, Development of Latent Prints & Lifting techniques, Physical & chemical Methods: Powder techniques & Various chemical techniques, Processing of Post developed prints. Finger print comparison & Identification, Introduction to AFIS.

References and Suggested Readings:

1. David R. Ashbaugh; Quantitative and Qualitative Friction Ridge Analysis, CRC PressE. Roland Menzel; Fingerprint Detection, with Lasers, Second edition; Marcel, Dekker, Inc. USA.
2. James F. Cowger; Friction Ridge skin CRC Press London.
3. Mehta, M.K: Identification of Thumb Impression & Cross Examination of Finger Prints, N. Tripathi (P) Ltd, Bombay.
4. Moenssens: Finger Prints Techniques, Chitton Book Co. Philadelphia, New York.
5. Chatterjee S.K., Speculation in Finger print identification, Jantralekha, Printing Works, Kolkata.
6. Cowger, James F: Friction ridge skin: Comparison and Identification of Fingerprints; CRC Press, Boca Raton, New York.

CUTM2459: Questioned Document

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		Total
					Internal Exams				University Exams		University Exams (LPW)		
					TA-1 & TA-2		MSE						
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To learn about questioned documents, various tools for its examination and age of document.
2. To learn about fundamentals of handwritings, printed documents, and their comparison.
3. To learn about various alterations used in documents.
4. To learn about charred documents and its examination.
5. To learn about Examination of Counterfeit Indian Currency Notes, Passports, Visas, stamp pads, credit card, visa, seal and other mechanical impressions.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To explain the basic fundamentals of questioned documents.
CO-2	To understand the significance of class and individual characteristics in handwriting, natural variations and comparing different types of documents.
CO-3	To acquire skills for detecting frauds, forgeries and counterfeiting by examination of questioned documents.

MODULE-1 Basics of Questioned Document Teaching Hours: 15 Hours

Definition of Questioned Document, Types of Questioned Document, Preliminary Examination of Questioned Document. Basic Tools Needed for Forensic Document Examination- Ultraviolet, Visible, Infrared, and Fluorescence Spectroscopy, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus. Determining the Age and Relative Age of Documents.

MODULE-2 Fundamentals of Questioned Document Teaching Hours: 15 Hours

Comparison of Handwriting, Determination of sequence of strokes, Development of Individuality in Handwriting, Natural Variations and Fundamental Divergences in Handwriting, Class & Individual Characteristics.

Merits and Demerits of Exemplar and Non-Exemplar Samples During Comparison of Handwriting. Standards for Comparison of Handwriting, Comparison of Paper, Ink, Printed Documents, Typed Documents, Xeroxed Documents.

MODULE-3 Examination of Questioned Document Teaching Hours: 15 Hours

Alterations in Documents, Including Erasures, Additions, Over-Writing, and Obliterations. Indented and Invisible Writings. Charred Documents. Examination of Counterfeit Indian Currency Notes, Passports, Visas, stamp pads, credit card, visa, seal and other mechanical impressions.

References and Suggested Readings:

1. Hardless H.R. (1988). Disputed Documents, Handwriting and Thumbs –Print Identification, Profusely Illustrated. India: Low Book Co.
2. Rev. ED.; Ordway Hilton; Scientific Examination. I of Questioned Documents, Elsevier, NewYork.
3. Charles C. Thomas, I.S.Q.D. Identification System for Questioned Documents; Billy PriorBates Springfield, Illinois, USA.
4. Wilson R. Harrison; Suspect Documents -Their Scientific Examination; Universal LawPublishing, Delhi.
5. Hard less, H.R: Disputed Documents, handwriting and thumbs -print identification: profuselyillustrated, Low Book Co., Allahabad.
6. Morris, Ron, N: Forensic handwriting identification, Acad Press, London.
7. Kurtz Sheila: Graphotypes a new plant on handwriting, analysis, Crown Publishers Inc., USA.
8. Lerinson Jay; Questioned Documents, Acad Press, London.

CUTM2460: General Physics-II

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		
					TA-1 & TA-2		MSE						
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To learn about atom and their characteristics
2. To learn about nucleus and their properties
3. To learn the fundamentals of lasers and holography
4. To learn the basics of electricity and magnetism

Course Outcome: On successful completion of this course, the students should be able

CO	Statements
CO-1	To demonstrate about different atomic structures and radioactivity.
CO-2	To enhance their skills in different applications of laser
CO-3	To gain knowledge about electric field, magnetic field and electromagnetic induction.

MODULE-1 Atomic and Nuclear Physics Teaching Hours: 15 Hours

Atomic Physics: Structure of atom. Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Idea of discrete energy levels and electron spin: Franck-Hertz and Stern- Gerlach experiments, Significance of four quantum numbers, Pauli's exclusion principle, Orbital magnetic dipole moment, Orbital, spin and total angular momenta, and Vector model of atom.

Nuclear Physics and Radioactivity: Composition and size of nucleus, atomic masses, isotopes, isobars, isotones. Alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission and fusion.

MODULE-2 Lasers Teaching Hours: 15 Hours

Introduction to Lasers: Characteristics of laser light, Spontaneous emission, Stimulated emission, Stimulated absorption, Einstein coefficients, Characteristics of laser radiation, Population inversion and condition for light amplification, Essential components of the laser, Optical resonator, CW and pulsed laser, peak power and pulse energy.

Application of lasers: Holography: Formation of a hologram, Reconstruction of the hologram, Requirements, Application In forensic investigation.

MODULE-3	Electricity and Magnetism	Teaching Hours: 15 Hours

Electric field and potential: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. Electrostatic energy of a charged sphere.

Magnetic Field: Biot-Savart Law and its simple applications: straight wire and circular loop. Ampere's Circuital Law and its application solenoid and wire. Properties of magnetic field: curl and divergence. Magnetic Force on (a) point charge (b) current carrying Torque on a current loop in a uniform Magnetic Field.

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self-Inductance and Mutual Inductance. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.

Reference books:

1. Physics of atoms and molecules, B. H. Bransden and C. J. Joachain, 2003, Pearson.
2. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
3. Laser Fundamentals, William T. Silfvast, 2008, Cambridge University Press.
4. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw.
5. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education.
6. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edition, 1998, Benjamin Cummings.

CUTM2461: General Chemistry-II

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE						
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To learn about about various analytical techniques.
2. To learn about calibration and standards.
3. To learn about basic electrochemistry.
4. To learn about basic nuclear and radiation chemistry.

Course Outcome: On successful completion of this course, the students should be able

CO	Statements
CO-1	To enhance their skills about different analytical techniques and reagent preparation
CO-2	To demonstrate the laws and theories of electrochemistry
CO-3	To gain knowledge about nuclear forces, nuclear fission reaction and basics of radiation chemistry.

MODULE-1 Analytical Chemistry Teaching Hours: 15 Hours

Concepts of Controls & Standards: Calibration, Positive and Negative control, False positive and false negative results, Reference Standards, Certified Reference Materials, Internal Standards and Internal Standardisation Method, Standard Addition Calibration Method.

Statiscal Evaluation: Determinant and indeterminant errors, Normal error curve, Accuracy and Precision, Relative and standard deviation, Methods for minimizing errors, Criteria for rejection of observation, Significant figures and computation rules, Error propagation.

Precipitation: Desirable properties of gravimetric precipitates, Formation of gravimetric precipitates, Conditions for quantitative precipitations, Contamination in precipitates, Method for removal of impurities in precipitates, Steps involved in quantitative precipitation, Organic precipitants (oxine, dithizone, α-nitroso-(naphthol, cupferon, dimethyl glyoxime) in chemical analysis.

Analytical Reagents: Theoretical and practical aspects of the use of EDTA, cerate, iodate, bromate, chloramine-T, Karl Fischer and periodate reagents in chemical analysis.

Radio-Analytical Methods: Elementary theory, Isotope dilution and Neutron activation methods and applications.

MODULE-2 Electrochemistry Teaching Hours: 15 Hours

Arrhenius theory of electrolytic dissociation, Hydrolysis of salts, hydrolysis constant, buffer solutions, indicators and theory of acid-base indicators. Migration of ions: transference number and its determination by Hittorf methods. Conductance of electrolyte solutions, molar conductance of electrolyte and its splitting into ionic molar conductance, Kohlrausch law of independent migration of ions, ionic mobility. Application of conductance measurements:

determination of degree of dissociation and dissociation constant of weak electrolytes/acids, solubility of sparingly soluble salts, and Conductometric titrations.

MODULE-3 Nuclear and Radiation Chemistry Teaching Hours: 15 Hours

Nucleus and its classification, nuclear forces, nuclear binding energy, stability of nucleus. Radioactivity: Radioactive elements, general characteristics of radioactive decay, decay kinetics (decay constant, half-life, mean life period), units of radioactivity. Nuclear fission: the process, fragments, mass distribution, and fission energy. Nuclear reactor: the natural uranium reactor, classification of reactors, breeder reactor. Nuclear fusion and stellar energy.
Radiation chemistry: Elementary ideas of radiation chemistry, radiolysis of water and aqueous solutions, unit of radiation chemical yield (G-value), radiation dosimetry (Fricke's dosimeter), units of radiation energy (Rad, Gray, Rontgen, RBE, Rcm, Sievert)

Reference Books:

1. Modern Methods of Chemical Analysis', R.L. Pecscock, L.D. Shields, T. Cairns, and I.C. Mc William, 2nd Edition (197 6), John Willey, New York.
2. Basic Concepts of Analytical Chemistry', S.M.Khopkar, 2nd edition (1998), New Age International Publications, New Delhi.
3. Analytical Chemistry', G.D. Christian, John Willey & sons, New York (2001).
4. Instrumental Methods of Analysis', H.H. Willard, L.L. Merritt, and J.A.Dean, 6th edition(l986), CBS Publishers & Distributors, Shahdara, Delhi.
5. Principles of Instrumental Analysis, D.A. Skoog, F.J.Holler and T.A. Nieman, , 5th edition (l998), Horcourt Brace & Company, Florida.
6. Physical Chemistry, P. Atkins and J. De Paul, 8th Edition (2006), International Student Edition, Oxford University Press.
7. Physical Chemistry, P. C. Rakshit, 5th Edition (1988), 4th Reprint (1997), Sarat Book House, Calcutta.
8. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, and M. S. Pathania, 37th Edition (1998), Shoban Lal Nagin Chand & Co., Jalandhar.
9. Physical Chemistry, K. J. Laidler and J. M. Meiser, 3rd Edition, Houghton Mifflin Comp., New York, International Edition (1999).
10. Essentials of Nuclear Chemistry H. J. Arnikar, 4th Edition (1995), New Age International (p) Ltd., Wiley Eastern Ltd., New Delhi.

CUTM2462: General Biology-II

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. Knowledge of Human anatomy and physiology
2. Understanding of concept of evolution and ecology
3. Knowledge of Plant anatomy and physiology

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To demonstrate animal cell structure and physiological systems in an animal body
CO-2	To gain knowledge about the history of biological evolution and components of ecology.
CO-3	To demonstrate about plant anatomy and physiology

MODULE-1 Animal-Anatomy and Physiology Teaching Hours: 15 Hours

Animal cell and Animal tissues- Type, structure, location and function, Basics of Human physiology (Parts and their functions)-Digestive system, Respiratory system, Circulatory system, Excretory system, Skeletal system, Muscular system, Nervous system and Endocrine system, Entomology- General characteristics of Arthropoda, Characteristics features, classification of insects, Life cycle of insect (Flies, Beetles).

MODULE-2 Evolution and Ecology Teaching Hours: 15 Hours

Evolution:

Theories of Origin of life, Biological evolution and evidences for biological evolution, Theories of evolution; Mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection, Gene flow and genetic drift, Hardy - Weinberg's principle, Adaptive radiation

Ecology:

Ecological hierarchy, Habitat and niche, Components of environment, Effect of abiotic factors of environment, Ecological adaptations, Population and population attributes; population interactions, Ecosystem- Components; productivity and decomposition; energy flow; Ecological pyramids; Nutrient cycles; Ecological succession, Ecological services

MODULE-3 Plant-Anatomy and Physiology Teaching Hours: 15 Hours

Plant cell, Morphology of different parts of flowering plants- root, stem, leaf, flower, fruit and seed, Structure of pollen grain and its role in species identification, Diatoms-Characteristic and structure, Plant anatomy-Location and functions of different tissues and tissue systems in flowering plants, Basics of plant physiology-Transport in Plants, Growth and Development.

References and Suggested Readings:

1. Jennifer L. Regan, Andrew F. Russo, Cinnamon L. VanPutte (2021) Seeley's Essentials of Anatomy and Physiology, 11th Edition. McGraw Hill
2. Elaine N. Marieb, Suzanne Keller ssentials of Human Anatomy & Physiology Global Edition, 12th Edition ,Pearson Education
3. Richard Crang, Sheila L. Sobaski (2018) Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants, 1st Edition, Springer
4. S N Pandey, B K Sinha (2005)Plant Physiology, 4th Edition, S Chand
5. William G. Hopkins , Norman P A Huner (2013) Introduction to Plant Physiology 4th Edition, Wiley India
6. T M Smith, R L Smith (2015) Elements of Ecology Global Edition, 9th Edition , Pearson Education India
7. Douglas J. Futuyma (2020), Mark Kirkpatrick Evolution, 4th Edition, Oxford University Press

CUTM2470 : English

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
2	0	0	2	2	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To develop understanding about basic grammar.
2. To learn how to write different letters, paragraph, essay, etc.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about verbs, articles, and proper application of basic grammar
CO-2	To improve formal and official writing skills

om

MODULE-I Basic Grammar Teaching Hours: 15 Hours

Articles, Verbs: Auxiliaries, Finite and Non Finites, Time and Tens, Subject: Verb Agreement (concord), Active and Passive Voice, Narration, Single word / verb substitution, Common Error, Comparison, Antonym, homonym, Sentence, Building (Vocabulary).

MODULE-2 Formal and Official Writing Teaching Hours: 15 Hours

Précis, Essay, Paragraph Writing and Comprehension, Official Correspondence, Memorandum; Circular Letter.

References and Suggested Readings:

1. English Grammar- N.D. Turton, ABC of Common Grammatical Error for learners and Teachers.
2. English Grammar- Dr. K.K. Ramchandran et al; business Communication.
3. Technical English- Sharon j Gerson and Steven M Gerson
4. Angela Burt, Quick Solutions to common Error in English.
5. W. Foulsham, The Complete letter writer.
6. John East wood- Oxford guide to English Grammar.

CUTM2463: Practical-II

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
0	0	8	4	8							100	6:00	100

Course Objectives:

At the end of course, students will be gaining the hands on training in the following modules.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To elucidate on the cases that falls under the purview of criminal and evidence law.
CO-2	To acquire skills for analyzing fingerprint patterns, classification and their detection. They will also be able to detect forgeries, frauds and counterfeiting in documents.
CO-3	To demonstrate aspects of resistance, current, magnetic field. They will be able to prepare molar solutions and also prepare temporary slides for animal tissue.

MODULE-I Criminal and Evidence Law

1. To study a crime case in which an accused was punished under different sections.
2. To study a case in which Drugs and Cosmetic Act was invoked.
3. To study a case in which Explosive Substances Act was invoked.
4. To study a case in which Arms Act was invoked.
5. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.

MODULE-2 Fingerprint

1. To record plane and rolled fingerprints.
2. To identify different fingerprint patterns.
3. To carry out digit classification of fingerprints.
4. To investigate physical method of fingerprint detection.
5. To use different light sources for enhancing to develop fingerprints.

MODULE-3 Questioned Documents

1. Authorship identification through handwriting.
2. Identification of forgery in signatures.
3. Detection of tampering in documents.
4. Variation in handwriting under natural conditions.

MODULE-4 General Physics-II

1. Determine the divergence and beam spot of a laser beam.
2. To use a digital multimeter for measuring dc voltage, dc current, resistance and capacitance.
3. B-H curve-Determination of the hysteresis energy loss.
4. To determine the resistance per cm of a given wire by plotting a graph of potential difference versus current, and hence determining the resistivity.
5. Measurement of field magnetic field strength and its variation in a solenoid.

MODULE-5 General Chemistry-II

1. Preparation of molar solutions and molal solutions of NaOH & HCl.
2. Quantitative estimation of protein in any food sample by UV-Visible spectroscopy
3. Complexometric titration of Zinc using EDTA.
4. Determination of oxidation & reduction potential of Potassium ferrocyanide by Electrochemical workstation.
5. To perform test for alcohols using positive and negative controls.

MODULE-6 General Biology-II

1. Preparation of temporary slides of animal tissue
2. Separation of plant pigments through paper chromatography
3. Test for presence of urea, sugar, albumin and bile salt in urine.
4. Study the plant population density and frequency by quadrat method.
5. Study of different soil samples for texture, moisture content, pH and water holding capacity.

SEMESTER-III

CUTM2464 Forensic Psychology

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE						
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hrs	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. Understand the practical role played by contemporary forensic psychologists in society
2. Demonstrate a knowledge of forensic psychology as a discipline and research methods used within forensic psychology
3. Demonstrate awareness of the fundamental application of psychology, as a science, to understand key forensic issues

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To describe the overview of forensic psychology and legal aspects of forensic psychology.
CO-2	To acquire the skills involving the tools and techniques required for detection of deception and the critical assessment of advanced forensic techniques.
CO-3	To rationalize the significance of forensic psychology in crime and its assessment.

MODULE-1 Basics of Psychology Teaching Hours: 15 Hours

Psychology Introduction Scope and importance, Principles of development, Attention and perception, Process of learning, Memory and forgetting, Motivation, Attitudes, Values of emotions, Behavioural problems, Conflict and use of defence mechanisms, Psychology of criminal behaviour.

MODULE-2 Techniques of Forensic Psychology Teaching Hours: 15 Hours

Forensic Psychology: Truth and Deception, Psychology of lying, Various methods of lie detection, Principles of Polygraph, Legal aspects, Narco analysis, Brain Fingerprinting, BEOS: History, Importance as an investigative tool, methods as use of drugs, Hypnosis etc., Limitations and legal aspects.

MODULE-3	Forensic psychology of crime	Teaching Hours: 15 Hours

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

References and Suggested Readings:

1. Bruce A. Arrigo, Stacey L. Shipley: Introduction to Forensic Psychology, Second Edition.
2. Jadunath Sinha: Elementary Psychology.
3. Bruce, A. A: Introduction to Forensic Psychology, Academic Press, 2000.
4. Shapiro, D. L.: Forensic Psychology Assessment – An Investigative Approach, Allen & Bacon, 1991.
5. Kleiner, M.: Handbook of Polygraph Testing, Academic Press, 2002.
6. Turrey, B.: Criminal profiling – An Introduction to Behavioral Evidence Analysis, Academic Press, 1999.

CUTM2465: Forensic Chemistry - I

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
Th	Tu	Pr	C	TCH	Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hrs	
					Marks	Hrs	Marks	Hrs					
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. To help students learn basics of forensic chemistry.
2. To help students learn about quality management.
3. To study and understand Narcotics and psychotropic substances.
4. To learn about explosives, arson and petroleum products.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To explain the significance of quality management.
CO-2	To understand about Narcotic drugs and Psychotropic substances along with their analysis and also about the significance of bomb scene management.
CO-3	To demonstrate the methods of analyzing trace petroleum products in crime scene, arson evidence and explosives.

MODULE-1 Quality Management Teaching Hours: 15 Hours

Forensic chemistry:
Introduction to forensic chemistry, Types of cases/exhibits received for analysis, Overview of forensic chemical analysis

Quality management:
Introduction to Quality, Quality Assurance, Quality control, TQM
Definition of Accreditation, History and development of ISO
Importance of accreditation in Forensic science laboratories, Process of accreditation, Quality system, International Laboratory Accreditation Co-operation (ILAC), Asia Pacific Laboratory Accreditation Co-operation (APLAC). American Society of Crime Laboratory Directors (ASCLD)
Traceability and Validation of new methods, measurement of uncertainty, Equipment maintenance and calibration
Proficiency testing, internal audit/External audit, MRM Training and conferences

MODULE-2 Narcotic Drugs & Explosives Teaching Hours: 15 Hours

Narcotic Drugs &Psychotropic Substances:
Introduction to NDPS drugs, Controlled Substances, Classification of controlled substances, Precursor chemicals, Narcotic raids and clandestine drug laboratories investigation, Mandatory provisions of NDPS Act, 1985.
Drug addiction (Physical & Psychological), Drug dependence and Drug Tolerance.
Designer Drugs, Analysis of Drug of abuse by colour test and TLC.
Case studies.

Explosives:
Introduction, Classification and chemistry of explosives; Post blast investigation.
Systematic examination of explosive and explosion residues (organic and inorganic) by colour test and TLC.
Case studies.

MODULE-3 Fire & Petroleum products Teaching Hours: 15 Hours

Introduction to Fires &Arson Investigation:
Introduction to Thermodynamics and Chemistry of Fire, Investigation of Fire and Arson, Forensic Analysis of Fire Debris by Instrumental methods, Case studies.

Forensic Analysis of Petroleum Products:
Introduction to Petroleum Products and Analysis of Petrol, Kerosene and Diesel as per BIS Specifications. Case Studies

Reference Books:

1. J ASiegel, P.J Saukko (2000) Encyclopaedia of Forensic Sciences Vol. I, II and III, Acad. Press.
2. NABL -, Guide for Internal audit and Management Review for Laboratories.
3. NABL-210, Assessor Guide Issue No.3, 1.5.2002.
4. DFSS: Manuals of Forensic Sciences.
5. Maudham Bassett et al.; Voget's Textbook of Quantitative Chemical Analysis, 6th Ed. Longman Essex.
6. Brean S. Furniss Etal; A.I. Vogel Textbook of Practical Organic Chemistry, Addison Wesley Longman, Edinburg.
7. D A Skoog, D.M. West, F.J. Holler; Analytical Chemistry – An Introduction, 7th Ed. Saunders College Pub, Philadelphia, USA.
8. Boudreau JE, Etal; Arson & Arson Investigation, Survey & Assessment National Institutes of Law Enforcement, U.S. Deptt. Of Justice, U.S. Govt Printing Press.
9. Dettean J D; Kirk's Fire Investigation, 5th Ed. Prentice Hall, Eaglewood Cliffs, N. J.
10. Yinon Jitrin; Modern Methods & Application in Analysis of Explosives, John Wiley & Sons, England.
11. Working Procedure Manual – Chemistry, Explosives and Narcotics, BPR&D Pub.
12. C.A. Watson; Official and Standardized Methods of Analysis, Royal Society of Chemistry, UK.
13. Feigl; Spot Test in Inorganic Analysis, Elsevier Pub. New Delhi.
14. Feigl; Spot Test in Organic Analysis, Elsevier Pub. New Delhi.

15. Silverman; Organic Chemistry of Drug Design & Drug Action, Elsevier Pub. New Delhi.
16. Abraham Burger; Medicinal Chemistry & Drug Discovery, 6 Vol Set, 6th Ed John Wiley & Sons, NY.
17. NDPS Act, 1985.

CUTM2466 Forensic Physics - I

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		Total
					TA-1 & TA-2		MSE						
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hr	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. Students will be able to explain the properties of the materials, glass and soil nature
2. Students will be able to examine different types of papers and paint.
3. Students will gain understanding of road collisions and reconstruction of the incidents.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To demonstrate the methods for examination and analysis of glass evidences.
CO-2	To understand the composition of paint and its forensic examination.
CO-3	To acquire skills for analysis of soil sample from a crime scene.

MODULE-1 Glass Teaching Hours: 15 Hours

Introduction to glass, Types of glass and their compositions, Forensic examination of glass fractures under different conditions, determination of direction of impact: hackle marks, backward fragmentation, Physical measurements of glass, color and fluorescence, physical matching, density comparison, physical measurements, refractive index by refractometer, elemental analysis, and interpretation of glass evidence, Case Studies.

MODULE-2 Paints Teaching Hours: 15 Hours

Introduction, Composition, Manufacture of Paint, types of paint, Forensic Examination of Paints and Coatings: Collection and Preservation of paint samples, macroscopic and microscopic techniques for the characterization of Paint Fragments, Physical , Chemical
& Instrumental analysis of paint, , interpretation of Paint Evidence, Case Studies.

MODULE-3	Soil	Teaching Hours: 15 Hours

Soil and its composition, Classification of soil, Collection and preservation of soil as a evidence, analysis of soil samples: Physical, chemical and instrumental, interpretation of soil evidence, Soil as a geomarker, Case Studies.

References and Suggested Readings:

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

CUTM2467: Basics of Computer & Biometrics

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		
					Internal Exams				University Exams		University Exams (LPW)		
Th	Tu	Pr	C	TCH	TA-1 & TA-2		MSE						Total
					Marks	Hrs	Marks	Hrs	Marks	Hrs	Marks	Hr	
3	0	0	3	3	50	00:45	50	01:30	100	03:00	-	-	200

Course Objectives:

1. Number systems
2. Computer fundamentals
3. Basics of Computer Networking and Internet
4.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To understand about the number systems, basics of operating systems involved and computer related crimes.
CO-2	To acquire skills in computer networking and elucidate crime cases related to networking and internet.
CO-3	To describe the basics of biometry and illustrate the classification of biometric processes.

MODULE-1 Number Systems and Computer Fundamentals Teaching Hours: 15 Hours

Introduction to Binary, Octal, Decimal and Hexadecimal Number Systems; Conversion from Binary to Decimal, Decimal to Binary, Binary to Hexadecimal, Hexadecimal to Binary; Representation of signed and unsigned Binary Numbers; Arithmetic, Logical, Relational and Shift Operations on Binary Numbers; ASCII and UTF.

Definition of Computer, History, Key Terms, Hardware and Software, Primary and Secondary Storage Devices; Basics of Operating System, Introduction to Filesystems, Windows and Linux OS architectures; Introduction to Computer Related Crimes.

MODULE-2 Basics of Computer Networking and Internet Teaching Hours: 15 Hours

Definition of Computer Network, Components of Network, Topology and Types of network, Introduction to OSI layer and TCP / IP protocol suite, Communication Devices, IP and MAC Addresses, Understanding Internet, Introduction to websites and webpages; understanding Firewall, IDS and IPS; Introduction to Network and Internet Related Crimes.

MODULE-3 Introduction to Biometrics Teaching Hours: 15 Hours

Introduction - Biometric fundamentals – Biometric technologies – Biometrics vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics – Key biometric processes: verification, identification and biometric matching – Performance measures in biometric systems. Physiological and behavioural biometrics.

References and Suggested Readings:

1. Operating Systems | Internals and Design Principles, Ninth Edition by William Stallings
2. Modern Operating Systems 4eby Tanenbaum
3. Structured Computer Organization 6/e PaperbackbyTanenbaum
4. Computer Networks: A Top - Down Approach by FOROUZAN
5. TCP/IP Protocol Suite E/4 by Behrouz A. Forouzan

	Core Elective - I	L	T	P	Cr	2	0	0	2

	Skill Based Elective - III	L	T	P	Cr	2	0	0	2

Yoga and its benefits

CUTM2468: Practical-III

Teaching and Evaluation Scheme

Teaching Scheme					Evaluation Scheme								
					Theory						Practical		Total
					Internal Exams				University Exams		University Exams (LPW)		
					TA-1 & TA-2		MSE		Marks	Hrs	Marks	Hr	
Th	Tu	Pr	C	TCH	Marks	Hrs	Marks	Hrs					
0	0	8	4	8							100	6:00	100

Course Objectives:

At the end of course, students will be gaining the hands on training in the following modules.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To elucidate different cases involving criminal profiling and importance of psychological assessment in gauging criminal behavior.
CO-2	To acquire skills in analysis of NDPS drugs, explosives, petroleum products by TLC.
CO-3	To demonstrate the methods in analyzing properties of glass, paint and soil. They will also be able to gain knowledge on basics of computer applications.

MODULE-I **Forensic Psychology**

1. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.
2. To prepare a report on relationship between mental disorders and forensic psychology.
3. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
4. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.
5. To cite a criminal case in which narco analysis was used as a means to detect deception.

MODULE-2 Forensic Chemistry-I

1. Identification of NDPS drugs by colour test and TLC.
2. Detection of low explosives by chemical/colour test and TLC.
3. Examinations of petroleum products as per BIS specifications.
4. Identification of alcoholic beverages as per BIS specifications.
5. Analysis of phenolphthalein in bribe trap cases.

MODULE-3 Forensic Physics-I

1. Density gradient analysis of soil samples.
2. Determination of density of glass by specific gravity bottle method
3. Restoration of erased identification marks.
4. Determination of refractive index of glass and liquid.
5. Comparison of broken glass bangles.
6. Physical matching of broken pieces of different objects.
7. Determination of tensile strength of rope/dupatta.
8. Physical examination of paint samples by microscopic method

MODULE-4 Basics of Computer

1. Learning how to install and configure Linux OS
2. Understanding basic Windows OS administration (setting IP address, other network settings, adding/removing software/hardware, device driver settings, configuring printer, etc.).
3. Configuring Widows Firewall and Defender
4. Working with Windows Backup and Restore options

SYLLABUS FOR CORE ELECTIVES

GROUP-A

CUTM2473	Anti-Dope Forensics	L	T	P	Cr	2	0	0	2

Course Objectives:

1. Anti-Dope Forensics & Drugs of Abuse in Sports
2. Pharmacodynamics and Pharmacokinetics of Dope drugs
3. Dope testing in Humans & Animals

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about different drugs used in case of doping
CO-2	To understand the importance of pharmacokinetics and pharmacodynamics of doping drugs
CO-3	To gain skills on testing different drugs from body fluids and understanding guidelines for dope testing

MODULE-1 Introduction to Anti-Dope Forensics & Drugs of Abuse in Sports Teaching Hours: 15 Hours

Doping & Sports Forensics; Problem of Doping in Sports; Types of Sports under anti-doping norms; Introduction to Dope Drugs; New medicines and medical technologies; Stimulants, Anabolic Steroids, Energy Boosters, Contraband Drugs, Growth Hormones, Diuretics, Synthetic Oxygen Carriers, Blood Doping, Insulin, Gene Doping; Therapeutic drug use exemptions.

MODULE-2 Pharmacovigilance and Legal aspects Teaching Hours: 15 Hours

Pharmacodynamics and Pharmacokinetics of Dope drugs; Protecting the health of the athlete and maintaining clean sport; Healthcare providers at major sporting events; National & International Laws governing doping in sports; Anti- Doping Agencies NADA & WADA; Need of Doping Education & Awareness among athletes.

MODULE-3 Testing & Analysis Teaching Hours: 15 Hours

Dope testing in Humans & Animals; Guidelines for dope testing; Role of Body Fluids in Analysis of Dope drugs (Blood, Urine, and Saliva & Sweat); International Standards for Dope testing Laboratories and Accreditation, Effective Testing Programs. Case Studies.

Suggested readings:

1. W. Goodwin, A. Linacre, H. Sibte, An Introduction to Forensic Genetics, John Wiley & Sons, England, 2007, pp. 17-50.
2. World Anti-Doping Agency (WADA), The World Anti-Doping Code, Montreal, 2009 (accessed April 2011) http://www.wada-ama.org.
3. At-a-Glance - About Anti-Doping." World Anti-Doping Agency. N.p., 04 July 2014. Web. 18 Apr. 2016.
4. At-a-Glance - The Doping Control Process." World Anti-Doping Agency. N.p., 04 July 2014. Web. 18 Apr. 2016.
5. Reardon, Claudia L., and Creado, Shane. "Drug Abuse in Athletes." Substance Abuse and Rehabilitation (2014): 95-105. Web. 29 Feb. 2016.
6. 2016 Prohibited List." World Anti-Doping Agency. N.p., 29 Sept. 2015. Web. 18 Apr. 2016.
7. Moston, S., & Engelberg, T. (2016). Detecting Doping in Sport (1st ed.). Routledge. https://doi.org/10.4324/9781315718514.

	Incident Response Management	L	T	P	Cr	2	0	0	2

Course Objectives: To understand the -

1. Key concepts of information security
2. Incident response
3. Steps involved in Incident handling

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about the key concepts of Incident management
CO-2	To enhance their skills in handling an incident response scene
CO-3	To demonstrate the importance of incident response plan

MODULE-1 Introduction to Incident Response Teaching Hours: 15 Hours

Computer Security Incident, Key Concepts of Information Security, Incident Management, Purpose of Incident Management, Need and Goals of Incident Response, Incident Response Plan, Signs / Indicators of an Incident, Incident Categories, Incident Prioritization, Incident Response, Incident Handling, Estimating Cost of an Incident, Incident Reporting, Incident Response Team, Incident Response Team Members Roles and Responsibilities.

MODULE-2 Management of Incident Response Teaching Hours: 15 Hours

Steps of Incident Response / Handling: 1: Identification, 2: Incident Recording, 3: Initial Response, 4: Communicating the Incident, 5: Containment, 6: Formulating a Response Strategy, 7: Classification, 8: Investigation, 9: Data Collection, 10: Forensic Analysis, 11: Evidence
Protection, 12: Notifying External Agencies, 13: Eradication, 14: Systems Recovery, 15: Documentation, 16: Damage and Cost Assessment, 17: Lessons Learned, 18. Review and Update the Response Policies.

MODULE-3 Goals of Incident Response Teaching Hours: 15 Hours

Goals of Incident Response, Incident Response Plan, Incident Identification, Incident Prioritization, Incident Handling, Estimating Cost of an Incident, Incident Reporting, Incident Reporting Organizations, Vulnerability Resources.

References and Suggested Readings:

1. CERT IN Guidelines.
2. ENISA Manuals
3. Computer Incident Response and Forensics Team Management: Conducting a Successful Incident Response, Leighton Johnson, Syngresss
4. Incident Handling and Response: A Holistic Approach for an efficient Security Incident Management by Jithin Alex,
5. The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk, N.K. McCarthy, Incident Response & Computer Forensics, Jason T. Luttgens, McGraw-Hill

	Multimedia Forensics	L	T	P	Cr	2	0	0	2

Course Objectives:

1. Introduction to multimedia forensics and multimedia files
2. Source identification of multimedia evidences
3. Enhancement and authentication of multimedia exhibits
4. Content analysis of the files

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about handling of multimedia evidences
CO-2	To enhance skills for audio, video, image examination
CO-3	To gain skills on handling, preservation and management of CCTV surveillances.

MODULE-1 Introduction to Multimedia Forensics Teaching Hours: 15 Hours

Need of multimedia forensics, multimedia tools, their applications, forgeries in media files, Handling and preservation of multimedia files, Legal Aspects of digital multimedia evidence, and recovery of audio and video files, copyright infringement, plagiarism and related laws.

MODULE-2 Audio, Video and Image Examination Teaching Hours: 15 Hours

Authentication of audio, video and image file, enhancement techniques, forensic voice analysis, video/image analysis, Digital Signal Processing, Origin and integrity of multimedia files, digital watermarking, LPC, DFT and FFT, Multimedia file Formats, Tools for Analysis

MODULE-3 CCTV Forensics: Teaching Hours: 15 Hours

Role and functioning of CCTV cameras, Types of CCTVs, CCTV footage analysis, Handling, Preservation and transport of CCTV footages, Video Management system, CCTV surveillance, Intelligent Video analytics and related case studies

Reference books:

1. Forensic Speaker Identification by Phil Rose & James R Robertson
2. Forensic Voice Identification by Harry Hollien
3. The Acoustic Analysis of Speech by Ray D Kent & Charles Read
4. Voice Recognition by Richard L Klevans & Robert D Rodman
5. Multimedia Forensics and Security: Foundations, Innovations, and Applications by Mohamed Mostafa Fouad et al
6. Multimedia Forensics and Security by Chang-Tsun Li
7. Intelligent Video Surveillance Systems by Jean-Yves Dufour
8. Digital Image Processing by Rafael Gonzalez & Richard Woods
9. Digital Image forensics by Roy, A. et al

	Forensic Statistics	L	T	P	Cr	2	0	0	2

Course Objectives:

At the end of course, students will be able to explain;

1. Importance of statistics in Forensic Science
2. Different types of distributions; Normal, Binomial and Poisson
3. Concept of probability theory, Chi square test, Student's t-test etc.

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about standard deviation, mean, median and mode and other statistical methodologies
CO-2	To perform different probability distribution functions
CO-3	To gain skills on application of different statistical tools and techniques

MODULE-1 Introduction to statistics Teaching Hours: 15 Hours

Importance of statistics in interpreting forensic data in research work and quality control, Data, Population, Distribution, Location, Random experiment, Brief introduction to sampling and data collection, Frequency distribution, Concept of measures of central tendencies, Normal distribution, Arithmetic mean, Median & Mode concept of measures of dispersion, Variance, Normal distribution, Variance, Standard Deviation, Coefficient of variation.

MODULE-2 Introduction to Probability distribution functions Teaching Hours: 15 Hours

Concept of probability, Definitions of probability, Discrete random variables and probability distributions, Addition, multiplication and Bayer's theorem & applications, Probability in Forensic Evidence, Concept of random variable, Discrete and continuous, Some examples, Concept of probability distribution, Binomial, Poisson, Normal distribution , Definitions, statements of properties of above distribution and examples, Simple linear regression and correlation, Concept of computational methodology, Examples, Concept of tests of hypothesis, Null and alternative hypothesis , Critical region , Types of errors & level of significance

MODULE-3 Statistical tools and techniques **Teaching Hours: 15 Hours**

Large samples tests, Test for single mean, Difference of means, Single proportion and difference of proportion examples - Chi square test for goodness of fit and test for independence of attributes, Examples, Hypothesis testing for one or two population means, Student's t-test, t-test for simple mean, Difference of means, Examples. Hypothesis testing for small sample sizes and multinomial experiments, Fisher's exact test, Analysis of variance and multiple comparison tests, F-test for equality of variance, Examples, Concept of analysis of variance, Computational procedure for ANOVA one way and two way classification, Examples.

Suggested Reading:

1. David Lucy: Introduction to Statistics for Forensic Scientists, Wiley, 2004

2. Colin Aitken & Franco Taroni: Statistics and E valuation of Evidence for Forensic Scientists (Statics in

practice)

3. Wing kam Fung & Yue-Quing Hu: Statistical DNA Forensics, Theory Methods & Computation, Wiley,

2008.

4. I. W. Evett & B. S. Wier: Interpreting DNA Evidence – Statistical Genetics for Forensic Scientists, 1998

5. Miller, J. C. and Miller, J. N.: Statistics for Analytical Chemistry, Ellis Horwood, 1988

6. Fisher, R. A.: Statistical Methods for Research Workers, John Wiley, 1954

7. Sokal, R. R. and Rolf, F. J.: Biometry – Principles and Practices of Statistics in Biological Research, Freeman, 1981

8. Bhaskar Rao T.: Methods of Biostatistics, Paras, 2001.

9. Rama Krishnan P., Biostatistics, Saras, 1995.

10. Meier, P. C. and Zund, R. E.: Statistical Methods in Analytical Chemistry, Wiley, 2000.

11. Rao, V. K., Biostatistics – A Manual of Statistical methods for use in Health, Nutrition and Anthropology,

Jaypee Medical Pub., 1996.

	Accident Investigations	L	T	P	Cr	2	0	0	2

Course Objectives: To understand about

1. Motor vehicle accident
2. The analysis of Pre-crash and Post-crash movement
3. Tachograph data & Tachograph charts

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about source of accident and its investigation procedure
CO-2	To understand the aspects of accident analysis
CO-3	To gain skills in interpreting tachograph charts

MODULE-1 Motor Vehicle Accidents Teaching Hours: 15 Hours

Accident scene, Sources of forensic information, Eyewitness accounts, Extent of vehicle damage, Visibility conditions, Photographs of accident site, Estimation of speed, Tire marks, skid marks, scuff marks, Maintenance of vehicles, Abandoned vehicles, Importance of air bags, Railway accidents.

MODULE-2 Accident Analysis Teaching Hours: 15 Hours

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

MODULE-3 Tachographs Teaching Hours: 15 Hours

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

References and Suggested Readings:

1. T.S. Ferry, Modern Accident Investigation and Analysis, Wiley, New York (1988).
2. D. Lowe, The Tachograph, 2nd Edition, Kogan Page, London (1989).
3. T.L. Bohan and A.C. Damask, Forensic Accident Investigation: Motor Vehicles, Michie Butterworth, Charlottesville (1995).
4. S.C. Batterman and S.D. Batterman in Encyclopedia of Forensic Sciences, Volume 1, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

	Immunology and Immunological Techniques	L	T	P	Cr	2	0	0	2

Course Objectives:
To understand about

1. Immunology
2. Fundamentals of Antigen and Antibody
3. Different techniques to study antigen-antibody interactions

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about the immune system and organs involved
CO-2	To understand the concept of antigens, antibodies and antigen-antibody interactions
CO-3	To gain skills on performing different immunotechniques

MODULE-1 Overview of Immunology Teaching Hours: 15 Hours

Phylogeny of immune system, Innate and Acquired immunity, Clonal nature of immune response, Cells and Organs of the immune system: Hematopoiesis and differentiation, B-lymphocytes, T- lymphocytes, Macrophages, Dendritic cells, Natural killer cells, Lymphokine activated killer cells, Eosinophils, Neutrophils and Mast cells, Organization and structure of lymphoid organs.

MODULE-2 Antigen and Antibody Teaching Hours: 15 Hours

Antigen – Epitope, essential factors for antigenicity, haptenes and adjuvant. Antibody: structure and function, antigenic determinants on immunoglobulins, isotypic, allotypic and ideotypic variants, antigen and antibody interactions, and their importance, Major histocompatibility complex and their importance in Forensics, Antigen Processing and presentation, Cytokines and their role in immune regulation.

MODULE-2 Immunotechniques Teaching Hours: 15 Hours

Different techniques to study antigen-antibody interactions, immunodiffusion, Immunoelectrophoresis, radioimmunoassay, ELISA, immunohistochemistry, development of dot blot, Flow cytometry, production of monoclonal and polyclonal antibodies, hybridoma technology, Vaccine, Concepts of vaccines, whole-organism vaccines, recombinant vaccines, DNA vaccine, synthetic peptide and multivalent sub unit vaccines., different strategies of vaccine development.

Reference Books

1. 1.J. Owen, J. Punt, S. Stranford, (2012) Kuby Immunology (8th Edition), WH Freeman
2. and Company, USA.
3. 2.J.M. Berg, J.L. Tymoczko, L. Stryer. (2012) Biochemistry (7th Edition), WH Freeman
4. and Company, USA.
5. 3.D. Male, J. Brostoff, D. Roth, I. Roitt, (2012) Immunology (8th Edition), Saunders,
6. Elsevier, USA.
7. 4.K. Murphy (2011) Janeway's Immunobiology (8th Edition), Garland Science, USA.
   5. A. Abbas, A. Lichtman, S. Pillai, (2014) Cellular and Molecular Immunology (8th
8. Edition), Saunders, Elsevier, USA

Skill Based Elective

CUTM2469	Communication skill	L	T	P	Cr	2	0	0	2

Course Objectives:

At the end of course, students will be able to;

1. Improve the communication skills
2. Understand the importance of the body language and gesture

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To develop interpersonal communication skills.
CO-2	To improve their listening, reading and writing skills

MODULE-1 Importance and process of Communication Teaching Hours: 15 Hours

Verbal and Non-verbal process of Communication, How to face an interview, Group Discussion, How plan and conduct the Interviewer, importance of body language and gesture in interview, eye contact and appearance during interview process.

MODULE-2 Different skills and Its importance Teaching Hours: 15 Hours

Listening, Developing Reading Skills, Developing Conversational skills, Technical Writing skills.

References and Suggested Readings:

1. Sreevalsan, MC; Spoken English, Vikash Publishing House, New Delhi.
2. Communication Skills; Sanjay Kumar, Pushphate, Oxford.
3. Krishna Mohan, Meera Banarjee, Developing Communication Skills.
4. Frank O' Connor, Phonetics, Pengiun.
5. Business Correspondence and Report Writing- Sharma and Krishna Mohan- Tata Mgraw.

CUTM2470	English	L	T	P	Cr	2	0	0	2

Course Objectives:

At the end of course, students will be able to;

1. Improve English speaking
2. Communicate official letters and circular

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about verbs, articles, and proper application of basic grammar
CO-2	To improve formal and official writing skills

MODULE-1 Basic Grammar Teaching Hours: 15 Hours

Articles , Verbs: Auxiliaries, Finite and Non Finites, Time and Tense , Subject: Verb Agreement (concord), Active and Passive Voice, Narration, Single word / verb substitution, Common Error, Comparison, Antonym, homonym, Sentence, Building (Vocabulary).

MODULE-2 Formal and Official Writing Teaching Hours: 15 Hours

Précis, Essay, Paragraph Writing and Comprehension, Official Correspondence, Memorandum; Circular Letter.

References and Suggested Readings:

1. English Grammar- N.D. Turton, ABC of Common Grammatical Error for learners and Teachers.
2. English Grammar- Dr. K.K. Ramchandran etal; business Communication.
3. Technical English- Sharon j Gerson and Steven M Gerson
4. Angela Burt, Quick Solutions to common Error in English.
5. W. Foulsham, The Complete letter writer.
6. John East wood- Oxford guide to English Grammar.

CUTM2471	Yoga and its benefits-I	L	T	P	Cr	2	0	0	2

Course Objectives:

At the end of course, students will be able;

1. To perform various Pranayam
2. To understand the power of meditaton
3. To understand the impact of yoga on health

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about the components of self and self identity
CO-2	To understand the importance of pranayama and its impact on human body

MODULE-1 Self and Self Identity Teaching Hours: 15 Hours

- Concept of Self and Self-identity
- Indian Concept of Self with reference to Satva, Rajas and Tamas Guna
- Constituent of Panch Kosh
- Components of Self – Attitude, Beliefs, Values

MODULE-2 Pranayama Teaching Hours: 15 Hours

Foundations of Yoga: History, Evolution of Yoga and Schools of Yoga.

Perform any five;

1. Anulom vilom,
2. Bhrastika,
3. Kapalbhanti,
4. Shitali,
5. Sitkari,
6. Bhramari,
7. Surya bhedan
8. Chandra Bhedan

CUTM2472	Yoga and its benefits-II	L	T	P	Cr	2	0	0	2

Course Objectives:

1. To apply the knowledge yoga in the well-being of self and society
2. To explain the concept of Spiritualism and Integral Humanity
3. To perform various Asanas

Course Outcome : On successful completion of this course, the students should be able

CO	Statements
CO-1	To gain knowledge about spiritual awareness and its integration in daily life
CO-2	To gain skill in performing different asanas

MODULE-1 Development of Spiritual Self Teaching Hours: 15 Hours

- Concept of Spiritual Self, Spiritualism and Integral Humanity
- Process of Self-awareness, Self-observation, Introspection and Austerity
- Concept of Sthitpragya (Bhagwad Geeta Ch-2)
- Yoga as a tool for Integration of Individual and Universal Self (Ashtang Yog)

MODULE-2 Perform Asanas, (Any Twelve) Teaching Hours: 15 Hours

a) Sitting Posture: Matsyendrasana, Kukkutasana, Vakrasana, JanuShirshasana, Bakasana

b) Sleeping Posture: Ardha Salbhasana, Navkasana, Mandukasana, Matsyasana, Setubandhasana

c) Standing Posture: Katichakrasana, Ustrasana, Garudasana, Virbhadrasana, Adho mukhasana