

TEACHING SCHEME

| BASKET | COURSE NAME | TEACHING HRS WEEK | CREDITS | | | | TOTAL CREDITS PER SEM |
|--------------------------|---|----------------------|---------|---|----|-----|-----------------------------|
| | | | T | P | Pr | PER | |
| | SEMESTER I | | | | | | |
| Major | <i>Fundamentals of Forensic Science</i> | 5 | 3 | 1 | 0 | 4 | 24 |
| Major | <i>Introduction to Criminology and Criminal Profiling</i> | 5 | 3 | 1 | 0 | 4 | |
| Minor | <i>Human Anatomy and Physiology</i> | 5 | 3 | 1 | 0 | 4 | |
| Multidisciplinary | <i>Multidisciplinary I</i> | 5 | 3 | 1 | 0 | 4 | |
| AEC | <i>English</i> | 2 | 2 | 0 | 0 | 2 | |
| SEC | <i>Skill for Success I</i> | 8 | 0 | 2 | 2 | 4 | |
| VAC | <i>VAC I</i> | 4 | 0 | 0 | 2 | 2 | |
| | SEMESTER II | | | | | | |
| Major | <i>Crime Scene Management</i> | 5 | 3 | 1 | 0 | 4 | 24 |
| Major | <i>Criminal and Evidence Law</i> | 5 | 3 | 1 | 0 | 4 | |
| Minor | <i>Basics of Computer and Biometrics</i> | 5 | 3 | 1 | 0 | 4 | |
| Multidisciplinary | <i>Multidisciplinary II</i> | 5 | 3 | 1 | 0 | 4 | |
| AEC | <i>Communication Skill</i> | 2 | 2 | 0 | 0 | 2 | |
| SEC | <i>Skill for Success II</i> | 8 | 0 | 2 | 2 | 4 | |
| VAC | <i>VAC II</i> | 4 | 0 | 0 | 2 | 2 | |
| | SEMESTER III | | | | | | |
| Major | <i>Fingerprint and Impression Evidences</i> | 5 | 3 | 1 | 0 | 4 | 24 |
| Major | <i>Questioned Document</i> | 5 | 3 | 1 | 0 | 4 | |
| Major | <i>Forensic Ballistics</i> | 5 | 3 | 1 | 0 | 4 | |

| | | | | | | | |
|--------------------------|--|---|---|---|---|---|------------------------------------|
| Minor | <i>Forensic Photography</i> | 5 | 3 | 1 | 0 | 4 | |
| Multidisciplinary | <i>Multidisciplinary III</i> | 5 | 3 | 1 | 0 | 4 | |
| AEC | <i>Personality Development</i> | 2 | 2 | 0 | 0 | 2 | |
| VAC | <i>VAC III</i> | 2 | 2 | 0 | 0 | 2 | |
| | SEMESTER IV | | | | | | |
| Major | <i>Forensic Chemistry</i> | 5 | 3 | 1 | 0 | 4 | 20 |
| Major | <i>Forensic Physics</i> | 5 | 3 | 1 | 0 | 4 | |
| Major | <i>Forensic Biology, Serology and DNA</i> | 5 | 3 | 1 | 0 | 4 | |
| Minor | <i>Multimedia Forensics</i> | 5 | 3 | 1 | 0 | 4 | |
| AEC | <i>Technical Writing</i> | 4 | 0 | 0 | 2 | 2 | |
| VAC | <i>VAC IV</i> | 2 | 2 | 0 | 0 | 2 | |
| | SEMESTER V | | | | | | |
| Major | <i>Forensic Medicine</i> | 5 | 3 | 1 | 0 | 4 | 20 |
| Major | <i>Fundamentals of Forensic Toxicology</i> | 5 | 3 | 1 | 0 | 4 | |
| Major | <i>Basics of Forensic Psychology</i> | 5 | 3 | 1 | 0 | 4 | |
| Major | <i>Forensic Anthropology, Odontology and Archaeology</i> | 5 | 3 | 1 | 0 | 4 | |
| Minor | <i>Food Forensics</i> | 5 | 3 | 1 | 0 | 4 | |
| | SEMESTER VI | | | | | | |
| Major | <i>Digital and Cyber Forensics</i> | 5 | 3 | 1 | 0 | 4 | 12 for 3 yr. UG 16 for 4 yr. UG |
| Major | <i>Information Security Audit and Compliance or Instrumental Techniques (Only for 4 year UG candidate)</i> | 5 | 3 | 1 | 0 | 4 | |
| Minor | <i>Digital Fraud Investigation</i> | 4 | 4 | 0 | 0 | 4 | |
| Internship | <i>@Private or Government organizations</i> | 8 | 0 | 0 | 4 | 4 | |

| SEMESTER VII | | | | | | | |
|----------------------|---|----|---|---|----|----|----|
| Major | <i>Instrumental Techniques</i> | 5 | 3 | 1 | 0 | 4 | 16 |
| Major | <i>Ethics in Science Education and Research</i> | 4 | 4 | 0 | 0 | 4 | |
| Major | <i>Advances in Forensic Science</i> | 4 | 4 | 0 | 0 | 4 | |
| Minor | <i>Explosive Analysis and Post Blast Investigations</i> | 5 | 3 | 1 | 0 | 4 | |
| SEMESTER VIII | | | | | | | |
| Major | <i>Research Methodology</i> | 5 | 3 | 1 | 0 | 4 | 20 |
| Minor | <i>Innovation and Entrepreneurship</i> | 6 | 3 | 0 | 1 | 4 | |
| Research | <i>Research Project / Dissertation</i> | 24 | 0 | 0 | 12 | 12 | |

T: Theory; P: Practice; Pj: Project [1 Credit= 1 hour Theory; 1 credit = 2 Hours Practice / Project]

BASKET

BASKET I: MAJOR (DISCIPLINE-SPECIFIC CORE) COURSES

| Sl. No. | COURSE CODE | NAME OF THE CORE COURSES | CREDITS | TEACHING HOURS/WEEK |
|----------------|--------------------|--|----------------|----------------------------|
| 1 | CUFS1001 | Fundamentals of Forensic Science | 4+0+0 | 4 |
| 2 | CUFS1002 | Introduction to Criminology and Criminal Profiling | 3+0+1 | 5 |
| 3 | CUFS1003 | Crime Scene Management | 3+1+0 | 5 |
| 4 | CUFS1004 | Criminal and Evidence Law | 3+0+1 | 5 |
| 5 | CUFS1005 | Fingerprint and Impression Evidences | 3+1+0 | 5 |
| 6 | CUFS1006 | Questioned Document | 3+1+0 | 5 |
| 7 | CUFS1007 | Basics of Forensic Psychology | 3+1+0 | 5 |
| 8 | CUFS1008 | Forensic Chemistry | 3+1+0 | 5 |
| 9 | CUFS1009 | Forensic Physics | 3+1+0 | 5 |
| 10 | CUFS1010 | Fundamentals of Forensic Toxicology | 3+1+0 | 5 |
| 11 | CUFS1011 | Forensic Medicine | 3+1+0 | 5 |
| 12 | CUFS1012 | Forensic Biology, Serology and DNA | 3+1+0 | 5 |
| 13 | CUFS1013 | Forensic Ballistics | 3+1+0 | 5 |
| 14 | CUFS1014 | Forensic Anthropology, Odontology and Archaeology | 3+1+0 | 5 |
| 15 | CUFS1015 | Digital and Cyber Forensics | 3+1+0 | 5 |
| 16 | CUFS1016 | Information Security Audit and Compliance | 3+1+0 | 5 |
| 17 | CUFS1017 | Instrumental Techniques | 3+1+0 | 5 |
| 18 | CUFS1018 | Ethics in Science Education and Research | 3+0+1 | 5 |
| 19 | CUFS1019 | Advances in Forensic Science | 3+0+1 | 5 |
| 20 | CUFS1020 | Research Methodology | 3+0+1 | 5 |

BASKET II: MINOR (DISCIPLINE-SPECIFIC ELECTIVE) COURSES

| SI. No. | COURSE CODE | NAME OF THE ELECTIVE COURSES | CREDITS | TEACHING HOURS / WEEK |
|---------|-------------|--|---------|-----------------------|
| 1 | CUFS1021 | Multimedia Forensics | 3+1+0 | 5 |
| 2 | CUFS1022 | Antidope Forensics | 3+1+0 | 5 |
| 3 | CUFS1023 | Food Adulteration Analysis | 3+0+1 | 5 |
| 4 | CUFS1024 | Arson Investigation | 3+1+0 | 5 |
| 5 | CUFS1025 | Forensic Linguistics | 3+1+0 | 5 |
| 6 | CUFS1026 | Explosive Analysis and Post-Blast Investigations | 3+1+0 | 5 |
| 7 | CUFS1027 | Introduction to Artificial Intelligence and Machine Learning | 3+1+0 | 5 |
| 8 | CUFS1028 | Digital Fraud Investigations | 3+1+0 | 5 |
| 9 | CUFS1029 | Forensic Photography | 3+1+0 | 5 |
| 10 | CUFS1030 | Accident Investigation | 3+1+0 | 5 |
| 11 | CUFS1031 | Quality Control and Quality Assurance | 3+1+0 | 5 |
| 12 | CUFS1032 | Human Anatomy and Physiology | 3+1+0 | 5 |
| 13 | CUFS1033 | Basics of Computer and Biometrics | 3+1+0 | 5 |
| 14 | CUFS1034 | Innovation and Entrepreneurship | 3+0+1 | 5 |

BASKET III: MINOR PROJECT AND INTERNSHIP

| SI. No. | COURSE CODE | NAME OF THE COURSES | CREDITS | TEACHING HOURS / WEEK |
|---------|-------------|---------------------|---------|-----------------------|
| 1 | CUFS1035 | General Chemistry | 3+1+0 | 5 |
| 2 | CUFS1036 | General Physics | 3+1+0 | 5 |
| 3 | CUFS1037 | General Biology | 3+1+0 | 5 |

BASKET IV: ABILITY ENHANCEMENT COURSES (AEC)

| SI. No. | COURSE CODE | NAME OF THE COURSES | CREDITS | TEACHING HOURS / WEEK |
|---------|-------------|-------------------------|---------|-----------------------|
| 1 | CUFS1038 | English | 0+2+0 | 4 |
| 2 | CUFS1039 | Communication Skill | 0+2+0 | 4 |
| 3 | CUFS1040 | Personality Development | 0+2+0 | 4 |
| 4 | CUFS1041 | Technical Writing | 0+2+0 | 4 |
| 5 | CUFS1042 | Job Readiness | 0+2+0 | 4 |

BASKET V: SKILL FOR SUCCESS (PREFERRED FROM CUTM BASKET OF 120+ COURSES)

BASKET VI: VALUE-ADDED COURSES (VAC)

| SI. No. | COURSE CODE | NAME OF THE ELECTIVE COURSES | CREDITS | TEACHING HOURS / WEEK |
|---------|-------------|-----------------------------------|---------|-----------------------|
| 1 | CUFS1043 | Universal Human Values | 0+0+2 | 4 |
| 2 | CUFS1044 | Sustainable Development Goal | 0+0+2 | 4 |
| 3 | CUFS1045 | Disaster Management | 0+0+2 | 4 |
| 4 | CUFS1046 | Environmental Science | 0+0+2 | 4 |
| 5 | CUFS1047 | Indian Knowledge System | 0+0+2 | 4 |
| 6 | CUFS1048 | Indian Society and Culture | 0+0+2 | 4 |
| 7 | CUFS1049 | Indian Constitution | 0+0+2 | 4 |
| 9 | CUFS1050 | Health and Wellness | 0+0+2 | 4 |
| 10 | CUFS1051 | Climate Change and sustainability | 0+0+2 | 4 |
| 11 | CUFS1052 | Gender and Human Rights | 0+0+2 | 4 |
| 12 | CUFS1053 | Yoga and Its Benefits | 0+1+1 | 4 |



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BASKET VII: INTERNSHIP (4 CREDITS)

Students can also opt for the MOOCs offered by SWAYAM and avail transfer of credit upon successful completion

BASKET VIII: RESEARCH PROJECT / DISSERTATION (12 CREDITS)

BASKET I: MAJOR COURSES

CUFS1001

FUNDAMENTALS OF FORENSIC SCIENCE

CREDITS: 4 (4-0-0)

Course Description

This course provides a comprehensive introduction to the principles and practices of forensic science, including its history, methods and applications. Students will explore the scientific techniques and tools used in analysis of various evidences. The course will also explore the organization structure and functional aspects of forensic science laboratories, along with other investigating organizations.

Course Objectives

1. To learn about the development and basic principles of Forensic science.
2. To learn about the organizational setup of various academic institutions and government agencies involved in criminal investigations.
3. To study the functional aspects of forensic science.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Recall key historical events and infer the scope, need, and application of various disciplines of forensic science.
2. Interpret the significance of the fundamental principles of forensic science in evidence analysis and report writing.
3. Demonstrate the working of different forensic establishments in India and abroad.
4. Analyze the functions and contributions of the different agencies in the context of forensic investigations.
5. Evaluate the operational scope of specific institutions involved in national security and criminal investigations.

Course Outline

Module 1: History of Forensic Science

History of Development of Forensic Science Globally. Historical aspects of forensic science in India. Functions of forensic science. Definitions and concepts in forensic sciences. Need of forensic science. Scope of forensic science. Branches of forensic science (definition and functions). Various contemporary disciplines of forensic science.

Module 2: Concepts in Forensic Science

Basic principles of forensic science. Roles and responsibilities of forensic scientist. Code of conduct for forensic scientists. Ethics in forensic science. Qualifications of forensic scientists. Tools and Techniques used in forensic science for analysis of evidence. Chain of custody. Data depiction. Report writing.

Module 3: Functional Aspects of Forensic Science

Forensic science in international perspectives: set up of INTERPOL, and FBI. Organizational setup of Forensic Science Laboratories in India. Hierarchical setup of Central Forensic Science Laboratories, State Forensic Science Laboratories, Directorate of Forensic Science Services.

Module 4: Agencies Involved in Crime Detection

Organizational structure of Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Bureau of Police Research & Development, CCTNS.

Module 5: Agencies Involved in the Investigation

Academic institutions involved; Police and Detective Training Schools, NIA, R&AW, and CBI.

Practice Components

1. To study the history of crime cases from a forensic science perspective.
2. To write reports on different types 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.

Suggested Readings

1. B.R. Sharma, Forensic Science In Criminal Investigation And Trials
2. M.S. Dahiya, Crime Scene Management (A Scientific Approach)
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. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
5. V. Veeraraghavan, Handbook of Forensic Science, S&S Books (2004)
6. J.A Siegel, Encyclopedia of Forensic Science, Academic Press (2000)

CUFS1002

INTRODUCTION TO CRIMINOLOGY AND CRIMINAL PROFILING

CREDITS: 4 (3-1-0)

Course Description

This course offers a comprehensive introduction to criminology and criminal profiling, covering foundational concepts, theoretical perspectives, and practical applications within the criminal justice system. Students will explore various criminological theories, the nature and causes of criminal behavior, and the structure and functioning of the criminal justice system. Emphasis is placed on understanding different types of crimes, data sources, crime prevention strategies, and rehabilitation measures. Practical skills in criminal profiling and the application of criminological theories to real-world scenarios are also highlighted.

Course Objectives

1. To understand and explain the fundamental concepts of crime and the scope of criminology.
2. To analyze various schools of criminology and their relevance to modern criminological issues.
3. To learn about the structure of the criminal justice system, including crime investigation, prevention strategies, and correctional measures.

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand the foundations and theories of criminology, including historical perspectives and theoretical frameworks.
2. Analyze the causes of criminal behavior through psychological, sociological, and biological lenses, and identify different types of criminals.
3. Identify various types of crimes, including traditional, modern, and white-collar crimes, and understand their social and technological implications.
4. Understand the structure and functions of the criminal justice system in India, including the roles of legislation, law enforcement, and the judiciary.
5. Acquire knowledge of effective crime prevention strategies, rehabilitation methods, and human rights considerations within the criminal justice system.

Course Outline

Module 1: Foundations of Criminology

Introduction to Crime: Essentials of Crime (Actus Reus and Mens Rea); Criminology: Definition, Aim, and Scope; Schools of Criminology: Pre-classical, Classical, Neo-classical, Positivist, Feminist Criminology; Criminology and Other Social Sciences ; Criminological Theories: Historical and Contemporary Perspectives

Module 2: Crime and Criminal Behavior

Causation of Crime: Psychological, Sociological, and Biological Theories; Psychological Disorders and Criminality; Types of Criminals: Adult Offenders, Juveniles, Recidivists, Violent Offenders, Occupational Offenders;

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

Module 3: Types of Crimes

Crimes Against Property and Person: Hate Crimes, Transnational Crimes, Organized Crime; Traditional and Modern Crimes: White Collar Crimes, Economic Crime, Political Crimes, Cyber-crime; Terrorism and Insurgency; Media, Technology, and Crime; Social Change and Crime

Module 4: Criminal Justice System

Structure of the Criminal Justice System in India: Coordination Among Components; Juvenile Delinquency; Roles of Legislature, Law Enforcement, Prosecution, Judiciary; Investigation of Crimes: Complaint, F.I.R., Arrest, Search, Seizure, Police Custody, Judicial Remand, and Bail; Types of Evidence: Admissibility of Confession, Dying Declaration

Module 5: Crime Prevention and Rehabilitation

Crime Prevention Strategies: Situational Crime Prevention, Policing Styles, Community Policing; Correctional Measures and Rehabilitation of Offenders; Human Rights and the Criminal Justice System in India

Practice Components

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

Suggested Readings

1. Criminology: Theory, Research, and Policy by P. O'Connor
2. Criminal Behavior: A Psychological Approach by H. Eysenck and M. Eysenck
3. Introduction to Criminology: Theories, Methods, and Criminal Behavior by D. M. McShane and L. T. Williams
4. Crime and Justice: An Introduction by T. H. Barlow
5. The Criminal Justice System by S. K. Roberts and P. D. H. Hughes

CUFS1003

CRIME SCENE MANAGEMENT

CREDITS: 4 (3-1-0)

Course Description

Crime Scene Management is a critical aspect of forensic science that involves the systematic and methodical handling of crime scenes to ensure the proper collection, preservation, and analysis of physical evidence. This course provides comprehensive knowledge and practical skills required for effective crime scene investigation, documentation, and reconstruction, emphasizing the importance of maintaining the integrity of the evidence from the crime scene to the court.

Course Objectives

1. To understand the techniques behind the management of different crime scenes, including photography.
2. To evaluate the importance of evidence and its correct collection, handling, and preservation techniques.
3. To develop proficiency in the analysis and reconstruction of crime scenes and the presentation of evidence in court.

Course Outcomes

On successful completion of this course, students will be able to:

1. Apply skills in investigation, documentation, and reconstruction for crime scenes and make logical deductions.
2. Develop proficiency in crime scene photography.
3. Process the standards for handling different types of evidence.
4. Understand various tools and techniques for the analysis of different types of crime scene evidence.
5. Maintain the chain of custody for physical evidence and present findings effectively in a court of law.

Course Outline

Module 1: Introduction to Crime Scene Management

Introduction to the crime scene; Types of crime scenes; Evaluation and processing of crime scenes; Securing the scene of the crime; Documenting the crime scene: Note making, sketching; Searching techniques of crime scene; Reconstruction of the scene of crime; Report writing of crime scene visits; Role of the first arriving officer and investigating officer at the crime scene; Manpower and logistics management of crime scene; Case studies.

Module 2: Crime Scene Photography

Types of crime scene photography; Cameras: SLR & DSLR, lenses, filters, films; Exposing, development, and printing; Different kinds of developers and fixers; Specialized photography: UV, IR, X-Ray; Photography using scientific equipment; Videography of crime scene

Module 3: Introduction to Physical Evidence

Introduction to physical evidence; Types of physical evidence; Classification and role of physical evidence in criminal investigations & trials; Processing of physical evidence: Discovering, recognizing, and examination of physical evidence; Collection, safety measures for evidence collection; Preservation, packaging, sealing, labeling, and forwarding of physical evidence; Maintaining the chain of custody; Probative value of physical evidence

Module 4: Tools and Techniques for Crime Scene Investigation

Tools: Basic kits, Investigator's kit, Tools used in the mobile laboratory; Techniques: Detective dyes, Speed detection devices, 3-D scanning technique, Neutron radiography, Tele forensic technology for crime scene investigation; Technology innovation in crime scene management; National and international scenario of crime scene management

Module 5: Crime Scene to the Court

Overview of the legal system; Role of forensic experts in court; Presentation of physical evidence in court; Preparation of expert witness testimony; Cross-examination techniques; Legal and ethical responsibilities of forensic experts; Case studies on court presentations; Interaction with legal professionals and mock trials

Practice Components

1. To prepare a report on the evaluation of a crime scene.
2. To establish the chain of custody and note-taking at a crime scene.
3. To reconstruct an indoor crime scene.
4. To reconstruct an outdoor crime scene.
5. Collection, packaging, and preservation of evidence.
6. Preparation and presentation of expert witness testimony.
7. Participation in a mock trial to understand the legal proceedings related to crime scene evidence.

Suggested Readings

1. M.S Dahiya, Crime Scene Management (A Scientific Approach), Shanti Prakashan (2009).
2. Richard Saferstein, Criminalistics: An Introduction to Forensic Science, Pearson (2011).
3. W.J. Tilstone, M.L. Hastrup, and C. Hald, Fisher's Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).
4. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, Boca Raton (2013).
5. Jay A. Siegel, Pekka J. Saukko, and Geoffrey C. Koouper, Encyclopedia of Forensic Science, Academic Press (2000).



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6. B.R. Sharma, Forensic Science in Criminal Investigation and Trials, Lexis Nexis (2022).
7. K.S.N. Reddy, Practical Crime Scene Processing and Investigation, Jaypee (2017).
8. T.J. Fish, Crime Scene Investigation, Elsevier (2014).

CUFS1004

CRIMINAL AND EVIDENCE LAW

CREDITS: 4 (3-1-0)

Course Descriptor

This course explores the fundamental aspects of criminal and evidence law, focusing on legal procedures, criminal justice systems, and specific laws relevant to forensic science. Students will gain a comprehensive understanding of the Indian Penal Code (IPC), Criminal Procedure Code (CrPC), Indian Evidence Act (IEA), and various socio-economic and environmental laws impacting forensic investigations.

Course Objectives

1. Understand Key Legal Frameworks: Develop a foundational understanding of criminal law, including key legal terminology, court structures, and procedures under the IPC, CrPC, and IEA.
2. Explore Law Enforcement Structures: Learn about national and international police organizations, their functions, and their role in criminal justice.
3. Analyze Special Laws: Examine laws related to narcotics, explosives, environmental protection, and other socio-economic issues and their relevance to forensic science.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Apply Legal Knowledge: Demonstrate understanding of criminal law, legal procedures, and evidence rules in forensic contexts.
2. Understand Police and Legal Institutions: Describe the structure and functions of police organizations and their impact on criminal investigations.
3. Interpret Special Laws: Analyze and apply various laws related to drugs, explosives, environmental protection, and socio-economic issues.
4. Engage with Forensic Evidence: Utilize knowledge of the IPC, CrPC, and IEA to handle forensic evidence and expert witness procedures.
5. Navigate Legal Frameworks: Show proficiency in navigating the legal system and understanding the implications of different legal statutes for forensic science.

Course Outline

Module 1: Law Fundamentals

Definition of Law, Court, and Judge; Basic Terminology in Law; Introduction to Criminal Procedure Code (CrPC); FIR and Differences between Civil and Criminal Justice; Object of Punishment and Types of Punishment; Classification of Cases: Civil, Criminal; Essential Elements of Criminal Law; Constitution and Hierarchy of Criminal Courts;

Cognizable and Non-Cognizable Offences; Bailable and Non-Bailable Offences; Sentences by Chief Judicial Magistrate;

Module 2: Section related to Forensic Science

IPC Sections related to Forensic Science (e.g., Sections 121A, 299, 302, 304A, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362, 375 and 377 and their amendments); Indian Evidence Act: Evidence and Rules of Relevancy, Expert Witness, cross-examination and re-examination of witness; CrPC Sections: 291, 291A, 292, 293

Module 3: Police Science

Definition and Scope of Police Science; Central Government Police Organizations: BPR&D, CBI, IB, RAW, NCRB, NICFS, NPA, UT Police Force; International Police Organization: INTERPOL; State Police Organization: Structure and Functions at State, Range, and District Levels

Module 4: Acts Relating to Socio-Economic and Environmental Crimes

Narcotic Drugs and Psychotropic Substances Act; Essential Commodity Act; Drugs and Cosmetics Act; Explosive Substances Act; Arms Act; Dowry Prohibition Act; Prevention of Food Adulteration Act; Prevention of Corruption Act; Wildlife Protection Act; Information Technology (IT) Act; Environment Protection Act; Untouchability Offences Act

Module 5: Merging Special Laws Relevant to Forensics

Integration of Special Laws into Forensic Practices; Comparative Analysis of Indian and International Laws; Case Studies involving Multiple Legal Frameworks; Practical Implications of Legal Mergers in Forensic Investigations; Current Trends and Updates in Forensic Law.

Practice Components

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

Suggested Readings

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

CUFS1005

FINGERPRINT AND IMPRESSION EVIDENCE

CREDITS: 4 (3-1-0)

Course Description

Course deals with the fundamentals of fingerprint science and other impression evidence, including footwear, tire tracks, and tool marks. Students will learn about the formation, classification, and comparison of fingerprints, as well as the analysis and identification of other impression evidence.

Course Objectives

1. Gain a historical and foundational knowledge of fingerprint science.
2. Acquire proficiency in development, collection and preservation of prints and classify prints for identification.
3. Implement techniques for the collection, preservation and examination of footprints, shoe impressions, and palm prints.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Understand historical development and fundamental principles of fingerprint science and various types of fingerprint patterns.
2. Illustrate the techniques for development, lifting, and processing different types of fingerprint impressions found at crime scenes.
3. Apply the Henry classification system, NCIC classification, and AFIS classification to classify and catalog fingerprint records accurately.
4. Analyze known prints and unknown prints to identify fingerprint characteristics and level three characteristics.
5. Demonstrate the collection, preservation, and examination techniques for other impressions and apply fundamentals of fingerprint science and impression evidence to forensic investigation.

Course Outline

Module 1: History and Basics of Fingerprints

Introduction and history, with special reference to India, Embryological development of fingerprints. Fundamental principles of fingerprint science. Sweat and composition of sweat, Types of fingerprint patterns. Plain and rolled fingerprint impressions and its significance. Functions of Fingerprint Bureau.

Module 2: Development and lifting of fingerprint impressions

Types of fingerprint Impressions found at crime scene. Types of surfaces, Factors affecting fingerprint residue, Development of Latent Prints & Lifting techniques, Physical & chemical Methods: Powder techniques & Various chemical techniques, Processing of Post developed prints.

Module 3: Classification and cataloguing of fingerprint records.

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 4: Analysis of Fingerprint

Known prints & Rolled impressions, Direct or Ink prints, Ridge characteristics/minutiae. Fingerprint comparison & Identification, Introduction to AFIS.

Introduction to poroscopy, edgeoscopy, and its significance

Module 5: Other Impressions

Footprints & Shoe impression examination: Introduction to footprints & Shoe impression, locating impressions at the scene of crime, collection and Preservation of foot/footwear impressions, Electrostatic lifting of latent foot prints.

Palm prints: collection and examination of palm prints.

Practice Components

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 fingerprints.

Suggested Readings

1. Forensic Science in Criminal Investigation & Court Evidence by V.N. Sehgal, Selective & Scientific Books
2. Fingerprints- Analysis and understanding, Mark R. Hawthorne, CRC Press
3. Fingerprint Identification and Procedure Manual by P.S. Nayar, Select Publication
4. Forensic Science In Criminal Investigation And Trials by B.R. Sharma, Lexis Nexis
5. Advances In Fingerprint Technology by R.S. Ramotowski, CRC Press
6. Friction Ridge Skin Comparison And Identification Of Fingerprints by J.E. Cowger, CRC Press
7. Guide to Fingerprint Investigation by J.K. Kaushik, Selective & Scientific Books

CUFS1006

QUESTIONED DOCUMENT

CREDITS: 4 (3-1-0)

Course Description

This course covers the principles and techniques of forensic document examination, including the analysis and identification of questioned documents. Students will learn to evaluate the authenticity of documents, detect forgery and alteration, and security features in documents.

Course Objectives

1. To learn about the basics of document examination.
2. To learn about different types of forgery and their detection.
3. To learn about the examination of questioned documents.

Course Outcomes:

On successful completion of the course, a student will be able to:

1. Comprehend the definition of documents and categorize them into different types.
2. Demonstrate the use of different tools for examination of documents and determining their age. and determine the sequence of strokes.
3. Examine handwriting and signature samples to detect forgery by recognizing natural variations and determining stroke sequences.
4. Analyze alterations in documents, decipher charred documents, and examine other questioned documents.
5. Evaluate counterfeit security documents using forensic techniques.

Course Outline

Module 1: Basics of Document Examination

Definition of Document. Types of Document. Scope of forensic document examination. Document expert. Handling of Documents. Preliminary Examination of Questioned Document.

Module 2: Tools Used in Document Examination

Tools Needed for Forensic Document Examination- Ultraviolet, Visible, Infrared, Spectroscopy, Chromatography, Photomicrography, Microphotography, Visible Spectral Comparator, Electrostatic Detection Apparatus. Determining the Age of documents based on ink and paper.

Module 3: Handwriting and Signature Forgery

Principles of handwriting. Natural variations and Factors affecting handwriting. Class and individual characteristics. Definition and types of forgery. Handwriting forgery. Standards for comparison of handwriting. Signature forgery. Determination of sequence of strokes.

Module 4: Detection and Decipherment of Document Forgery

Alterations in Documents - erasures, additions, over-writing, obliterations, indented and invisible writings. Charred Documents. Examination of Printed documents, Typed documents & Xeroxed documents.

Module 5: Examination of Security Documents

Definition, Types of security documents, Examination of counterfeit Indian currency notes, passports, visa, credit cards, debit cards, stamp papers, seals, and stamps.

Practice Components

1. Identify the class and individual characteristics in the signature sample
2. Identification of forgery in signatures.
3. Detection of tampering in documents.
4. Variation in handwriting under natural conditions.

Suggested Readings

1. A.S Osborn, Questioned Documents, Nelson Hallco (1992)
2. B. Lal, Cross Examination Of Handwriting Expert, S&S Books (2010)
3. K.M Kopenhagen, Forensic Document Examination, Humana Press (2008)
4. J.S. Kelly, Scientific Examination Of Questioned Documents, Taylor & Francis (2006)
5. E. Olomu, Determining The Age Of Documents, African Academy (2023)
6. A. Gupta, Examination Of Questioned Documents, Forgery Detection And Legal Aspects, S&S Books (2021)

CUFS1007

BASICS OF FORENSIC PSYCHOLOGY

CREDITS: 4 (3-1-0)

Course Description

The basics of Forensic Psychology course introduces students to the intersection of psychology and the legal system, focusing on the application of psychological principles to criminal justice. Topics include psychological assessments in legal contexts and the roles of forensic psychologists. Students will gain foundational knowledge of how psychological expertise is applied to legal issues, including criminal investigations and courtroom proceedings

Course Objectives

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

Course Outcomes

On successful completion of the course, a student will be able to:

1. Understand the fundamental principles and concepts of Psychology and criminal behavior
2. Understand the role of forensic psychology within the legal system, including courtroom procedures, civil and criminal case assessments, and the psychology of evidence such as eyewitness testimony and confessions.
3. Evaluate the methods and tools used in psychological assessments within legal contexts
4. Apply Principles of psychology and forensic psychology to criminal investigations.
5. Evaluate the psychological aspects of crimes including juvenile delinquency, and analyze the psychological services provided in correctional settings.

Course Outline

Module 1: Basics of Psychology

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 defense mechanisms, Psychology of criminal behaviour.

Module 2: Foundations of Forensic Psychology

Definition and fundamental concepts of forensic psychology and forensic psychiatry. Psychology and law. Psychology in the courtroom, with special reference to Section 22 of the Bharatiya Nyay Sanhita. Role of forensic psychologist, Civil and criminal case assessment, Legal standards and admissibility. Ethical issues in forensic psychology.

Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling, Modus Operandi.

Module 3: Forensic Psychology of Crime

Psychological theories of criminal Behavior, Biological, Social, and environmental factors, Assessing mental competency, Mental disorders and Forensic Psychology, Crime, and Psychopathology, Genetics and Crime, Serial murders

Module 4: Tools for Detection of Deception

Forensic Psychology: Truth and Deception, Psychology of lying,

Various methods of lie detection: interviews, non-verbal detection, statement analysis, Principles of Polygraph, operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test. Narco analysis: Principle and theory, BEOS: History, Principle and theory. Importance as an investigative tool, Limitations, and legal Aspects

Module 5: Juvenile Offenders and Correctional Psychology

Juvenile delinquency – theories of offending (social cognition, moral reasoning), Child abuse (physical, sexual, emotional), juvenile sex offenders.

Psychological services in correctional settings, Treatment and rehabilitation of offenders, Challenges in correctional psychology Psychological impact of crime on victims.

Practice Components

1. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.
2. To prepare a report on the 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 a juvenile.
5. To cite a criminal case in which narco analysis was used as a means to detect deception.

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.

CUFS1008

FORENSIC CHEMISTRY

CREDITS: 4 (3-1-0)

Course Description

This course provides an in-depth understanding of forensic chemistry, focusing on the principles, methodologies, and applications used in forensic investigations. Students will explore the chemistry behind various forensic analyses, including narcotic drugs, explosives, fire debris, petroleum products, alcoholic beverages, polymers, and food adulteration. Emphasis will be placed on quality management systems in forensic laboratories, systematic examination techniques, and case study analysis.

Course Objectives

1. To understand fundamental concepts in forensic chemistry and the importance of quality management systems in forensic analysis.
2. To gain expertise in the analysis of narcotic drugs, psychotropic substances, and explosives, fire debris, petroleum products, including their forensic investigation and examination.
3. To develop proficiency in the forensic analysis of alcoholic beverages, bribe traps, polymers, and food adulteration.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Understand the fundamental principles of forensic chemistry and the role of quality management systems in forensic analysis.
2. Demonstrate knowledge and skills in the forensic analysis of narcotic drugs, psychotropic substances, and explosive materials.
3. Apply forensic methodologies to investigate and analyze fire and arson incidents, as well as conduct instrumental analysis of fire debris and petroleum products.
4. Analyze alcoholic beverages, bribe trap chemicals, and polymers, applying forensic techniques to these areas.
5. Detect food adulteration and conduct a detailed analysis of lipids, fats, dairy products, and other food items.

Course Outline

Module 1: Quality Management

Introduction to Forensic Chemistry: Types of Cases and Exhibits, Overview of Forensic Chemical Analysis; Quality Management Systems: Quality Assurance, Quality Control, Total Quality Management (TQM); Accreditation: Definition, History, and Development of ISO Standards; Importance of Accreditation in Forensic Laboratories: Accreditation Processes, Quality Systems, ILAC, APLAC, ASCLD; Equipment Maintenance and Calibration: Proficiency Testing, Internal and External Audits

Module 2: Narcotic Drugs and Explosives

Narcotic Drugs & Psychotropic Substances: Classification, Precursor Chemicals, Narcotic Raids, Clandestine Drug Laboratories; Drug Addiction and Dependence: Tolerance, Designer Drugs; Analytical Techniques: Color Tests, Thin-Layer Chromatography (TLC), Microcrystalline Testing; Explosives: Classification, Chemistry, Post-Blast Investigation; Systematic Examination of Explosive Residues: Organic and Inorganic Analysis by Color Test and TLC

Module 3: Fire and Petroleum Products

Fire and Arson Investigation: Thermodynamics and Chemistry of Fire, Investigation Techniques; Forensic Analysis of Fire Debris: Instrumental Methods, Case Studies; Petroleum Products: Analysis of Petrol, Kerosene, and Diesel as per BIS Specifications;

Module 4: Alcoholic Beverages, Bribe Traps, and Polymers

Alcoholic Beverages: Analysis of Country Made Liquor, Illicit Liquor, and Medicinal Preparations Containing Alcohol; Bribe Trap Analysis: Examination of Phenolphthalein and Other Chemicals Used in Bribe Trap Cases; Polymers: Forensic Examination of Plastics and Adhesives

Module 5: Food Chemistry

Food Adulteration: Common Adulterants, Detection Methods; Analysis of Lipids and Fats: Physical and Chemical Examination (Acid Value, Saponification Value, Ester Value, Acetyl Value, Iodine Value); Detection of Hydrogenated Oils and Fats, Rancidity; Analysis of Butter and Butter Fats; Analysis of Dairy Products: Milk and Milk Products for Adulteration

Practical Components

1. Quality Management Lab Exercises: Calibration and maintenance of forensic equipment, internal and external audits.
2. Narcotic Drugs and Explosives Analysis: Hands-on experience with color tests, TLC, and microcrystalline testing.
 - a. Identification of NDPS drugs by colour test and TLC.
 - b. Detection of low explosives by chemical/colour test and TLC.

3. Fire Debris Analysis: Practical exercises in analyzing fire debris using instrumental methods.
 - a. Analysis of phenolphthalein in bribe trap cases.
4. Petroleum Product Testing: Analysis of petrol, kerosene, and diesel.
 - a. Examinations of petroleum products as per BIS specifications.
5. Food Chemistry Tests: Detection of food adulteration, examination of lipids, fats, and dairy products.
 - a. Identification of alcoholic beverages as per BIS specifications.

Suggested Readings

1. Forensic Chemistry: Fundamentals and Applications by K. Smith and L. Jones
2. Introduction to Forensic Chemistry by J. Adams and R. Brown
3. Handbook of Forensic Science edited by M. Lee
4. Forensic Analysis of Narcotic Drugs by A. Johnson
5. Principles of Fire and Explosion Investigation by B. Davis
6. Food Chemistry by O. G. D. H. Williams and R. P. McDaniel

CUFS1009

FORENSIC PHYSICS

CREDITS: 4 (3-1-0)

Course Description

Forensic Physics involves the application of physics principles and techniques to solve crimes and analyze evidence. This course covers areas such as ballistics, accident reconstruction, and material analysis, providing students with the necessary skills to interpret physical evidence in forensic investigations. Students will learn to apply scientific methods to real-world forensic cases, ensuring precise and accurate conclusions.

Course Objectives

1. To understand the properties of the evidence like glass, paint, soil, fiber, tools, etc.
2. To evaluate classifications of physical evidence and their compositions.
3. To analyze the importance of physical evidence with the help of case studies.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Remember the methods for examination and analysis of glass evidence.
2. Understand the composition of the paint and its forensic examination.
3. Understand soil as a geo-marker evidence along with forensic analysis of fibers.
4. Understand properties and analysis of Tool and Tyre Mark and Restoration of erased marks
5. Analyze different types of impression marks such as earprints, lip prints, bite marks, footprints, and shoeprints.

Course Outline

Module 1: Glass

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

Module 2: Paints

Introduction, Composition, and 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, Case Studies.

Module 3: Soil and Fibre

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

Fibre evidence: Introduction and classification of fibres, collection of fibre evidence, Identification and comparison of fibres, Cloth evidence – importance, collection, analysis of adhering material, Matching of pieces.

Module 4: Tool and Tyre Mark, and Restoration of erased marks

Tool Marks: Introduction to tool marks, Types of tool marks, Class characteristics and individual characteristics of tool marks, Collection and Preservation of tool marks, Forensic examination of tool marks, Case Studies.

Tyre marks: Introduction to tyre impressions, Collection and Preservation of the tyre impression evidence, Forensic Significance of skid marks, Forensic Examination for identification and comparison, Case Studies.

Erased marks: Principle of restoration of erased marks, Techniques involved for alteration and obliterations of individual markings, Restoration of erased and obliterated marks on various surfaces, Photography and Forensic assessment of methods for restoration of obliterated marks, case studies.

Module 5: Impression Marks

Lip print: Introduction to Cheiloscopy and history of lip prints, Classification of lip prints, Collection, Development, Identification and Comparison of lip prints.

Bite marks: Objectives and forensic importance of bite-mark examination, morphology and types of bite marks, Evidence collection from victims and suspects, Photography and collections of bite marks, Case Studies.

Ear Prints: Introduction to the history of ear prints, Morphology of the ear, Procedure of taking standards from the suspects, Identification and comparison of ear prints.
Case Studies.

Practice Components

1. Density gradient analysis of soil and glass samples.
2. Determination of refractive index of glass and liquid.
3. Physical matching of broken/ cut or intact pieces of different evidence.
4. Determination of tensile strength of rope/dupatta.
5. To identify and compare tool marks.
6. Casting of foot, tire and bite impressions
7. Identification and comparison of ear prints and lip prints



Suggested Readings:

1. S.H. James and J.J. Nordby, *Forensic Science: An Introduction to Scientific and Investigative Techniques*, 2nd Edition, CRC Press, Boca Raton (2005).
2. R. Saferstein, *Criminalistics*, 8th Edition, Prentice Hall, New Jersey (2004).
3. B Caddy, *Forensic Examination of glass and paint*, CRC Press (2001).
4. B.R Sharma, *Forensic Science in Criminal Investigation and Trials*, Lexis Nexis (2017).
5. J.A Siegel, *Encyclopedia of Forensic Sciences*, Academic Press (2000).
6. J. Robertson, *Forensic Examination of Fibers*, CRC Press (2020).

CUFS1010

FUNDAMENTALS OF FORENSIC TOXICOLOGY

CREDITS: 4 (3-1-0)

Course Description

This course delves into forensic toxicology, covering the history, laws, and roles of forensic toxicologists, and the classification, modes of action, and legal aspects of poisons. It equips students with techniques for the safe collection, preservation, and analysis of toxicological samples. Emphasis is placed on chemical and instrumental methods for detecting and analyzing poisons.

Course Objectives

1. To develop an understanding of the history, laws, roles, and responsibilities involved in forensic toxicological examinations.
2. To acquire knowledge of poison classification, modes of action, and the legal aspects of managing poisoning cases.
3. To learn proper techniques for collecting, preserving, and analyzing toxicological samples using chemical and instrumental methods.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Understand history, laws, roles, and nature of forensic toxicological examinations.
2. Understand poison classification, modes of action, legal procedures, and management of poisoning cases.
3. Learn proper techniques for collecting, preserving, and handling toxicological samples safely.
4. Acquire skills in extracting poisons from various samples using appropriate methods
5. Develop proficiency in poison detection through chemical and instrumental methods.

Course Outline

Module 1: Introduction to Forensic Toxicology

History, Scope, and Significance of Forensic Toxicology, Nodal Agencies and Stakeholders in Forensic Toxicology, Roles and Responsibilities of Forensic Toxicologists, Nature of Forensic Toxicological Examinations, Drug Paraphernalia

Module 2: Poisoning and its Legal Aspects

Classification of poisons, Types of poisoning, Mode of action of poison, Factors affecting the action of poisons, Crime Scene Involving Poisons, Laws Related to Poisons, Format of Autopsy Report and Laboratory Report, Expert Witness Testimony, Post-Mortem Examination, Management of poisoning cases

Module 3: Samples and Collection Methods

Classes of Matrices, Biological and Non-Biological Samples, National and International Guidelines for Sample Collection, Types of Viscera, viscera collection and preservation, types of preservatives, types of containers, shelf-life of samples, Safety measures of toxicological samples handling, Personal Protective Equipment (PPEs)

Module 4: Extraction Techniques

Extraction of poisons from biological and non-biological samples, Liquid- Liquid extraction, extraction methods for acidic, basic and neutral poisons, extraction of volatile and non-volatile poisons, extraction of plant poisons

Module 5: Analysis Techniques and Challenges

Common methods of poison detection (Volatile, non-volatile, metallic, plant poisons, insect and snake bites), chemical tests and Instrumental methods (Chromatographic & Spectroscopic), Toxicological analysis of decomposed material and body remains, challenges in forensic toxicological examination

Practice Components

1. Extraction of non-volatile poison and its analysis.
2. Extraction of volatile and its analysis.
3. Analysis of heavy metals using colour tests (reinsch test).
4. Colour test and TLC of various plant poisons and pesticides
5. Analysis of drug using UV-Vis spectroscopy.

Suggested Readings

1. Modi JS: Medical Jurisprudence and Toxicology
2. Parikh CK: Medical Jurisprudence and Toxicology
3. Reddy: Forensic Medicine
4. Laboratory Procedure Manual- Forensic Toxicology, DFS, MHA, New Delhi
5. Medical Pharmacology- Tripathy
6. Essentials of Toxicology- Ellenhorn

CUFS1011

FORENSIC MEDICINE

CREDITS: 4 (3-1-0)

Course Description

Forensic medicine is the application of medical knowledge and expertise to aid in the investigation of crimes, injuries, and sudden deaths. It involves the examination and analysis of medical evidence, including autopsies, toxicology tests, and DNA analysis, to help reconstruct events. Forensic medicine experts, work closely with law enforcement agencies, legal professionals, and courts to provide objective, scientific evidence to support criminal investigations and prosecutions.

Course Objectives

1. To know the duties of the first responding officer who receives a call on homicide or suicide case.
2. To equip students with the knowledge and skills to identify, classify, and determine the causes of various types of asphyxial deaths and to provide a through knowledge of thanatology and it's forensic implications.
3. To comprehend the processes of death (thanatology) with proper techniques and legal considerations for exhumation procedures, as well as the ability to analyze and interpret findings from exhumed remains to establish identity and cause of death.

Course Outcomes

On successful completion of the course, a student will be able to;

1. Explain the fundamental aspects and scope of forensic medicine, identify the procedures involved in approaching a crime scene of death.
2. Analyze the medico-legal aspects of death, considering cause, manner and mode of death, postmortem changes and legal implications.
3. Develop the ability to analyze and interpret findings from exhumed bodies along with the knowledge to plan and execute exhumation processes, adhering to legal and ethical guidelines.
4. Able to identify and interpret the physical and internal signs of asphyxial deaths along with the importance of autopsy results to ascertain the cause, manner and time since death.
5. Develop the skills to evaluate and interpret types of traumatic injuries also will be able to communicate effectively with the victims of sexual offenses throughout the investigation and legal processes.

Course Outline

Module 1: Death Investigations

Fundamental aspects, scope and objectives of forensic medicine. Approaching the crime scene of death. Inquest, recording dying declaration. Identifying witnesses and, if possible, suspects. Interviewing onlookers and segregating possible witnesses.

Suspect in custody – initial interrogation and searching for evidence. Miranda warning card. Assessing the crime scene. Request for forensic team. Importance of command post and logbook. Management of crowd and media. Importance of taking notes. Items to be a part of notings. Documenting the death scene. Processing evidence.

Module 2: Thanatology

Definition of death- types and causes of death. – Mode of death. Somatic and Molecular death. Medico-legal aspects of death. Autopsy, types of autopsy Objectives of medico legal autopsy. Post-mortem changes- Immediate, early and late changes. Estimation of time since death.

Module 3: Exhumation

Handling buried body cases– search for buried bodies. Exhumation, Basic protocols of exhumation. Importance of exhumation.

Module 4: Asphyxial Deaths

Asphyxia and types of asphyxia- Hanging, strangulation, drowning , Ante-mortem and post-mortem drowning, medicolegal importance of asphyxial deaths.

Module 5: Traumatology

Definition of injury, types and classification of injuries, Ante-mortem and post-mortem injuries. Aging of injuries. Artificial injuries, Thermal deaths – electrocution and lightning injury, Sexual offenses- investigation of victim and accused. Child abuse.

Practice Components

1. To design a questionnaire for the first responder to the death scene.
2. To design a protocol to deal with the media at the crime scene.
3. To design a checklist for the forensic scientists at the death scene.
4. To design a canvass form giving a description of an unidentified victim.
5. To understand the concept of postmortem through virtual autopsy.

Suggested Readings

1. K.S.N Reddy: The Essentials of Forensic Medicine & Toxicology
2. Apurba Nandi: Textbook of Forensic Medicine.
3. Parikh CK: Medical Jurisprudence and Toxicology.
4. Krishan Vij: Textbook of Forensic Medicine and Toxicology.
5. Gautam Biswas: Review of Forensic Medicine and Toxicology.

CUFS1012

FORENSIC BIOLOGY, SEROLOGY, AND DNA

CREDITS: 4 (3-1-0)

Course Description

FORENSIC BIOLOGY, SEROLOGY, AND DNA is a comprehensive 4-credit course that explores the fundamental principles and advanced techniques used in forensic biology, serology, and DNA analysis. The course covers the collection, preservation, and examination of various biological evidence, the significance of serological and immunological studies in forensic investigations, and the application of DNA fingerprinting in solving crimes. Through theoretical understanding and practical applications, students will gain critical insights into the use of biological sciences in the field of forensic science.

Course Objectives

1. To understand the principles and methodologies involved in the collection and analysis of biological evidence in forensic science.
2. To gain knowledge in forensic serology and immunology, focusing on the identification and analysis of body fluids.
3. To develop expertise in DNA fingerprinting techniques and their applications in forensic investigations.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Identify and analyze various types of biological evidence, including hair, pollen, and microbial samples.
2. Apply forensic botany and entomology principles to analyze plant and insect evidence in crime scenes.
3. Perform serological tests to identify and differentiate body fluids and understand their forensic significance.
4. Conduct bloodstain pattern analysis to aid in crime scene reconstruction.
5. Utilize DNA fingerprinting techniques for the identification and analysis of forensic DNA samples.

Course Outline

Module 1: Introduction to Biological Evidence

Brief History of Forensic Biology: Developments and Scope.; Types of biological evidence and their significance; Collection, preservation, packing, forwarding, and documentation of

biological evidence; Hair: Anatomy, morphology, biochemistry, growth cycle, classification, and forensic significance.

Module 2: Forensic Botany and Microbial Forensics

Forensic Palynology: Structure of pollen, collection, microscopic examination, and forensic significance; Forensic Microbiology: Types of microbes, collection, examination, bio-warfare agents, and case studies.

Module 3: Forensic Limnology, Entomology, and Wildlife Forensics

Forensic Limnology: Diatoms, types, morphology, methods of extraction, and forensic significance; Forensic Entomology: Anatomy and taxonomy of forensically relevant insects, insect succession, and forensic significance; Wildlife Forensics: Threats to natural resources, wildlife conservation, Wild Life Protection Act-1972, poaching methods, and forensic analysis of wildlife crimes.

Module 4: Forensic Serology and Blood Spatter Analysis

Overview of forensic serology; Forensic Examination of Body Fluids: Blood components, blood grouping systems, and tests for identification of semen, saliva, sweat, urine, vaginal secretions, and fecal matter; Blood Spatter Analysis: Bloodstain characteristics, impact patterns, cast-off patterns, projected patterns, contact patterns, drying times, and crime scene reconstruction.

Module 5: DNA Fingerprinting in Forensic Science

Introduction to DNA Fingerprinting: Structure of DNA, history, development, nature, scope, collection, and preservation of biological samples.; Basics of Genes and DNA Markers: STR, VNTR, SNP, and forensic significance; DNA Extraction and Quantitation: Methods of extraction, Polymerase Chain Reaction. Introduction to RFLP, AFLP, RAPD.

Practice Components

1. Collection and preservation of biological evidence from simulated crime scenes.
2. Microscopic examination, identification and comparison of human and animal hair.
3. Microscopic examination of pollen samples to determine their forensic significance.
4. Extraction and identification of diatoms.
5. Estimation of time since death based on entomological evidence.
6. Perform blood grouping test.
7. Serological tests for the identification of body fluid.
8. Extraction and quantification of DNA from biological samples.

Suggested Readings

1. Forensic Biology by Richard Li
2. Fundamentals of Forensic DNA Typing by John M. Butler
3. Forensic Serology by Jay A. Siegel
4. Criminalistics: An Introduction to Forensic Science by Richard Saferstein
5. Microbial Forensics by Bruce Budowle, Steven E. Schutzer, and Stephen A. Morse

6. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers (2005) by John M. Butler, Academic Press, ISBN: 0121479528
7. An Introduction to Forensic Genetics by W. Goodwin, Blackwell
8. DNA by L. Kobilisky, Wiley & Sons
9. Cellular and Molecular Immunology by A.K. Abbas, Elsevier
10. Principles of Bloodstain Pattern Analysis by S.H. James, CRC Press
11. Forensic Biology by R. Krishnamurthy, S&S Books
12. Handbook of Forensic Biology and Forensic Serology by H. Sharma, S&S Books
13. Forensic Serology and Blood Examination by A. Tripathi, S&S Books
14. Forensic Science in Criminal Investigation and Trials by B.R. Sharma
15. Crime Scene Management (A Scientific Approach) by M.S. Dahiya
16. Handbook for Forensic Biology (Part-I) by S. Siddique
17. Forensic Biology by R. Krishnamurthy
18. Handbook of Forensic Biology and Forensic Serology by H. Sharma et al.
19. Wildlife Forensic Investigation, Principles and Practice by Jan Bundschuh

CUFS1013

FORENSIC BALLISTICS

CREDITS: 4 (3-1-0)

Course Description

Forensic Ballistics is a specialized course that delves into the science of firearms, ammunition, and the analysis of gun-related evidence in criminal investigations. This course covers the principles of internal, external, and terminal ballistics, the examination of firearms and ammunition, and the application of ballistic analysis in forensic contexts. Students will learn the techniques and methodologies used to analyze ballistic evidence, reconstruct shooting incidents, and present findings in legal settings.

Course Objectives

1. To learn the concepts of firearms and ammunition.
2. To understand the basics of internal, external, and terminal ballistics.
3. To learn the methods of identification of firearms, ammunition and gunshot residues.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Remember the classification of firearms and their firing mechanisms.
2. Understand the basic assembly of ammunition.
3. Apply knowledge of internal, external, and terminal ballistics.
4. Analyze the class and individual characteristics for firearm identification
5. Apprehend the shooter and range of fire using Gun Shot Residues.

Course Outline

Module 1: Firearms

Introduction, Parts of Firearms & their classification, History, and background of firearms, Functional assembly & Operating principle of firearms, Characteristics & Working mechanism of Standard: Rifled firearms, Small arms, Shot guns & Non-standard: Improvised, Country made, Imitative firearms.

Module 2: Ammunition

Ammunition & its constructional parts, Classifications of Ammunition on the basis of constructional features, Functional assembly of different types of ammunition & their types, and cartridge-firing mechanism.

Module 3: Types of Ballistics

Types of ballistics & their aspects, Internal, External, and Terminal Ballistics, General elementary & other principal problems: Heat problems, Pressure, Recoil, Vibration & Jump, Barrel Fouling, Trajectory formation & its computation, Vacuum Trajectories & its measurement, Influence of earth trajectory, Effect of air resistance on trajectories, Parameters involved in exterior ballistics. Effect of a projectile on target based on: nature of the target, bullet shape, striking velocity, striking angle and nature of the target, intermediate targets, and range.

Module 4: Handling and Identification of Firearms

Safety aspects for handling firearms and ammunition, Processing of Firearm Exhibits involved, Identification of firearms, ammunition and their components: Principles, Class characteristics & Individual characteristics (Identifiable marks) produced during the firing process on cartridge cases & projectiles and their linkage with firearms.

Module 5: Analysis of Firearm and GSR

Analysis of GSR –Composition of GSR, Location & Collection, Mechanism of formation, Chemical & Instrumental techniques involved in analysis, Shooter Identification technique. Case studies related to firearms.

Practice Components

1. To describe, with the aid of diagrams, the firing mechanisms of different types of firearms
2. To correlate the velocity of the bullet with the impact it produces on the target
3. To correlate the striking angle of the bullet with the impact on the target.
4. To estimate the range of fired bullets and to carry out the comparison of fired bullets as well as cartridge cases.
5. To identify gunshot residue.
6. To correlate the nature of injuries with the distance from which the bullet was fired.
7. To differentiate, with the aid of a diagram, contact wounds, close-range wounds, and distant wounds.

Suggested Readings

1. Hatcher, Jury and Weller, Firearms Investigation, Identification and Evidence; Stackpole Books, Harrisburg, P. A.
2. Brain J. Heard., Hand Book Of Firearms And Ballistics; John Willey, England
3. Chauhan R., Identification Of Firearms And Forensic Ballistics; S & S Books
4. Brain J. Heard., Forensic Ballistics In Court; John Willey, England
5. Vincent Di Maio, Gunshot Wounds; CRC Press, Washington, Dc
6. M. Johari, Identification Of Firearms, Ammunition And Firearms Injuries; BPR&D, New Delhi
7. Subrahmanyam BV., Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology, CBS Publishers & Distributors

CUFS1014

FORENSIC ANTHROPOLOGY, ODONTOLOGY, AND ARCHAEOLOGY

CREDITS: 4 (3-1-0)

Course Description:

This course provides a comprehensive understanding of forensic anthropology, odontology, and archaeology, emphasizing their applications in the identification and analysis of human remains. Students will learn to apply anthropological and odontological techniques in forensic investigations, including disaster victim identification (DVI) and the examination of skeletal remains. The course also covers forensic archaeology, focusing on the recovery and interpretation of human remains from archaeological contexts.

Course Objectives:

1. To understand the basics of forensic anthropology and its role in human identification.
2. To learn the fundamental principles of forensic odontology and its applications in forensic investigations.
3. To acquire knowledge of disaster victim identification and the methods used to examine and identify skeletal remains in mass disasters.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Define the basic concepts of forensic anthropology, including skeletal anatomy and human osteology.
2. Apply various techniques to analyze skeletal remains and estimate age, sex, and stature from bones.
3. Interpret age, sex, and race from teeth and evaluate their forensic significance.
4. Identify and examine skeletal remains from accidents, crimes, and mass disasters to determine individual and population characteristics.
5. Apply forensic anthropological and odontological techniques to real-world cases and effectively communicate the findings.

Course Modules:

Module 1: Basics of Anthropology and Application in Forensics

Forensic Anthropology: History, Scope, and Development. Role of the Forensic Anthropologist. Collection and Preservation of Evidence. Human Osteology: Determination of Age, Sex, and Stature. Determination of Personal Identity: Superimposition Techniques, Video Image Analysis, and Facial Reconstruction. Legal Provisions and Tools in Forensic Anthropology. Pathology of Bones and its Importance in Identification.

Module 2: Forensic Odontology and its Application in Forensics

Introduction to Forensic Odontology. Structure and Types of Teeth. Dentition and Dental Formula. Dental Diseases and Their Forensic Relevance. Determination of Age, Sex, and Race from Teeth. Role of Teeth in Mass Disaster Identification. Forensic Significance of Teeth in Human Identification.

Module 3: Disaster Victim Identification (DVI)

Identification of Burnt Bones and Skeletal Remains in Accidents and Crimes. Examination and Identification of Dead Bodies in Mass Disasters. Identification of Mutilated Bodies and Fragmentary Skeletal Remains. Determination of Age, Sex, Race, and Species Origin from Bones. Assessment of Stature from Skeletal Remains.

Module 4: Forensic Archaeology

Introduction to Forensic Archaeology. Techniques for Excavation and Recovery of Human Remains. Stratigraphy and Contextual Analysis. Dating Techniques: Relative and Absolute Dating. Interpretation of Archaeological Finds in a Forensic Context.

Module 5: Advanced Techniques in Forensic Anthropology and Odontology

Advanced Imaging Techniques: CT Scanning, MRI, and 3D Reconstruction. Trauma Analysis in Forensic Anthropology. Analysis of Bone Modification and Taphonomy. Application of DNA Analysis in Forensic Anthropology and Odontology. Ethical Considerations in Forensic Investigations.

Practical Components

1. Determination of Age from Skull and Teeth: Techniques and Practice.
2. Sex Determination from Skull and Pelvis: Methods and Application.
3. Identification and Description of Bones: Measurements and Analysis.
4. Distinguishing Between Human and Animal Bones: Examination and Techniques.
5. Forensic Recovery Techniques: Simulated Excavation and Recovery of Skeletal Remains.

Suggested Readings:

1. Maria Teresa Tersigni-Tarrant, Natalie R. Shirley, "Forensic Anthropology: An Introduction", CRC Press, Taylor & Francis Group, 2012.
2. Angi Christensen, N. Passalacqua, & E. Bartelink, "Forensic Anthropology: Current Methods and Practices", Academic Press, Elsevier, 2014.
3. Anil Mahajan & Surinder Nath, "Application Areas of Anthropology", Reliance Publishing House, 1992.
4. Megan Brickley & Roxanna Ferllini, "Forensic Anthropology: Case Studies from Europe", Charles C. Thomas Publisher, Springfield, Illinois, USA, 2007.
5. Whitaker, D.K. and MacDonald, D.U., "Forensic Dentistry", Wolfe Medical Publications Ltd., 1989.

CUFS1015

DIGITAL AND CYBER FORENSICS

CREDITS: 4 (3-1-0)

Course Description

This course provides a comprehensive understanding of the principles, practices, and legal aspects of digital and cyber forensics. It covers the various types of cybercrimes, digital evidence handling, incident response, and the legal framework governing cyber activities. Students will gain hands-on experience with forensic tools and techniques used in the investigation and analysis of digital evidence. The course also delves into the IT Act and related laws that govern the admissibility and legality of digital evidence.

Course Objectives

1. To understand the different types of cybercrimes and their impact on individuals and organizations.
2. To familiarize students with the principles and methodologies of digital forensics.
3. To equip students with the knowledge and skills for effective incident response and handling digital evidence.

Course Outcomes

On successful completion of the course, students will be able to:

1. Identify and categorize various forms of cybercrime and understand their implications.
2. Apply digital forensic principles in the investigation and analysis of digital evidence.
3. Execute incident response protocols, including the collection and preservation of digital evidence.
4. Analyze and interpret the IT Act and related laws pertaining to digital evidence and cybercrime.
5. Utilize various forensic tools and techniques to recover, analyze, and present digital evidence.

Course Modules

Module 1: Forms of Cyber-Crime and Introduction to Digital Forensics

Overview of Cyber-Crime: Internal and External Attacks, Online and Offline Attacks. Cyber-Crimes against Individuals and Organizations: Email spoofing, Phishing, Spamming, DoS and DDoS attacks, Malwares, E-mail bombing, Software Piracy, Industrial Espionage, Cyber-crimes on social media, Online and Banking frauds, Intellectual Property Frauds. Introduction to Digital Forensics: Objectives, Methodology, Rules, and Services.; Branches of Digital Forensics: Live Forensics, Disk Forensics, Network Forensics, Mobile Device Forensics.

Module 2: Incident Response and Digital Evidence

Incident Response: Role of First Responder, Toolkit, Stages of Response, Do's and Don'ts. Digital Evidence: Types, Sources, Principles for Collection, Best Evidence Rule. Forensic Readiness: Planning, Pre-search Requirements, Ethics, and Challenges. Search, Seizure, Collection, and Preservation of Evidence: Volatile and Non-volatile Evidence, Imaging, Hashing, Deleted Data Recovery.

Module 3: Introduction to IT Act and Cyber Laws

IT Act 2000: Objectives, Applicability, Non-applicability, Definitions, Amendments, and Limitations. Digital Signatures and Electronic Records: Legal Recognition and Admissibility. Information Technology (Amendment) Act 2008: Objectives, Applicability, and Jurisdiction. Cyber-Crimes and Legal Provisions: Sections 43, 65, 66, 67, 70, and Relevant Sections of the Indian Evidence Act.

Module 4: Forensic Tools and Techniques

Overview of Forensic Tools: Encase, FTK, PRTK, Registry Viewer, Black Bag Apple. Data Acquisition: Methods, Tools, Validation, and Remote Acquisition. Forensic Analysis Techniques: Slack Space, Data Recovery, Anti-Forensics, Memory Forensics. Processing Digital Evidence: Handling Digital Images, Multimedia Evidence, Deleted Data Recovery.

Module 5: Advanced Forensic Investigations

Current Forensic Tools: Software and Hardware, Validating and Testing Forensic Software. Data-Hiding Techniques and Countermeasures: Addressing Anti-Forensics. E-Mail Forensics: Investigating Email Crimes, Understanding E-Mail Servers, Specialized E-Mail Forensic Tools. Network Forensics: Preservation and Analysis of Network Traffic, Packet Analysis Tools and Techniques.

Practical Components

1. Image Analysis and Steganography: Techniques and Tools.
2. Evidence Handling: Techniques and Detection.
3. Forensic Tools Utilization: Encase, FTK, PRTK, Registry Viewer, Black Bag Apple.
4. Acquisition and Preservation of Volatile data from standalone computer.
5. Hash Calculation the files using different algorithms.
6. Recovery of Deleted Files and Folders
7. Imaging of data storage media using different file formats
8. Recovery Password from the protected word, pdf and rar files.



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Suggested Readings

1. Nina Godbole and Sunit Belapore, "Cyber Security: Understanding Cyber-crimes, Computer Forensics and Legal Perspectives", Wiley Publications, 2011.
2. Bill Nelson, Amelia Phillips, and Christopher Steuart, "Guide to Computer Forensics and Investigations, 5th Edition", Cengage, 2010.
3. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
4. William Stallings, "Cryptography and Network Security: Principles and Practices, 5th Edition", Prentice Hall, 2003.
5. Majid Yar, "Cybercrime and Society", Sage Publications, 2006.
6. Harish Chander, "Cyber Laws and IT Protection", PHI Learning Pvt. Ltd, 2012.
7. Karnika Seth, "Computers, Internet and New Technology Laws", Lexis Nexis Buttersworth Wadhwa, 2012.

CUFS1016

INFORMATION SECURITY AUDIT AND COMPLIANCE

CREDITS: 4 (3-1-0)

Course Description

This course provides an in-depth understanding of information security audit and compliance, focusing on identifying and mitigating risks, implementing security policies, and ensuring compliance with standards and regulations. Students will learn about various security technologies and develop the skills necessary to conduct effective security audits and manage information security within organizations.

Course Objectives

1. To understand the concepts of information security, including risks, threats, and vulnerabilities.
2. To learn about policy standards, baselines, and the classification of information assets.
3. To gain knowledge of risk management and various security technologies such as firewalls, VPNs, Honeypots, IPS, and IDS and comprehend the techniques for implementing and managing information security.

Course Outcomes

On successful completion of the course, a student will be able to:

1. Understand the fundamental concepts of information security and identify various risks, threats, and vulnerabilities.
2. Implement and manage information security policies, standards, and baselines.
3. Conduct risk assessments and apply appropriate risk control strategies.
4. Utilize security technologies such as firewalls, VPNs, Honeypots, IPS, and IDS to protect information assets.
5. Plan, implement, and maintain comprehensive information security programs and ensure compliance with relevant standards and regulations.

Course Outline

Module 1: Introduction to Information Security

Teaching Basics of Information Security: CIA Triad; Threats and vulnerabilities; Policy standards, procedures, guidelines, and baselines; Information asset classification: Classification of information, information assets - owner, custodian, user access control, authentication, and authorization; System Development Lifecycle (SDLC) and Secure Software Development Lifecycle (SSDLC): Investigation, analysis, logical and physical design, implementation, and security; CCNS Security Model; Attacks: Malicious code, backdoors, password cracking

Module 2: Risk Management and Security

Overview of risk, risk identification: Asset identification and recovery, information asset valuation, vulnerability and threat identification; Risk assessment: Likelihood, risk determination, identification of controls, documentation; Risk control strategies: Defend, transfer, mitigate, accept, and terminate; Cost Benefit Analysis (CBA), quantitative vs. qualitative risk control practices; Access controls: Identification, authorization, authentication, and accountability; Firewalls: Processing modes, types, generations, configuration, and content filters; Remote access and VPNs; Intrusion Detection and Prevention Systems (IDPS): Types, detection methods, response behavior, approaches, strengths and limitations, deployment and effectiveness measurement; Honeypots and Honeynets; Scanning and analysis tools: Port scanners, firewall analysis tools, operating system detection tools, vulnerability scanners, packet sniffers; Biometric access controls

Module 3: Security Planning and Implementation

Information security planning and governance; Information security policies: EISP, ISSP, SysSP, policy management; NIST Security Models, IETF Security Architecture, Baselining, and Best Business Practices; Security education, training, and awareness programs; Business Impact Analysis (BIA), Incident Response Planning (IRP), Disaster Recovery Planning (DRP), Crisis Management; Information Security Project Management: Conversion strategies, Bull's Eye Model, consideration for organizational change; Information systems security certification and accreditation: Certification vs. accreditation, NIST SP 800-37, NIACAP, ISO 27001/27002 system certification and accreditation

Module 4: Security Maintenance and Monitoring

Security management maintenance models: NIST SP 800-100, security maintenance model; Monitoring internal and external environment; Vulnerability assessment and remediation; Digital forensics: The team, methodology; Security audits: Types, methodologies, and tools; Continuous improvement and adaptation in information security practices

Module 5: Compliance and Legal Issues

Compliance requirements and legal frameworks: GDPR, HIPAA, SOX, PCI-DSS; Privacy laws and regulations; Ethical issues in information security; Developing and implementing compliance programs; Case studies on compliance failures and successes; Preparing for compliance audits and managing audit findings

Practice Components

1. Secure configuration of ports and services on a Windows system
2. Encrypting and decrypting partitions using BitLocker
3. Creating sandboxes and honeypots for malware analysis
4. Conducting vulnerability scanning using different tools
5. Creating rules and configuring firewalls

Suggested Readings

1. Michael E. Whiteman and Herbert J. Mattord, Principles of Information Security, Vikas Publishing House, New Delhi, 2003.
2. William Stallings, Cryptography and Network Security: Principles and Practices, 5th Edition, Prentice Hall Publication Inc., 2003.
3. Majid Yar, Cybercrime and Society, Sage Publications, 2006.
4. EC-Council, Computer Hacking Forensic Investigator v.3.
5. Atul Kahate, Cryptography and Network Security, 9th Edition, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 2009.

CUFS1017

INSTRUMENTAL TECHNIQUES

CREDITS: 4 (3-1-0)

Course Description

INSTRUMENTAL TECHNIQUES is a 4-credit course offering a detailed exploration of various instrumental methods used in forensic science. The course focuses on microscopy, spectroscopy, chromatography, biochemical analytical techniques, and electrophoresis. Students will gain hands-on experience and theoretical knowledge essential for analyzing forensic evidence and applying advanced instrumental methods in their investigations.

Course Objectives

1. To understand and apply various microscopic and spectroscopic techniques in forensic analysis.
2. To learn chromatographic methods for the separation and analysis of forensic samples.
3. To explore biochemical and electrophoretic techniques for analyzing biological and biochemical substances.

Course Outcomes

On successful completion of the course, students will be able to:

1. Demonstrate the proper use of different microscopes for forensic evidence analysis.
2. Apply spectroscopic techniques to identify substances based on their spectral properties.
3. Utilize various chromatographic methods for the separation and analysis of forensic samples.
4. Analyze substances using different centrifugation techniques in biochemical contexts.
5. Evaluate and interpret the results of electrophoretic techniques for separating and identifying forensic samples.

Course Modules

Module 1: Microscopy

Basic principles of microscopy; Types of Microscopes: Simple and Compound, Comparison, Phase Contrast, Stereoscopic, Polarizing, Fluorescence, IR, Scanning Electron (SEM), and Transmission Electron (TEM) Microscopy. Applications in forensic science.

Module 2: Spectroscopy

Electromagnetic radiations and their interactions; Types of Spectroscopy, its Forensic applications and principles: UV-VIS, IR, Fourier-transform Infrared, Raman Spectroscopy, Mass Spectroscopy; Metal detection: Atomic Absorption, Atomic Emission, X-ray and ICP, Mass Spectroscopy.

Module 3: Chromatographic Techniques

Principles of adsorption, absorption, and partition. Types of Chromatography: Paper, Thin Layer, Size Exclusion, Ion Exchange, Gas Chromatography (GC), Gas Liquid Chromatography (GLC), High-Performance Liquid Chromatography (HPLC).

Module 4: Biochemical Analytical Techniques

pH, buffer systems, and physiological solutions, Types of Centrifuges: Bench Top, Microcentrifuge, Gas, High-Speed, Low-Speed, Ultracentrifuge; Principles and techniques: Density Gradient Centrifugation, Differential Centrifugation.

Module 5: Electrophoretic Techniques

Fundamentals of electrophoresis, Techniques: Zone Electrophoresis (ZE), Paper Electrophoresis (PE), Agarose Gel Electrophoresis (AGE), Polyacrylamide Gel Electrophoresis (PAGE), SDS-PAGE, Isoelectric Focusing (IEF).

Practice Components

1. To study the parts of the compound microscope
2. Morphological examination of samples and microstructures using microscope / Microscopic examination of forensic evidence
3. Preparation of buffer and standard solutions.
4. Measurement and adjustment of pH.
5. pH metric titration of strong acid vs. strong base and weak acid vs. strong base.
6. To understand & perform calibration of the instrument / Calibration of Micropipettes.
7. To identify the compound UV-VIS spectrophotometer (chemical dyes / pharmaceutical drug of forensic importance)
8. Separation of mixture using centrifugation.
9. To prepare the TLC plate and identify natural dyes
10. Understand the concepts and working column chromatography, HPLC, GC and GC-MS, and HPLC

Suggested Readings

1. D.A. Skoog, F.J. Holler, and T.A. Neman, *Principles of Instrumental Analysis*, College Publishers, Singapore.
2. R.L. Grob, *Modern Techniques of Gas Chromatography*, Marcel Dekker, New York.
3. Dr. G.R. Chatwal, *Instrumental Methods of Chemical Analysis*, Himalayan Publication.
4. S.R. Sankar, *Advanced Instrumentation Techniques*, K.K. Publications.
5. M.F. Vitha, *Chromatography*, John Wiley.
6. R.D. Barun, *Introduction To Instrumental Analysis*, Pharma Med.
7. R.K. Verma, *Analytical Chemistry: Theory And Practice*, CBS Publisher.
8. D.M. Rao, *Instrumental Methods Of Analysis*, CBS.
9. Dr. S. Ravi Shankar, *Textbook of Pharmaceutical Analysis*, RX Publications.

CUFS1018

ETHICS IN SCIENCE EDUCATION AND RESEARCH

CREDITS: 4 (4-0-0)

Course Description

This course explores the fundamental principles and applications of ethics in science education and research. It covers the essential ethical considerations for conducting and presenting scientific research, maintaining integrity in academic settings, and understanding the responsibilities associated with publication. The course aims to equip students with a comprehensive understanding of ethical standards and practices, ensuring that they can navigate the complexities of ethical issues in their scientific careers.

Course Objectives

1. To understand and explain the fundamental ethics related to academic research and the standards required in higher education.
2. To analyze and apply ethical conventions in scientific research and publication, including the responsibilities of authors and the issues related to scientific misconduct.
3. To evaluate publication ethics, including best practices, conflicts of interest, and the implications of ethical violations.

Course Outcomes

On successful completion of this course, students will be able to:

1. Explain the principles of ethics in academic research, including integrity, objectivity, and respect for intellectual property.
2. Analyze ethical issues in scientific research and publication, such as collaboration, authorship, and the impact of predatory journals.
3. Identify and address ethical misconduct, including falsification, fabrication, and plagiarism.
4. Apply best practices and guidelines for publication ethics, understanding standards set by organizations like COPE and WAME.
5. Understand the role of ethics in maintaining credibility and trust in science education and research.

Course Outline

Module 1: Ethics in Higher Education and Academic Research

Introduction to Ethics in Academic Research; Issues in Research Ethics; Postulates for Maintaining Ethical Standards in Higher Education; Reliability and Integrity; Objectivity; Genuineness; Respect for Intellectual Property; Novelty in Publication; Confidentiality and Anonymity; Agreement for Consent; Concerns of Ethics in Academic Structure

Module 2: Ethics of Research and Publication

Ethics in Science and Research; Collaborative Research and Sharing of Credits; Ethical Conventions of Publications; Research Supervisor-Student Relationship; General Responsibilities of Authors; Ethical Conventions of Publications; Peer-Reviewed Scholarly Journals; Predatory Journals; Scientific Misconducts: Falsification, Fabrication, and Plagiarism; Impact Factor of Journals; H-Index;

Module 3: Publication Ethics

Definition, Introduction, and Importance of Publication Ethics; Best Practices/Standards Setting Initiatives and Guidelines: COPE, WAME, etc.; Conflicts of Interest; Publication Misconduct: Definition, Concept, Problems Leading to Unethical Behavior; Violation of Publication Ethics; Authorship and Contributorship; Identification of Publication Misconduct; Complaints and Appeals

Module 4: Case Studies and Real-world Applications

Analysis of Historical and Recent Cases of Ethical Violations in Research; Discussion on Effective Strategies for Addressing Ethical Issues; Role-playing and Simulation of Ethical Decision-making Scenarios;

Module 5: Review and Contemporary Issues in Research Ethics

Review of Key Ethical Principles and Practices; Discussion on Emerging Trends and Challenges in Research Ethics;

Suggested Readings

1. Ethics in Science Education Research and Governance, Edited by K. Muralidhar, Amit Ghosh, A.K. Singhvi, Indian National Science Academy, 2019.
2. Engineering Ethics, Charles E. Harris et al., Cengage, 2009.
3. Ethical Considerations, N.N. Das.
4. Professional Ethics, R. Subramaniam, Oxford University Press.
5. Research Methodology: A Step-by-Step Guide for Beginners, Ranjit Kumar, Sage Publications, 2011.

CUFS1019

ADVANCES IN FORENSIC SCIENCE

CREDITS: 4 (4-0-0)

Course Description

This course provides an in-depth exploration of the latest advancements and emerging technologies in forensic science. It covers a broad range of topics including new methodologies, advanced analytical techniques, and the integration of technology in forensic investigations. Students will gain insights into contemporary issues and future directions in forensic science, enabling them to apply cutting-edge techniques to solve complex forensic cases.

Course Objectives

1. To understand the latest advancements and technologies in forensic science and their applications in criminal investigations.
2. To analyze the impact of emerging forensic methodologies on crime scene investigation and evidence analysis.
3. To evaluate contemporary issues and challenges in forensic science and explore future trends in the field.

Course Outcomes

On successful completion of this course, students will be able to:

1. Describe the latest advancements in forensic science and their applications in various forensic disciplines.
2. Apply advanced analytical techniques and technologies to solve forensic cases.
3. Evaluate the effectiveness and limitations of new forensic methodologies and technologies.
4. Understand contemporary issues and challenges in forensic science and propose solutions to address them.
5. Explore future trends and potential developments in forensic science to enhance investigative practices.

Course Outline and Content

Module 1: Advanced Analytical Techniques

Overview of Emerging Technologies in Forensic Science; Advanced Chromatographic Techniques: UHPLC, SFC; High-Resolution Mass Spectrometry; Advanced Microscopy Techniques: FE-SEM, TEM; Novel DNA Analysis Methods: NGS, STR Analysis Advances

Module 2: Forensic Genetics and Molecular Biology

Recent Advances in DNA Profiling and STR Analysis; Mitochondrial DNA and Y-Chromosome Analysis; Epigenetics in Forensic Science; Advancements in RNA Analysis and Forensic Applications; Genomic Databases and Their Impact on Forensic Investigations

Module 3: Digital Forensics and Cybercrime

Latest Tools and Techniques in Digital Forensics; Mobile Device Forensics and Data Recovery; Cloud Computing and Forensic Challenge; Cybercrime Investigations and Evidence Management; Advanced Techniques in Network Forensics and Intrusion Detection

Module 4: Forensic Toxicology and Drug Analysis

Advances in Toxicological Screening and Analysis; New Methods in Drug Testing: LC-MS/MS, GC-MS; Emerging Drugs of Abuse and Their Detection; Biomarkers and Toxicology in Forensic Investigations; Advances in Post-Mortem Toxicology

Module 5: Future Directions and Challenges in Forensic Science

Ethical and Legal Implications of Forensic Advances; Challenges in Implementing New Technologies; Integration of Forensic Science with Other Disciplines; Case Studies: Application of Recent Advances in Real-world Scenarios; Discussion on Future Trends and Innovations in Forensic Science

Suggested Readings

1. Advances in Forensic Science, Edited by J. Paul, CRC Press.
2. Forensic Science: Advances, Challenges and Solutions, Edited by F. Daubert and R. Marks, Wiley.
3. Forensic Science and Technology, Edited by M. Thomas and L. Jackson, Elsevier.
4. Digital Forensics and Cyber Crime: A Law Enforcement Perspective, J. Thompson, Springer.
5. Principles of Forensic Toxicology, A. McDonald, CRC Press.

CUFS1020

RESEARCH METHODOLOGY

CREDITS: 4 (3-1-0)

Course Description

This course provides comprehensive coverage of the principles and practices of research methodology. It aims to equip students with the necessary skills to conduct independent research, including literature review, research planning, data collection and analysis, and effective communication of research findings. The course also addresses ethical issues, intellectual property rights, and the components essential for writing research papers and theses.

Course Objectives

1. To understand the various types of research and methodologies involved in conducting effective and reliable research.
2. To develop the skills required to collect, analyze, and interpret data accurately and effectively.
3. To learn the essential components and best practices for writing research papers and theses, as well as understanding ethical issues and intellectual property rights.

Course Outcomes

On successful completion of this course, students will be able to:

1. Conduct comprehensive literature reviews to inform and support research.
2. Develop and execute detailed research plans and designs.
3. Apply appropriate data collection methods and analyze data using statistical tools.
4. Write structured and well-documented research papers and theses.
5. Understand and address ethical issues, intellectual property rights, and copyright in research.

Course Outline

Module 1: Basics of Research

Objectives and types of research: Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, and Conceptual vs. Empirical; Research Formulation: Literature review and development of hypothesis; Research design and methods: Developing a research plan - Exploration, Description, Diagnosis, and Experimentation; Determining experimental and sample designs

Module 2: Data Analysis Methods

Data Collection and Analysis: Methods of data collection – Sampling methods and data processing; Data Analysis: Types of data, Basic concept of frequency distribution, Measure of central values – Mean, median, and mode, Measure of dispersion, Range, mean deviation and standard deviation, Probability theory and classical definition of probability, Bayes theorem of probability, Conditional probability and coincidence probability; Statistical Analysis: Chi-square test, ANOVA, SPSS; Types of Errors and Interpretation of Findings

Module 3: Scientific Reports and Thesis Writing

Reporting and thesis writing: Structure and components of scientific reports and thesis; Significance and different steps in the preparation; Illustrations, Bibliography; Presentations: Oral and Poster; Importance of effective communication in scientific research

Module 4: Ethical Issues and Intellectual Property Rights

Basics of ethical issues in research; Understanding intellectual property rights and copyright; Ethical standards and practices in research; Plagiarism and how to avoid it; Legal aspects of research and intellectual property

Module 5: Advanced Research Techniques and Tools

Advanced research methodologies and their applications; Use of software tools in research: SPSS, R, NVivo; Multivariate analysis techniques; Meta-analysis and systematic reviews; Emerging trends and future directions in research methodology

Practice Components

1. Calculation of mean, median, and mode
2. Calculation of standard deviation
3. Calculation of variance
4. Perform chi-square test on a given set of data
5. Perform T-test and student's T-test on a given set of values

Suggested Readings

1. Research Methodology: Methods and Techniques by C.R. Kothari, Gaurav Garg, New Age International Publishers.
2. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches by John W. Creswell, J. David Creswell, SAGE Publications.



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3. The Craft of Research by Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, University of Chicago Press.
4. Practical Research: Planning and Design by Paul D. Leedy, Jeanne Ellis Ormrod, Pearson.
5. Publication Manual of the American Psychological Association by American Psychological Association.
6. Research Methodology, by Sinha, S.C. and Dhiman, A.K., 2002. EssEss Publications.
7. Research Methods: the concise knowledge base by Trochim, W.M.K., 2005; Atomic Dog Publishing. 270p.
8. Research Methods: A Process of Inquiry, Allyn and Bacon by Anthony, M., Graziano, A.M. and Raulin, M.L., 2009.



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BASKET-II: MINOR

COURSES

CUFS1021

MULTIMEDIA FORENSICS

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides an in-depth understanding of multimedia forensics, focusing on the analysis and evaluation of audio, video, and image evidence in criminal investigations. Students will explore the principles, techniques, and tools used in forensic analysis, including voice identification, speaker recognition, and the examination of CCTV footage. The course also covers the practical aspects of handling and preserving multimedia evidence, with a focus on ensuring its integrity and admissibility in court.

Course Objectives

1. To provide a comprehensive understanding of voice production, speaker recognition, and their forensic significance.
2. To equip students with the skills to analyze and authenticate audio, video, and image evidence.
3. To introduce the methods and tools used in the forensic analysis of multimedia evidence, including CCTV footage.

Course Outcomes

On successful completion of this course, students will be able to:

1. Understand the fundamental concepts of voice production in forensic contexts.
2. Apprehend the approaches to speaker recognition
3. Analyze audio samples using forensic techniques to establish authenticity and identify speakers.
4. Conduct forensic video and image analysis, including the enhancement and authentication of multimedia evidence.
5. Apply forensic tools and methods to extract and analyze CCTV footage for use in criminal investigations.

Course Outline

Module 1: Introduction to Voice Production and Handling of Audio Samples

Voice identification and its forensic importance. History and theory of voice analysis. Text-dependent and text-independent speaker recognition. Discriminating tests: closed test, open test. Collection of standards, handling, and examination of audio evidence. Marking speakers and preparing working copies

Module 2: Approaches to Speaker Recognition

Components of speaker recognition: feature extraction, pattern matching. Speaker profiling: auditory and spectrographic analysis. Automatic speaker recognition techniques. Phonetic transcription and linguistic analysis. Acoustic parameters, Fourier analysis, speech signal processing

Module 3: Techniques for Audio Sample Analysis

Forensic audio/voice examination techniques. Enhancement and normalization of audio recordings. Establishing authenticity and integrity of audio samples. Speech signal processing: hardware and software. Alcohol speech relationships and report writing. Limitations and precautions in forensic audio analysis

Module 4: Video/Image Analysis

Forensic video examination: definition, scope, and significance. Technical aspects of video analysis. Video Management Systems. Handling, preservation, and enhancement of video/image evidence. Authentication techniques and related case studies

Module 5: CCTV Forensics

Introduction to CCTV forensics and its application in security. Acquisition and preservation of CCTV footage. Analysis and extraction of frames from CCTV footage. Forensic tools for enhancement and authentication. Legal admissibility of CCTV evidence and case studies

Practical Components

1. Hands-on experience in voice recording and speaker marking for forensic analysis.
2. Performing auditory and spectrographic analysis of recorded voice samples.
3. Analyzing and authenticating audio recordings using forensic software tools.
4. Video/image enhancement and authentication using forensic tools.
5. Extraction and analysis of CCTV footage, with a focus on forensic examination techniques.

Suggested Readings

1. Gold, B. (2007). *Speech and Audio Signal Processing*. Wiley India.
2. Kent, R. D. (1992). *The Acoustic Analysis of Speech*. San Diego.
3. Klevans, R. L. (1997). *Voice Recognition*. Artech House.
4. Rose, P. (2022). *Forensic Speaker Identification*. Taylor & Francis.
5. Carle, B., & Jensen, R. C. (2018). *Understanding Video Management Systems*. Salient Systems.
6. Wolper, V. E. (2020). *Photograph Restoration and Enhancement: Using Adobe Photoshop CC 2021 Version (3rd ed.)*. Mercury Learning & Information.

CUFS1022

ANTIDOPE FORENSICS

CREDITS: 4 (3+1+0)

Course Descriptor

This course offers an in-depth study of anti-dope forensics, focusing on the detection and analysis of performance-enhancing drugs in sports. Students will explore the types of drugs commonly used in doping, the pharmacodynamics and pharmacokinetics of these substances, and the legal and ethical implications of doping in sports. The course also covers the methodologies for dope testing in both humans and animals, with an emphasis on maintaining the integrity of competitive sports.

Course Objectives

1. To introduce students to the field of anti-dope forensics, including the types of drugs used in sports doping and the associated forensic challenges.
2. To provide an understanding of the pharmacodynamics and pharmacokinetics of doping drugs and their impact on athletes.
3. To equip students with the knowledge and skills required for dope testing and analysis in both human and animal subjects.

Course Outcomes

On the successful completion of this course, students will be able to:

1. Explain the fundamental concepts of anti-dope forensics and the types of drugs commonly abused in sports.
2. Analyze the pharmacodynamics and pharmacokinetics of various dope drugs and their effects on the human body.
3. Discuss the legal and ethical considerations related to doping in sports, including the roles of NADA and WADA.
4. Apply international standards and guidelines for dope testing in humans and animals, including the analysis of body fluids.
5. Evaluate case studies and real-world examples of doping incidents and the forensic methods used to detect them.

Course Outline

Module 1: Introduction to Anti-Dope Forensics & Drugs of Abuse in Sports

Overview of doping and its impact on sports; Types of sports under anti-doping norms; Introduction to dope drugs: stimulants, anabolic steroids, energy boosters, contraband drugs, growth hormones, diuretics, synthetic oxygen carriers, blood doping, insulin, and gene doping; Therapeutic drug use exemptions

Module 2: Pharmacovigilance and Legal Aspects

Pharmacodynamics and pharmacokinetics of dope drugs; Protecting athlete health and maintaining clean sport; Roles of healthcare providers at major sporting events; National and international laws governing doping in sports; Anti-doping agencies: NADA and WADA; The importance of doping education and awareness among athletes

Module 3: Testing & Analysis

Dope testing in humans and animals; Guidelines for dope testing procedures; Role of body fluids (blood, urine, saliva, sweat) in the analysis of dope drugs; International standards for dope testing laboratories and accreditation; Effective testing programs and case studies

Module 4: Legal and Ethical Implications in Anti-Dope Forensics

Ethical issues in anti-dope forensics; Legal implications and the role of expert testimony in doping cases; Review of major doping scandals and their forensic outcomes; Anti-doping policies and their enforcement; Case studies on the prosecution and defense in doping cases

Module 5: Advanced Techniques in Dope Testing

Innovations in drug detection technology; Use of mass spectrometry, chromatography, and other analytical techniques in dope testing; Challenges in detecting new and emerging doping methods; Future directions in anti-dope forensics; Case studies on cutting-edge dope testing techniques

Practical Components

1. Identification and analysis of common dope drugs using chromatography techniques.
2. Simulation of urine sample collection and testing for doping substances.
3. Analysis of blood samples for the presence of performance-enhancing drugs using mass spectrometry.
4. Comprehend the concepts of detection of synthetic oxygen carriers and blood doping in athletic samples.
5. Case study analysis: Evaluating a real-world doping case and preparing a forensic report.

Suggested Readings:

1. Goodwin, W., Linacre, A., & Sibte, H. (2007). *An Introduction to Forensic Genetics*. John Wiley & Sons.
2. World Anti-Doping Agency (WADA). (2009). *The World Anti-Doping Code*. Montreal.
3. Reardon, C. L., & Creado, S. (2014). "Drug Abuse in Athletes." *Substance Abuse and Rehabilitation*, 95-105.
4. Moston, S., & Engelberg, T. (2016). *Detecting Doping in Sport*. Routledge.
5. World Anti-Doping Agency. (2016). *Prohibited List*. Montreal.

CUFS1023

FOOD ADULTERATION ANALYSIS

CREDITS: 4 (3+0+1)

Course Descriptor

This course provides an in-depth understanding of food adulteration, focusing on the analysis of adulterants in food products. Students will learn about the detection techniques, health implications, and legal frameworks associated with food adulteration. Through theoretical knowledge and practical projects, the course aims to equip students with the skills necessary to identify and analyze food adulterants effectively.

Course Objectives

1. To understand the various types of food adulterants and their health implications.
2. To learn different techniques for detecting and analyzing food adulterants.
3. To gain knowledge of the legal and regulatory frameworks related to food safety and adulteration.

Course Outcomes

On the successful completion of this course, students will be able to:

1. Identify common adulterants in various food products.
2. Apply analytical techniques to detect and quantify food adulterants.
3. Understand the health risks associated with different types of food adulteration.
4. Interpret and comply with food safety regulations and standards.
5. Conduct a comprehensive analysis of food products for adulteration and prepare detailed reports.

Course Modules

Module 1: Introduction to Food Adulteration

Definition and types of food adulteration; Historical perspective and evolution of food safety; Commonly adulterated foods and their impact on health; Case studies on food adulteration incidents

Module 2: Analytical Techniques in Food Adulteration

Chemical methods for detecting adulterants; Physical and sensory evaluation techniques; Chromatographic and spectroscopic methods; Use of biosensors in food adulteration analysis

Module 3: Health Implications of Food Adulteration

Toxicological effects of adulterants; Chronic and acute health impacts; Foodborne diseases and contamination; Risk assessment and management strategies

Module 4: Legal Framework and Food Safety Regulations

National and international food safety laws; Standards and guidelines for food quality control; Role of agencies like FSSAI, WHO, and Codex Alimentarius; Legal consequences of food adulteration

Module 5: Emerging Trends in Food Adulteration and Detection

Advances in detection technology; Nanotechnology in food safety; The role of AI and machine learning in adulteration analysis; Future challenges and opportunities in ensuring food safety

Project Components

Students will undertake a project focusing on the analysis of food adulteration. The project may involve the collection of food samples, application of analytical techniques, data interpretation, and presentation of findings in a detailed report.

Suggested Readings:

1. "Food Adulteration: Detection and Control" by James S. Bus
2. "Chemical Analysis of Food: Techniques and Applications" by Yolanda Picó
3. "Food Safety and Protection: Protecting the Food Supply" by Vickie A. Vaclavik
4. "Food Adulteration and Contamination" by H.D. Singh
5. "Principles of Food Toxicology" by Tõnu Püssa

CUFS1024

ARSON INVESTIGATION

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides a comprehensive understanding of arson investigation, focusing on the scientific methods and techniques used in fire scene analysis. Students will explore the chemistry and physics of combustion, the development of fire patterns, and the methods for analyzing ignitable residues. The course is designed to equip students with the necessary skills to conduct thorough and accurate arson investigations, culminating in a hands-on project that applies theoretical knowledge to practical scenarios.

Course Objectives

1. To understand the importance of forensic and scientific methods in investigating fire and arson cases.
2. To learn the techniques for analyzing ignitable residues and evaluating ignition sources.
3. To gain a solid foundation in the core concepts of fire science, including its historical context.

Course Outcomes

On successful completion of this course, students will be able to:

1. Understand the chemistry and physics underlying combustion and apply this knowledge in fire investigations.
2. Analyze fire patterns, fire modeling, and the processes of ignition, including spontaneous and chemical ignition.
3. Utilize modern fire analysis techniques in the investigation of fire incidents.
4. Apply separation and analytical techniques to analyze ignitable liquid residues (ILR) and identify products like gasoline and distillates.
5. Implement proper reporting procedures, ensure quality assurance, and draw conclusive evaluations in arson investigations.

Course Outline

Module 1: Fundamentals of Fire Science

Introduction to fire science and its significance in forensic investigations; National Fire Protection Association (NFPA) 921 guidelines; Chemistry and physics of combustion: Fire and energy, chemical reactions, and behavior of gases, liquids, and solids; Understanding flammable limits and states of matter

Module 2: Fire Dynamics and Pattern Development

Fire dynamics: ignition, flames, and combustibility; Spontaneous and chemical ignition processes; Compartmental fire (e.g., house fires) and the development of fire patterns; Fire modeling and its role in fire investigations

Module 3: Arson Investigation Techniques

Introduction to fire and arson investigation: Accidental vs. deliberate causes; Planning and conducting fire scene investigations; Surveying and documenting the fire scene, including origin determination and reconstruction; Investigating fatal fires and vehicular fires, and eliminating accidental causes; Professional practice in fire investigation: Evidence collection, preservation, and reporting

Module 4: Analysis of Ignitable Residues

Introduction to ignitable liquid residues (ILR) and their importance in arson investigations; Evolution of analytical techniques for ILR analysis; Methods for isolating and analyzing residues: Identification of gasoline, distillates, and other products; Enhancing sensitivity and estimating the degree of evaporation in ILR analysis; Quality assurance in ILR analysis and reporting procedures

Module 5: Evaluation of Ignition Sources

Joint examination of physical evidence, appliances, and electrical components; Testing ignition scenarios, including spontaneous ignition tests; Conclusion and reporting in the evaluation of ignition sources; Case studies on real-world arson investigations

Practical Components

1. Simulated fire scene investigation and documentation.
2. Analysis of ignitable liquid residues using chromatography.
3. Identification and classification of gasoline and other distillates.
4. Evaluation of ignition sources through practical testing.
5. Report writing and presentation on a comprehensive arson investigation case study.

Suggested Readings

1. "Scientific Protocols for Fire Investigation" by John J. Lentini, CRC Press
2. "Practical Fire and Arson Investigation" by David R. Redsicker and John J. O'Connor, CRC Press
3. "Crime Scene Management – A Scientific Approach" by M. S. Dahiya
4. "Forensic Fire Scene Reconstruction" by David J. Icove and John D. DeHaan
5. "Kirk's Fire Investigation" by David J. Icove and Gerald A. Haynes



CUFS1025

FORENSIC LINGUISTICS

CREDITS: 4 (3+1+0)

Course Descriptor

This course explores the application of linguistic theory and methods to legal issues. Forensic Linguistics examines how language is used in legal contexts, including the analysis of written texts, spoken communication, and the role of language in criminal investigations. The course covers key areas such as authorship attribution, discourse analysis, and the use of linguistic evidence in court.

Course Objectives

1. To understand the fundamental concepts of forensic linguistics and its applications in legal settings.
2. To analyze various types of linguistic evidence used in forensic contexts, including written texts and spoken communication.
3. To apply forensic linguistic methods to real-world cases through practical projects and case studies.

Course Outcomes

On successful completion of this course, students will be able to:

1. Demonstrate knowledge of forensic linguistics principles and their relevance to the legal field.
2. Analyze and interpret linguistic evidence in criminal investigations and legal disputes.
3. Apply forensic linguistic methods to assess authorship, language patterns, and discourse in legal contexts.
4. Evaluate the effectiveness and limitations of linguistic evidence in court proceedings.
5. Develop practical skills in creating forensic linguistic reports and presenting findings.

Course Outline

Module 1: Introduction to Forensic Linguistics

Overview of Forensic Linguistics; History and Development; Key Concepts: Authorship Attribution, Discourse Analysis, and Language and Law; Applications in Criminal and Civil Cases

Module 2: Language Analysis in Forensic Contexts

Discourse Analysis: Spoken and Written Communication; Textual Analysis: Authorship and Plagiarism; Speech Acts and Implicature in Legal Settings; Language and Identity: Profiling and Verification

Module 3: Forensic Phonetics and Speech Analysis

Basics of Phonetics and Phonology; Speaker Identification and Voice Analysis; Forensic Voice Comparison Techniques; Analyzing Speech Patterns and Accents

Module 4: Legal Language and Courtroom Discourse

Legal Terminology and Language; Courtroom Communication: Lawyers, Witnesses, and Judges; Analysis of Legal Documents: Contracts, Testimonies, and Judgments; The Role of Language in Persuasion and Legal Argumentation

Module 5: Practical Applications and Case Studies

Real-world forensic Linguistics Case Studies; Conducting Forensic Linguistic Analysis; Preparing Forensic Linguistic Reports; Ethical and Legal Considerations in Forensic Linguistics

Practical Components

1. Analyze a legal document for authorship attribution.
2. Conduct a discourse analysis of courtroom interaction.
3. Perform a phonetic analysis of recorded speech samples.
4. Develop a report on a case study involving forensic linguistics.
5. Create a linguistic profile based on language use in written or spoken communication.

Suggested Readings

1. Gibbons, A., & McGregor, C. (2007). *Forensic Linguistics: An Introduction to Language in the Justice System*. Continuum.
2. Coulthard, M., & Johnson, A. (2010). *The Routledge Handbook of Forensic Linguistics*. Routledge.
3. Olsson, J. (2011). *Forensic Linguistics: Language in Evidence*. Routledge.
4. Tiersma, P. (2008). *Legal Language*. University of Chicago Press.
5. Coulthard, M., & Johnson, A. (2007). *Forensic Linguistics: A Reader*. Routledge.

CUFS1026

EXPLOSIVE ANALYSIS AND POST-BLAST INVESTIGATIONS

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides a comprehensive understanding of the forensic analysis of explosives and the investigation of post-blast scenes. Students will explore the chemistry and mechanics of explosions, classification of explosive materials, initiation techniques, and methods for analyzing post-blast residues. The course also covers the role of forensic scientists in documenting and reconstructing explosion scenes, as well as clandestine explosive manufacturing.

Course Objectives

1. To understand the fundamental principles of explosives, including their chemistry, classification, and initiation techniques.
2. To develop skills in processing explosion scenes, documenting evidence, and analyzing post-blast residues using various forensic methods.
3. To apply forensic techniques to reconstruct explosion events and understand the role of forensic scientists in legal proceedings.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Explain the history, development, and chemistry of explosives, including key concepts like explosive power and kinetics of reactions.
2. Classify different types of explosive materials and describe their uses, including initiating devices and propellants.
3. Analyze initiation techniques and understand the mechanisms of combustion, detonation, and thermal decomposition.
4. Process and document explosion scenes, collect and evaluate post-blast residues, and reconstruct the sequence of events using forensic methods.
5. Conduct practical analyses of explosive residues and apply various instrumental techniques for post-blast investigation.

Course Outline

Module 1: Introduction to Explosives

History and development of explosives; Oxygen balance and explosive power; Power index, temperature, force, and pressure of explosions; Kinetics of explosive reactions

Module 2: Classification of Explosives

High explosives (commercial and military); Initiating devices: safety fuses, detonators; IEDs, Pyrotechnics, and propellants; Shattering and other explosive materials

Module 3: Initiation Techniques and Explosion Mechanics

Combustion, deflagration, and detonation; Thermal decomposition of explosives; Mechanics of explosions: shock waves and fragmentation effects

Module 4: Post-Blast Investigation

Processing the explosion scene; Role of Forensic Scientists in post-blast Investigations; Documentation and collection of post-blast residues; Evaluation, assessment, and reconstruction of explosion sites; Famous case studies and court testimony

Module 5: Analysis and Manufacturing of Explosives

Clandestine explosive manufacturing techniques; Analysis of post-blast residues using chemical, microscopic, and instrumental methods (chromatographic, spectroscopic, electrophoresis)

Practice Components

1. Analysis of low explosives (cations and anions) using standard forensic techniques.
2. Analysis of high explosives (picric acid) and their residues.
3. Use of chromatographic methods for residue analysis.
4. Application of spectroscopic techniques to identify explosive materials.
5. Conducting a mock post-blast investigation, including evidence documentation and residue analysis.

Suggested Readings

1. Beveridge, A. Forensic Investigation of Explosives. Taylor & Francis, 2000.
2. Yallop, H. J. Explosion Investigation. Forensic Science Society & Scottish Academic Press, 1980.
3. Narayanan, T. V. Modern Techniques of Bomb Detection and Disposal. R. A. Security System, 1995.
4. Yinon, J., and Zitrin, S. The Analysis of Explosives. Pergamon, 1981.
5. Yinon, Jitrin. Modern Methods & Applications in the Analysis of Explosives. John Wiley & Sons, England.

CUFS1027

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides a comprehensive introduction to Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL). It covers fundamental concepts, techniques, and practical applications in these fields, with a focus on Python programming, machine learning models, neural networks, and data handling. The course aims to equip students with the knowledge and skills necessary to create AI models and understand their applications, as well as the importance of body language and gestures in the context of AI.

Course Objectives

1. To understand the core concepts of Artificial Intelligence, Machine Learning, and Deep Learning, including their definitions, history, and applications.
2. To learn and apply various Machine Learning and Deep Learning techniques, including model creation, evaluation, and optimization.
3. To develop practical skills in Python programming for AI, including data handling, model building, and analysis.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Demonstrate proficiency in Python programming for AI applications, including using libraries like NumPy, Pandas, and Matplotlib.
2. Explain the concepts of Machine Learning and Deep Learning, including their types, techniques, and applications.
3. Build, evaluate, and optimize machine learning models using supervised and unsupervised learning methods.
4. Design and implement neural network models, including Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Long Short-Term Memory Networks (LSTMs).
5. Understand and apply the significance of body language and gestures in AI applications.

Course Outline

Module 1: Introduction to Python and Mathematics for Machine Learning

Python Programming: Setting up the environment and basic Python commands, Creating Python scripts, conditions, loops, Lists, dictionaries, and user-defined functions.



Introduction to Anaconda and libraries: NumPy, Pandas, Matplotlib; Mathematics for Machine Learning: Vectors, matrices, and linear equations; Mean, median, mode, standard deviation, and variance; Probability, correlation, and regression; Data handling and representation

Module 2: Machine Learning (ML)

Overview of AI and ML: Definition, history, and applications of AI, Defining machine learning and its challenges, Types of machine learning: supervised, unsupervised, and reinforcement learning.

Supervised Learning: Basics of prediction and classification, Understanding datasets, feature selection, and normalization, Training, testing, and validation sets, Model evaluation: accuracy, loss, underfitting, and overfitting

Unsupervised Learning: Basics and different models

Module 3: Neural Networks

Artificial Neural Networks (ANNs): Understanding biological brains and ANN fundamentals; Building perceptrons and feedforward networks; Backpropagation, activation functions, and loss functions; Compiling and evaluating ANN models;

Deep Learning Architectures: Convolutional Neural Networks (CNNs): Understanding convolutions, pooling, model building, and performance evaluation\

Recurrent Neural Networks (RNNs): Basic architecture, applications, model building, and performance evaluation

Long Short-Term Memory Networks (LSTMs): LSTM architecture and building models

Module 4: Practical Applications and Model Creation

Creating AI Models: Hands-on model building using Python libraries, Implementing various machine learning and deep learning techniques, Evaluating and optimizing model performance; Applications of AI: Understanding real-world applications of AI and machine learning; Importance of body language and gestures in AI

Module 5: Advanced Topics and Emerging Trends

AI and Ethics: Ethical considerations in AI and machine learning; Emerging Trends: Latest advancements in AI, ML, and DL, Future directions and research areas

Practice Components

1. Writing Python scripts to perform basic data analysis using NumPy and Pandas.
2. Building and evaluating a simple machine learning model using Scikit-Learn.
3. Implementing a Convolutional Neural Network (CNN) model for image classification.
4. Creating a Recurrent Neural Network (RNN) model for sequence prediction.
5. Analyzing body language and gesture recognition using machine learning techniques.

Suggested Readings

1. Deisenroth, M. P. Mathematics for Machine Learning. 1st Edition.
2. Géron, A. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems. 2nd Edition.
3. Raschka, S., & Mirjalili, V. Python Machine Learning: Machine Learning and Deep Learning with Python, Scikit-Learn, and TensorFlow 2. 3rd Edition.
4. Purkait, N. Hands-On Neural Networks with Keras: Design and Create Neural Networks Using Deep Learning and Artificial Intelligence Principles. 1st Edition.
5. Gulli, A., & Pal, S. Deep Learning with Keras: Implementing Deep Learning Models and Neural Networks with the Power of Python.

CUFS1028

DIGITAL FRAUD INVESTIGATIONS

CREDITS: 4 (3+1+0)

Course Descriptor

This course offers an in-depth examination of digital fraud investigation, focusing on the principles and practices of digital forensics. Students will explore the importance of digital evidence, the history and development of e-discovery, and techniques for identifying, preserving, and analyzing digital evidence. The course also covers legal and ethical considerations, as well as the role of AI in investigations.

Course Objectives

1. To understand the fundamentals of digital forensics, including the types of digital evidence and legal considerations.
2. To learn about the history and development of e-discovery, including relevant laws and technological advancements.
3. To develop practical skills in the identification, preservation, and analysis of digital evidence, including the use of AI-driven investigation techniques.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Explain the core concepts of digital forensics and the types of digital evidence relevant to investigations.
2. Describe the history and evolution of e-discovery, including the Electronic Discovery Reference Model (EDRM).
3. Demonstrate proficiency in identifying and preserving digital evidence, and understand the process of data collection and processing.
4. Apply analytical techniques to investigate digital fraud cases, including the use of AI tools.
5. Prepare and present evidence in a manner that is legally defensible and suitable for court proceedings.

Course Outline

Module 1: Introduction to Digital Forensics

Overview of Digital Forensics: Definition and importance, Types of digital evidence (e.g., files, logs, network traffic); Legal and Ethical Considerations: Privacy laws and regulations, Chain of custody, Ethical practices in digital forensics

Module 2: History and Development of E-Discovery

Evolution of E-Discovery: Historical context and advancements; E-Discovery Laws: Legal frameworks and regulations; Technology in E-Discovery: Creation, storage, and disposition of electronic evidence; EDRM – Electronic Discovery Reference Model: Phases of e-discovery: identification, preservation, collection, processing, review, analysis, and presentation

Module 3: Identification and Preservation of Digital Evidence

Data Collection/Acquisition: Techniques for collecting relevant electronically stored information (ESI), Tools and methods for data acquisition; Processing: Assessment, preparation, selection, and output of review; Documentation: Maintaining a defensible audit trail, Ensuring data integrity and evidence authenticity

Module 4: Investigations and Analysis

Investigative Techniques: Analysis of digital evidence: file systems, metadata, and network data, Status and progress reporting; AI-Driven Investigation: Use of artificial intelligence in fraud detection and analysis; Production and Presentation of Evidence: Preparing reports, Presenting findings in legal proceedings

Module 5: Advanced Topics and Case Studies

Advanced Techniques: Emerging trends in digital forensics, Case studies of high-profile digital fraud investigations; Practical Application: Hands-on experience with forensic tools and techniques

Practice Components

1. Perform a forensic data acquisition from a digital device using industry-standard tools.
2. Process digital evidence using software tools to prepare for review and analysis.
3. Analyze a set of digital evidence to identify signs of fraud.
4. Use AI tools to assist in the investigation of a simulated fraud case.
5. Prepare a forensic report based on the analysis of digital evidence, including a mock courtroom presentation.

Suggested Readings

1. Bertino, E., & Sandhu, R. *Digital Forensics and Incident Response*. CRC Press.
2. Carrier, B., & Spafford, E. *File System Forensic Analysis*. Addison-Wesley.
3. Kohn, M. *Computer Forensics: Investigating File and Operating Systems*. Wiley.
4. Reith, M., Carr, C., & Gunsch, G. *An Examination of Digital Forensic Models*. International Journal of Digital Evidence.
5. Casey, E. *Handbook of Digital Forensics and Investigation*. Academic Press.

CUFS1029

FORENSIC PHOTOGRAPHY

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides a comprehensive introduction to forensic photography, focusing on the techniques, principles, and applications of photography in criminal investigations. Students will learn about the historical development of forensic photography, the fundamentals of light and optics, and the use of specialized photographic equipment. The course also covers the application of various photographic techniques at crime scenes, in evidence documentation, and courtroom presentations.

Course Objectives

1. To introduce the fundamental principles and history of forensic photography and its significance in criminal investigations.
2. To equip students with the skills to apply various forensic photographic techniques for documenting crime scenes and evidence.
3. To familiarize students with specialized forensic photography methods and their applications in forensic science.

Course Outcomes

On the successful completion of this course, students will be able to:

1. Understand the historical development and significance of forensic photography in criminal investigations.
2. Apply fundamental concepts of light, optics, and camera functions to forensic photography.
3. Perform various types of crime scene photography, including overall, mid-range, and close-up photography.
4. Utilize specialized forensic photography techniques, such as UV, IR, and underwater photography, in documenting evidence.
5. Prepare photographic evidence for court presentation, including report writing and expert testimony.

Course Outline

Module 1: History of Forensic Photography

History of photography in criminal investigations; Development of forensic working groups on photography; Examination of infamous cases involving forensic photography

Module 2: Basics of Light and Optics

Light temperature and sources of light; Light intensity and angles; Fundamentals of optics in forensic photography

Module 3: Camera Peripherals & Functions

Camera body and lenses; Filters and lens care; Camera handling and media storage; Overview of photographic equipment and peripherals

Module 4: Crime Scene and Evidence Photography

Aerial, overall, mid-range, and close-up photography techniques; Techniques for photographing various types of evidence: physical, biological, chemical, toxicological, fingerprint, document, digital, and corpse photography; Specialized photography: UV, IR, underwater, and surveillance photography

Module 5: Photography in Forensics and Court Presentation

Digital photography software and file formats (jpg, gif, bmp, tiff, raw, etc.); Image enhancement techniques, photogrammetry, and digital watermarking; CCTV image enhancement and manipulation detection; Preparation of photographic evidence for court presentations and expert testimony;

Practical Components

1. Crime scene photography using the overall photography method.
2. Mid-range photography techniques at a simulated crime scene.
3. Close-up photography of physical and biological evidence.
4. Application of UV and IR photography for evidence documentation.
5. Preparing a forensic photography report and presenting photographic evidence in a mock trial.

Suggested Readings

1. Marsh, N. (2014). *Forensic Photography: A Practitioner's Guide*. Routledge.
2. Mancini, K. (2016). *Fundamentals of Forensic Photography: Practical Techniques for Evidence Documentation on Location and in the Laboratory*. CRC Press.
3. Redsicker, D. R. (1994). *The Practical Methodology of Forensic Photography*. CRC Press.
4. Robinson, E. M. (2016). *Crime Scene Photography* (3rd ed.). Academic Press.
5. Weiss, S. (2009). *Handbook of Forensic Photography*. Academic Press
6. Ang, T. (2010). *The Complete Photographer*. Dorling Kindersley Ltd.]
7. Gernsheim, H. (2016). *A Concise History of Photography*. Dover Publications.
8. Freeman, M. (2008). *The Complete Guide to Digital Photography*. Lark Books.
9. Farrell, I. (2013). *Complete Guide to Digital Photography*. Quercus Publications.
10. Edge, M. (2010). *The Underwater Photographer*. Focal Press.

CUFS1030

ACCIDENT INVESTIGATION

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides an in-depth understanding of the forensic aspects of motor vehicle accident investigations. It covers the analysis of pre-crash and post-crash events, the significance of tachographs in accident reconstruction, and the interpretation of physical evidence from accident scenes. The course also focuses on the methodologies and tools used in analyzing accident scenes to determine causes and contributing factors.

Course Objectives

1. To introduce the principles and techniques used in the forensic investigation of motor vehicle accidents.
2. To equip students with the skills to analyze pre-crash and post-crash movements and interpret evidence from accident scenes.
3. To develop proficiency in the use and analysis of tachograph data and charts for accident reconstruction.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Describe the forensic significance of motor vehicle accidents and the methods used to investigate them.
2. Analyze pre-crash and post-crash movements using collision models and evidence from accident scenes.
3. Evaluate the role of physical evidence, including tire marks and vehicle damage, in accident reconstruction.
4. Interpret tachograph data and charts to assess speed, route tracing, and potential falsifications.
5. Apply forensic techniques to analyze accidents involving abandoned vehicles, airbag deployment, and railway incidents.

Course Outline

Module 1: Introduction to Motor Vehicle Accidents

Accident scene overview; Sources of Forensic Information; Eyewitness accounts and visibility conditions; Extent of vehicle damage; Importance of airbags in accident scenarios; Railway accidents: forensic considerations

Module 2: Accident Scene Analysis

Pre-crash and post-crash movements; Collision model and driver's reaction analysis; Occupants' kinematics; Types of injuries resulting from accidents; Trace evidence collection and interpretation at accident sites

Module 3: Tire Marks and Vehicle Evidence

Types of tire marks: skid, scuff, and others; Estimation of speed from tire marks; Analysis of vehicle maintenance records; Investigating abandoned vehicles; Photographic documentation of accident sites;

Module 4: Tachographs and Forensic Significance

Introduction to tachographs and their forensic significance; Tachograph charts: principles of analysis; Accuracy of speed records and tire slip effects; Detection of tachograph data falsification; Route tracing and diagnostic signals

Module 5: Special Cases in Accident Investigation

Hit-and-run investigations; Biomechanics of injuries; Role of airbags in occupant protection; Investigating train accidents; Case studies of major road and railway accidents

Practice Components

1. Lifting and analyzing tire marks from accident scenes.
2. Estimating vehicle speed from skid marks.
3. Conducting a full analysis of a motor vehicle accident, including pre-crash and post-crash movements.
4. Preparing a detailed report on a major road accident.
5. Analyzing tachograph charts for potential data falsification and route tracing.

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).
5. J. Stannard, *Accident Reconstruction: The Forensic Engineer's Approach*, CRC Press, London (2005).

CUFS1031

QUALITY CONTROL AND QUALITY ASSURANCE

CREDITS: 4 (3+1+0)

Course Descriptor

This course introduces students to the fundamental principles of quality control and quality assurance (QC/QA) within forensic science laboratories. The course covers the essential requirements for standardization, management, and accreditation of forensic laboratories, with a focus on ensuring the reliability and accuracy of forensic analyses. Students will also learn about the significance of audits and the various accreditation bodies relevant to forensic science.

Course Objectives

1. To introduce the basic concepts and importance of quality control and quality assurance in forensic science laboratories.
2. To provide an understanding of laboratory management procedures, including testing, calibration, and validation processes.
3. To familiarize students with the auditing process and the role of accreditation bodies in maintaining forensic laboratory standards.

Course Outcomes

On the successful completion of this course, students will be able to:

1. Understand the scope and need for quality control and quality assurance in forensic science laboratories.
2. Apply quality management principles, including testing, calibration, and validation, in a forensic laboratory setting.
3. Evaluate the laboratory management procedures including the implementation and use of LIMS and the validation of forensic equipment.
4. Analyze the importance of audits and accreditation in ensuring the reliability and accuracy of forensic analyses.
5. Demonstrate knowledge of relevant standards and accreditation bodies such as NABL, ISO, IEC, and BIS.

Course Outline

Module 1: Introduction to Quality Control & Quality Assurance

Introduction to QC/QA in forensic science; Scope and need for standardization in forensic laboratories; General requirements for forensic laboratory standardization

Module 2: Quality Management

Testing and calibration procedures; Concepts of total quality assurance and quality control; Quality planning in forensic laboratories

Module 3: Laboratory Management Procedure

Laboratory Information Management System (LIMS); Validation of forensic equipment and safety protocols; Best practices for maintaining laboratory standards

Module 4: Quality Audit

Definition and types of audits: internal and external; Importance of audits in forensic science; Forensic significance and the role of quality audits

Module 5: Accreditation & Certification

NABL: Introduction and relevant provisions; **ISO:** Introduction and relevant provisions; **IEC & BIS:** Introduction and relevant provisions

Practice Components

1. Introduction to Laboratory Information Management Systems (LIMS) and its application in forensic labs.
2. Conducting basic validation procedures for forensic equipment.
3. Simulated internal audit process for a forensic laboratory.
4. Analysis and application of NABL and ISO standards in a forensic setting.
5. Preparation of a quality assurance plan for a forensic laboratory project.

Suggested Readings

1. Doyle, S. (2019). *Quality Management in Forensic Science*. CRC Press.
2. Katz, E. (2009). *Forensic Quality Control*. Springer.
3. Saferstein, R. (2013). *Forensic Science Handbook: Quality Assurance*. Pearson.
4. McGlinchey, M. (2018). *Laboratory Quality Management*. Wiley-Blackwell.
5. Giebels, E. (2020). *Forensic Laboratory Management: Accreditation, Certification, and QA/QC*. Elsevier.

CUFS1032

HUMAN ANATOMY AND PHYSIOLOGY

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides an in-depth study of human anatomy and physiology. It covers the structure and function of the human body systems, including the musculoskeletal, cardiovascular, respiratory, digestive, and nervous systems. The practical component includes hands-on activities to reinforce theoretical knowledge and enhance understanding of human anatomy and physiology in real-world contexts.

Course Objectives

1. To understand the structure and function of human body systems and their interrelationships.
2. To explore the physiological processes that maintain homeostasis and health.
3. To apply anatomical and physiological knowledge through practical exercises and case studies.

Course Outcomes

1. Describe the anatomical structures and physiological functions of major body systems.
2. Explain the physiological processes involved in maintaining homeostasis.
3. Identify and analyze common diseases and disorders related to specific body systems.
4. Demonstrate practical skills in observing and interpreting anatomical structures.
5. Apply knowledge of anatomy and physiology to real-life forensic cases.

Course Outline

Module 1: Introduction to Human Anatomy and Physiology (6 Hours)

Overview of Human Anatomy and Physiology; Basic Terminology and Anatomical Positions; Overview of Body Systems; Levels of Organization: Cells, Tissues, Organs, and Systems; Homeostasis and Feedback Mechanisms

Module 2: Musculoskeletal System (6 Hours)

Anatomy of Bones and Joints; Muscle Structure and Function; Types of Muscles and Their Functions; Mechanisms of Muscle Contraction; Common Musculoskeletal Disorders

Module 3: Cardiovascular and Respiratory Systems (6 Hours)

Anatomy of the Heart and Blood Vessels; Physiology of Blood Circulation; Anatomy of the Respiratory System; Mechanisms of Breathing and Gas Exchange; Cardiovascular and Respiratory Diseases;

Module 4: Digestive and Nervous Systems (6 Hours)

Anatomy of the Digestive Tract and Accessory Organs; Physiology of Digestion and Absorption; Anatomy of the Nervous System; Nervous System Functions and Reflexes; Common Digestive and Nervous Disorders

Module 5: Forensic Applications and Case Studies (6 Hours)

Application of Anatomy and Physiology in Forensic Science; Identifying Trauma and Disease from a Forensic Perspective; Analyzing Forensic Case Studies: Anatomy and Physiology in Action; Techniques for Estimating Time of Death and Cause of Injury; Review of Landmark Forensic Cases and Their Anatomical Insights

Practical Components

1. Simulation of Dissection of anatomical models to study musculoskeletal structures.
2. Measurement of heart rate, blood pressure, and respiratory rate.
3. Observation of the digestive system through virtual simulations or models.
4. Reflex testing and assessment of nervous system responses.
5. Analysis of case studies related to anatomical and physiological anomalies.

Suggested Readings:

1. "Human Anatomy & Physiology" by Elaine N. Marieb and Katja Hoehn
2. "Anatomy & Physiology: The Unity of Form and Function" by Kenneth S. Saladin
3. "Principles of Anatomy and Physiology" by Gerard J. Tortora and Bryan Derrickson
4. "Essentials of Human Anatomy & Physiology" by Elaine N. Marieb
5. "Human Anatomy & Physiology Laboratory Manual" by Elaine N. Marieb

CUFS1033

BASICS OF COMPUTER AND BIOMETRICS

CREDITS: 4 (3+1+0)

Course Descriptor

This course provides a comprehensive introduction to fundamental concepts in computing and biometrics. It covers number systems, computer fundamentals, networking basics, and biometrics technologies. The practical component focuses on hands-on experience with computer systems and biometric technologies, emphasizing their applications and relevance in the field of forensic science.

Course Objectives

1. To understand number systems and their applications in computing.
2. To gain foundational knowledge of computer fundamentals, including hardware, software, and operating systems.
3. To learn the basics of computer networking, internet technologies, and biometric systems.

Course Outcomes

On successful completion of this course, students will be able to:

1. Convert between different number systems and perform arithmetic and logical operations on binary numbers.
2. Understand the core concepts of computer hardware, software, and operating systems, and recognize computer-related crimes.
3. Grasp the fundamental concepts of computer networking, including network topologies, OSI layers, and internet technologies.
4. Familiar with the principles of biometric systems, including their technologies, processes, and performance measures.
5. Apply their knowledge to perform practical tasks related to computer systems and biometric technologies.

Course Outline

Module 1: Number Systems (6 Hours)

Introduction to Binary, Octal, Decimal, and Hexadecimal Number Systems; Conversion between Number Systems (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 Encoding

Module 2: Computer Fundamentals (6 Hours)

Definition and History of Computers; Key Terms and Concepts; Hardware vs. Software; Primary and Secondary Storage Devices; Basics of Operating Systems; Introduction to Filesystems; Windows and Linux OS Architectures; Introduction to Computer-Related Crimes

Module 3: Basics of Computer Networking and Internet (6 Hours)

Definition and Components of Computer Networks; Network Topology and Types; Introduction to OSI Layers and TCP/IP Protocol Suite; Communication Devices; IP and MAC Addresses; Understanding the Internet; Introduction to Websites and Webpages; Understanding Firewalls, IDS, and IPS; Introduction to Network and Internet-Related Crimes

Module 4: Introduction to Biometrics (9 Hours)

Introduction to Biometrics and Its Fundamentals; Biometric Technologies and Techniques; Comparison of Biometrics with Traditional Techniques; Characteristics of a Good Biometric System; Benefits of Biometric Systems; Key Biometric Processes: Verification, Identification, and Matching; Performance Measures in Biometric Systems; Physiological and Behavioral Biometrics

Module 5: Forensic Applications (3 Hours)

Case studies of computer-related and biometric crimes

Practical Components

1. To learn 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 Windows Firewall and Defender
4. Working with Windows Backup and Restore options
5. Prepare a report on the findings of any one relevant case study

Suggested Readings

1. Operating Systems: Internals and Design Principles, Ninth Edition by William Stallings – Comprehensive overview of operating systems.
2. Modern Operating Systems by Andrew S. Tanenbaum – Detailed introduction to operating system principles.
3. Structured Computer Organization, 6th Edition, by Andrew S. Tanenbaum – Fundamental concepts in computer architecture.
4. Computer Networks: A Top-Down Approach by James Kurose and Keith Ross – Introduction to networking concepts and technologies.
5. TCP/IP Protocol Suite, 4th Edition by Behrouz A. Forouzan – In-depth coverage of TCP/IP protocols and internet technologies.

CUFS1034

INNOVATION AND ENTREPRENEURSHIP

CREDITS: 4 (3+0+1)

Course Descriptor

This course explores the fundamental concepts of innovation and entrepreneurship, focusing on the processes and strategies involved in developing and launching new ventures. It provides students with a comprehensive understanding of how to identify opportunities, create innovative solutions, and effectively manage and grow new businesses. Emphasis is placed on practical application through a project-based approach.

Course Objectives

1. To understand the principles and practices of innovation and entrepreneurship.
2. To develop skills in identifying and evaluating business opportunities.
3. To create and implement a business plan for a new venture.

Course Outcomes

On successful completion of the course, students will be able to:

1. Articulate the key concepts of innovation and entrepreneurship.
2. Capable of identifying and assessing viable business opportunities.
3. Demonstrate the ability to develop a comprehensive business plan.
4. Gain and Apply practical experience in managing and executing an entrepreneurial project.
5. Apprehend the role of innovation in sustaining competitive advantage and growth.

Course Outline

Module 1: Introduction to Innovation and Entrepreneurship (6 hours)

Definition and importance of innovation and entrepreneurship; Historical overview and evolution of entrepreneurship; Types of innovation: incremental, disruptive, radical; Entrepreneurial mindset and characteristics

Module 2: Opportunity Identification and Evaluation (6 hours)

Techniques for identifying business opportunities; Market research and analysis; Feasibility studies and business model development; Risk assessment and management

Module 3: Business Planning and Strategy (6 hours)

Components of a business plan: executive summary, market analysis, operations plan, financial projections; Strategic planning for startups; Developing a value proposition; Funding strategies and sources

Module 4: Innovation Management (6 hours)

Process of innovation: from idea generation to commercialization; Managing innovation teams and fostering a culture of creativity; Intellectual property and its management; Case studies of successful innovations

Module 5: Entrepreneurial Execution and Growth (6 hours)

Launching and scaling a new venture; Operational management and performance metrics; Marketing and sales strategies for startups; Building and maintaining customer relationships

Project Components

Students will work on a project to develop a business plan for a new venture, including opportunity analysis, business model design, and financial projections. The project will be presented at the end of the course.

Suggested Readings

1. "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" by Eric Ries
2. "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers" by Alexander Osterwalder and Yves Pigneur
3. "Zero to One: Notes on Startups, or How to Build the Future" by Peter Thiel and Blake Masters
4. "Innovator's Dilemma: When New Technologies Cause Great Firms to Fail" by Clayton M. Christensen
5. "Start with Why: How Great Leaders Inspire Everyone to Take Action" by Simon Sinek

BASKET III:
MULTIDISCIPLINARY
COURSES

CUFS1035

GENERAL CHEMISTRY

CREDITS: 4 (3+1+0)

Course Description

GENERAL CHEMISTRY is a foundational course that provides an in-depth understanding of atomic structure, chemical bonding, and preliminary concepts in organic chemistry. It also covers the states of matter, thermodynamics, and electrochemistry, emphasizing their applications in daily life. Through this course, students will develop a solid knowledge base and analytical skills essential for advanced studies in chemistry.

Course Objectives

1. To have a sound knowledge of the structure of atoms and types of chemical bonds.
2. To learn preliminary concepts in organic chemistry.
3. To achieve concepts in different states of matter and thermodynamics for day-to-day applications.

Course Outcomes

On successful completion of the course, students will be able to:

1. Understand the fundamental principles of atomic structure and quantum mechanics.
2. Explain various types of chemical bonding and molecular structures.
3. Apply concepts of organic chemistry, including classification, structure, and isomerism.
4. Analyze the behavior of gases, liquids, and their properties based on kinetic theory and thermodynamics.
5. Understand basic electrochemical principles and their applications in conductometric titrations.

Course Outline

Module 1: Structure of Atom

Atomic Structure: Wave mechanics, de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrödinger wave equation, radial and angular wave functions. Quantum numbers and their importance, Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, and variation of orbital energy with atomic number.

Module 2: Chemical Bonding

Chemical Bonding: VSEPR theory, structure of simple molecules and ions of main group elements, concept of hybridization, Molecular Orbital Theory and its application to

diatomic molecules, weak interactions: hydrogen bonding and van der Waal's interactions. Ionization potential, electron affinity, and electronegativity.

Module 3: Preliminary Concepts of Organic Chemistry

Classification, structure, and nomenclature, the influence of hybridization on bond properties. Optical isomerism: optical activity, chirality/asymmetry, specific rotation, enantiomers, racemic mixture, and resolution.

Module 4: States of Matter and Thermodynamics

Gaseous State: Kinetic theory of gases, ideal gas laws based on kinetic theory, behavior of real gases - the van der Waal's equation. Liquid State: Surface tension of liquids, temperature effect on surface tension, viscosity of liquids, its variation with temperature.

Module 5: Electrochemistry

Basic concepts, specific, molar, and equivalent conductance. Kohlrausch's Law. Application of conductance measurements and conductometric titrations.

Practice Components

1. Determination of anions and cations by chemical tests
2. Determination of melting point of organic solids.
3. Determination of viscosity of sugar solution and effect of temperature on viscosity
4. Preparation of molar solutions and molal solutions of NaOH & HCl.
5. Quantitative estimation of protein in any food sample by UV-visible spectroscopy
6. Complexometric titration of Zinc using EDTA.
7. Determination of oxidation & reduction potential of Potassium ferrocyanide by Electrochemical workstation.
8. To perform a test for alcohol using positive and negative controls.

Reference Books

1. "Principles of Physical Chemistry" by Puri, Sharma, and Pathania
2. "Organic Chemistry" by Paula Yurkanis Bruice
3. "Physical Chemistry" by Peter Atkins and Julio de Paula
4. "Inorganic Chemistry" by J.D. Lee
5. "Atkins' Physical Chemistry" by Peter Atkins and Julio de Paula

CUFS1036

GENERAL BIOLOGY

CREDITS: 4 (3+1+0)

Course Description:

GENERAL BIOLOGY is an introductory course designed to provide a comprehensive understanding of the fundamental principles of biology. The course covers a wide range of topics including the anatomy and physiology of animals and plants, cellular organization, microbiology, genetics, evolution, and ecology. Through lectures and practical sessions, students will gain a solid foundation in biological concepts and develop analytical skills applicable to real-world biological issues.

Course Objectives

1. To understand the structure and function of animal and plant cells and tissues.
2. To explore the principles of cellular organization, microbiology, and genetics.
3. To comprehend the mechanisms of evolution and ecological interactions.

Course outcomes

On successful completion of the course, students will be able to:

1. Describe the anatomy and physiology of major systems in animals and plants.
2. Differentiate between prokaryotic and eukaryotic cells and their subcellular components.
3. Explain the characteristics and classification of microorganisms, including bacteria, fungi, and viruses.
4. Understand basic genetic principles and mechanisms, including inheritance and genetic variation.
5. Analyze evolutionary theories and ecological principles, including ecosystem dynamics and biogeochemical cycles.

Course Outline

Module 1: : Animal and Plant- Anatomy and Physiology

Animal cell and Animal tissues- Type, structure, Location and function, Basics of human physiology: Digestive system, Respiratory system, Circulatory system, Excretory system, Skeletal system, Nervous system and Endocrine system.

Plant-Anatomy and Physiology: Plant cell, morphology of different parts of flowering plants, Basics of plant physiology-Transport in plants, Growth and development.

Module 2: : Cellular Organization

The cell theory, Prokaryotic and eukaryotic cells, Eukaryotic subcellular 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 3: : Introduction to Microbiology:

Bacteria: General characteristics, Cell structure of bacteria and their components, Classification of bacteria, Mode of nutrition, Mycoplasma; Fungi: General characteristics and classification Viruses, Life cycle of virus.

Module 4: : Basic of Genetics

Introduction to genetics, Incomplete dominance and codominance, Linkage, recombination and crossing over, Chromosomal basis of inheritance, Mutations, Genetic basis of sex determination, Extra-nuclear inheritance, Exchange of genetic material: Conjugation, Transformation and Transduction.

Module 5: Evolution and Ecology

Evolution: Theories of evolution; Mechanism of evolution - Variation and natural selection, Hardy - Weinberg's principle

Ecology: Ecological hierarchy, Habitat and niche, Ecosystem- Components, Population and population attributes, Energy flow, Ecological pyramids, Biogeochemical cycles, Ecological succession.

Practice Components:

1. Preparation of temporary slides of animal and plant cells under a microscope.
2. Study different stages of mitosis and meiosis.
3. Preparation of bacterial smear and different staining methods (Gram's staining).
4. Mendelian inheritance using seeds of different colour/sizes of any plant.
5. Study the plant population density and frequency by quadrat method.

Reference and Suggested Books:

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 (2017) Essentials 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. Nelson DL, Cox MM (2017) Lehninger Principles of Biochemistry, 7th Edition. W. H. Freeman
5. Dubey R C. (2023). A Textbook of Microbiology. 5th Edition, S Chand & Company.
6. Snustad DP, Simmons MJ. (2015) Principles of Genetics, 7th Edition , Wiley.
7. Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5thedition.
8. Sharma, P.D. (2010). Ecology and Environment. Rastogi Publications, Meerut, India. 8th ed.

CUFS1037

GENERAL PHYSICS

CREDITS: 4 (3+1+0)

Course Description

GENERAL PHYSICS is a comprehensive course that covers fundamental principles of physics, including mechanics, thermodynamics, wave phenomena, optics, atomic and nuclear physics, and lasers. The course is designed to provide a solid foundation in physics, with a focus on practical applications and experiments that enhance understanding of theoretical concepts.

Course Objectives

1. To understand the fundamental laws of motion, simple harmonic motion, and the concepts of elasticity.
2. To learn the principles of thermodynamics, wave motion, and optics.
3. To gain knowledge of atomic and nuclear physics, as well as the characteristics and applications of lasers.

Course Outcomes

On successful completion of the course, students will be able to:

1. Apply the laws of motion and principles of friction in practical situations.
2. Solve problems involving simple harmonic motion and understand the concepts of elasticity.
3. Analyze thermodynamic processes and understand the laws of thermodynamics.
4. Explain wave phenomena, including sound waves and optical effects.
5. Understand atomic structure, nuclear reactions, and the principles and applications of lasers.

Course Outline

Module 1: : Mechanics

Laws of motion: Newton's laws of motion, law of conservation of linear momentum and its applications, static and kinetic friction, laws of friction, circular motion (centripetal and centrifugal force), and projectile motion.

Module 2: : Oscillations and Elasticity

Simple harmonic motion: differential equation of SHM and its solution, kinetic energy, potential energy, total energy, and their time-average values. Elasticity: stress, strain, and relation between elastic constants; elastic and inelastic collisions between particles.

Module 3: : Thermodynamics

First Law of Thermodynamics: thermodynamic variables, equilibrium, zeroth law of thermodynamics, the concept of work and heat, various thermodynamic processes, relation between C_p and C_v , work done during isothermal and adiabatic processes.

Second Law of Thermodynamics: reversible and irreversible processes, heat engines, Carnot engine and efficiency, Kelvin-Planck and Clausius statements.

Module 4: : Waves and Optics

Wave motion: wave equation, longitudinal and transverse waves, plane progressive waves, speed of sound in different media, velocity of transverse vibrations of stretched strings, Newton's hypothesis, Laplace correction.

Optics: reflection, refraction, interference, diffraction, polarization, Young's double slit experiment, Newton's ring experiment, refractive index, and total internal reflection.

Module 5: : Atomic and Nuclear Physics and Lasers

Atomic Physics: structure of the atom, Rutherford's model, Bohr model, energy levels, hydrogen spectrum, Franck-Hertz and Stern-Gerlach experiments, quantum numbers, Pauli's exclusion principle, orbital magnetic dipole moment, angular momenta, vector model of the atom.

Nuclear Physics and Radioactivity: composition and size of the nucleus, atomic masses, isotopes, isobars, isotones, alpha, beta, and gamma particles, radioactive decay law, mass-energy relation, mass defect, binding energy, nuclear fission, and fusion.

Lasers: Characteristics of laser light, spontaneous emission, stimulated emission, stimulated absorption, Einstein coefficients, population inversion, optical resonator, CW and pulsed lasers, applications of lasers in forensic investigations.

Practice Components:

1. Determination of rigidity modulus of the material of the supplied rod by Barton's apparatus.
2. Determination of Young's modulus of the material of the supplied wire by Searle's method.
3. Determination of coefficient of friction between two surfaces on an inclined plane.
4. Determination of coefficient of thermal conductivity by Lee's method.
5. Verify laws of transverse vibration of a string using a Sonometer.
6. Determination of wavelength of sodium light by forming Newton's ring.
7. Determination of refractive index of glass slab/water by using a traveling microscope.
8. Determination of specific rotation of sugar solution by using a Polarimeter.
9. Determination of grating element of a plane diffraction grating.
10. Determination of wavelength of laser by diffraction grating method.
11. Determination of divergence and beam spot of a laser beam.



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Centurion University of Technology and Management
School of Forensic Sciences
B.Sc. in Forensic Science
Syllabus 2024

Suggested Readings:

1. "University Physics with Modern Physics" by Hugh D. Young and Roger A. Freedman
2. "Fundamentals of Physics" by David Halliday, Robert Resnick, and Jearl Walker
3. "Concepts of Physics" by H.C. Verma
4. "Optics" by Eugene Hecht
5. "Modern Physics" by Kenneth S. Krane
6. "Introduction to the Thermodynamics of Materials" by David R. Gaskell
7. "Solid State Physics" by Neil W. Ashcroft and N. David Mermin

BASKET IV: ABILITY

ENHANCEMENT

COURSES

CUFS1038

ENGLISH

CREDITS: 2 [0+2+0]

Course Description:

ENGLISH PRACTICE COMPONENT is aimed at equipping students with functional English language skills used in typical settings. Emphasis is placed on active listening, asking questions, taking notes, and contributing ideas. The course includes activities like guided discussions, debates, group discussions, mock interviews, oral reports, and presentations, with special attention to pronunciation, vocabulary, idioms, and public speaking.

Course Objectives

1. Attain and enhance competence in English listening, speaking, presenting, conversing, and communicating.
2. Improve speaking ability in English in terms of fluency and comprehensibility.
3. Improve English listening comprehension skills through extensive listening exercises.

Course Outcomes

On successful completion of the course, students will be able to:

1. Comprehend and participate in various conversational situations with improved fluency and clarity.
2. Use functional language effectively in academic and professional settings.
3. Overcome pronunciation and accent barriers, enhancing their overall communication skills.
4. Confidently participate in group discussions and personal interviews.
5. Deliver presentations and oral reports with improved public speaking skills.

Course Outline

Module 1: Basic Grammar

Articles, verbs (auxiliaries, finite and non-finite), time and tense, subject-verb agreement, active and passive voice, narration, single word/verb substitution, common error, comparison, antonym, homonym, sentence building (vocabulary).

Module 2: Formal and Official Writing

Précis, forensic report writing, paragraph writing and comprehension, official correspondence, memorandum, circular letter.

Module 3: Listening Skills & Basics of Phonetics

Listening, pronunciation, introduction to English phonetics, listening & comprehension, vocabulary & word formation from different texts & dictionaries and audio files.

Module 4: Art of Good Communication & Body Language

Verbal & non-verbal communication, the difference between oral and written communication, 7 Cs of effective communication, the importance of effective communication, types and functions of body language, role of body language, proxemics.

Module 5: Group Discussion/Personal Interview Skills

Becoming successful in group discussions, learning GD skills (types, strategies), group, pair, individual presentations, interview-taking skills, non-verbal communication, using appropriate body language in GDs and interviews, using positive facial expressions, using polite eye contact, visuals, and self-awareness questionnaires.

Suggested Readings

1. "English Grammar in Use" by Raymond Murphy
2. "Effective Communication Skills" by MTD Training
3. "Speak English Like an American" by Amy Gillett
4. "Business Communication: Building Critical Skills" by Kitty O. Locker and Stephen Kyo Kaczmarek
5. "High School English Grammar & Composition" by Wren & Martin

CUFS1039

COMMUNICATIVE ENGLISH

CREDITS: 2 [0+2+0]

Course Description

COMMUNICATIVE ENGLISH is designed to enhance students' proficiency in English with a focus on effective communication. The course covers grammar, language skills, writing, and vocabulary, preparing students for professional settings through interactive sessions, group discussions, and interviews.

Course Objectives

1. To enable students to brush up on their grammatical knowledge in English.
2. To help students understand the importance of communication and its types.
3. To prepare students for professional platforms by involving them in exhaustive group discussions and personal interviews.

Course Outcomes

On successful completion of the course, students will be able to:

1. Comprehend and interpret a range of texts after reading/listening.
2. Communicate with confidence and clarity.
3. Represent themselves effectively in group discussions and personal interviews.
4. Develop proficient writing skills for various formats.
5. Use appropriate grammar and vocabulary in different contexts.

Course Outline

Module 1: Importance and Process of Communication

Verbal and non-verbal communication processes, how to face an interview, group discussion techniques, planning and conducting interviews, the importance of body language and gestures, eye contact, and appearance during interviews.

Module 2: Language Skills

Introduction to language skills, CELTS pattern, speaking about self, family, hobbies, interests, introduction & interview, topic discussions (e.g., Environment, Post Covid-19, Job), assessment on speaking skills.

Module 3: Writing

Summarizing charts, tables, and graphs; comparing and contrasting graphs and tables; describing maps & diagrams; agreeing & disagreeing; expressing personal views & opinions; assessment on writing skills; job application: CV & cover letter; letter writing/ report writing/ technical writing; email writing, getting started with writing an introduction.

Module 4: Grammar & Vocabulary

Articles, prepositions, subject-verb agreement, spotting errors, sentence correction, synonyms, antonyms, contextual vocabulary.

Module 5: Reading Comprehension

Paragraph/sentence completion, jumbled sentences/jumbled paragraphs, reading comprehension.

Suggested Readings:

1. "English Grammar in Use" by Raymond Murphy
2. "Effective Communication Skills" by MTD Training
3. "Speak English Like an American" by Amy Gillett
4. "Business Communication: Building Critical Skills" by Kitty O. Locker and Stephen Kyo Kaczmarek
5. "High School English Grammar & Composition" by Wren & Martin

CUFS1040

PERSONALITY DEVELOPMENT

CREDITS: 2 [0+2+0]

Course Description

This course aims to enhance the personal and professional growth of B.Sc. Forensic Science students focus on developing essential personality traits, communication skills, emotional intelligence, and leadership qualities. The course will equip students with the skills needed to excel in their academic and professional lives, ensuring they are well-prepared for the demands of the forensic science field.

Course Objectives

1. To understand the importance of personality development in professional and personal contexts.
2. To enhance emotional intelligence and stress management abilities and Cultivate leadership and teamwork skills.
3. To improve self-confidence and self-motivation as well as Learn techniques for personal grooming and etiquette.

Course Outcomes

On successful completion of the course, students will be able to:

1. Demonstrate improved communication skills in both verbal and written forms.
2. Apply emotional intelligence strategies in personal and professional interactions.
3. Exhibit leadership and teamwork capabilities in group settings.
4. Manage stress and maintain a positive attitude under pressure.
5. Present themselves professionally with appropriate grooming and etiquette.

Course Outline

Module 1: Introduction to Personality Development: Definition and significance of personality development, The role of personality in professional success, Overview of key personality traits, Communication Skills focusing on listening and speaking skills

Module 2: Emotional Intelligence: Understanding emotions and their impact, Techniques to enhance emotional intelligence, Managing emotions and stress, Developing empathy and interpersonal relationships

Module 3: Leadership and Teamwork: Leadership styles and qualities, Building and leading effective teams, Conflict resolution and problem-solving, Decision-making skills

Module 4: Self-Confidence and Self-Motivation: Building self-confidence. Overcoming self-doubt and negative thinking, Goal setting and motivation techniques

Module 5: Personal Grooming and Etiquette: Importance of personal grooming, Professional attire and hygiene, Social and workplace etiquette, Time management and organizational skills

Practice and Project Components

- **Role-Playing Exercises:** Students will engage in role-playing activities to practice communication, leadership, and conflict-resolution skills.
- **Group Discussions:** Regular group discussions on various topics to enhance verbal communication and teamwork.
- **Presentations:** Students will prepare and deliver presentations on topics related to personality development and forensic science.
- **Self-Assessment and Reflection:** Students will complete self-assessment exercises and reflect on their personal growth throughout the course.
- **Case Studies:** Analysis of real-life scenarios requiring effective communication, leadership, and emotional intelligence.

Suggested Readings

1. "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman
2. "How to Win Friends and Influence People" by Dale Carnegie
3. "The 7 Habits of Highly Effective People" by Stephen R. Covey
4. "Presence: Bringing Your Boldest Self to Your Biggest Challenges" by Amy Cuddy
5. "The Art of Communication" by Thich Nhat Hanh

CUFS1041

TECHNICAL WRITING

CREDITS: 2 [0+2+0]

Course Description

This course is designed to enhance the technical writing skills of B.Sc. Forensic Science students. It focuses on the principles and practices of effective technical communication, emphasizing clarity, conciseness, and precision. The course will cover various forms of technical writing, including reports, research papers, manuals, and professional correspondence, tailored to the forensic science context.

Course Objectives

1. To understand the fundamentals of technical writing and its importance in forensic science.
2. To develop skills to produce clear, concise, and well-organized technical documents and proficiency in using appropriate style, tone, and format for different document
3. To learn the conventions of writing reports, research papers, and professional correspondence

Course Outcomes

On successful completion of the course, students will be able to:

1. Write clear and effective technical documents suitable for forensic science contexts.
2. Structure and organize information logically in technical reports and research papers.
3. Apply appropriate writing styles and formats for various technical documents.
4. Edit and proofread technical documents to ensure clarity, accuracy, and coherence.
5. Communicate technical information effectively to diverse audiences.

Course Outline

Module 1: Introduction to Technical Writing and its basics: Definition and significance of technical writing, Differences between technical writing and other forms of writing, The role of technical writing in forensic science. Clarity, conciseness, and precision in writing, The writing process: planning, drafting, revising, and editing, Common technical writing pitfalls and how to avoid them.

Module 2: Technical Reports: Types of technical reports: incident reports, lab reports, case reports, Structure and format of technical reports, Writing effective introductions, methods, results, and conclusions

Module 3: Research Papers: Structure and components of a research paper, Writing literature reviews, abstracts, and summaries, Citation styles, and referencing

Module 4: Manuals and Standard Operating Procedures (SOPs): Purpose and structure of manuals and SOPs, Writing step-by-step instructions and procedures, Ensuring clarity and user-friendliness

Module 5: Professional Correspondence: Writing emails, letters, and memos, Professional tone, and etiquette in correspondence, Writing cover letters and resumes

Practice and Project Components

- **Writing Exercises:** Regular writing assignments on different types of technical documents.
- **Peer Review Sessions:** Students will review and provide feedback on each other's work to improve editing and proofreading skills.
- **Group Projects:** Collaborative projects involving the creation of technical reports, research papers, or manuals.
- **Case Studies:** Analysis and writing of technical documents based on real-life forensic scenarios.
- **Presentations:** Oral presentations of written reports and papers to enhance communication skills.

Suggested Reading

1. "Technical Communication" by Mike Markel and Stuart A. Selber
2. "Technical Writing for Engineers & Scientists" by Leo Finkelstein
3. "The Elements of Style" by William Strunk Jr. and E.B. White
4. "Scientific Writing and Communication: Papers, Proposals, and Presentations" by Angelika H. Hofmann
5. "Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded" by Joshua Schimel

CUFS1042

JOB READINESS

CREDITS: 2 [0+2+0]

Course Description

This course is designed to equip B.Sc. Forensic Science students with the essential skills and knowledge required to successfully enter the job market. It covers a range of topics from resume writing and interview techniques to professional networking and workplace ethics. The course aims to enhance students' employability by preparing them for the various stages of the job application process and helping them understand the expectations of potential employers.

Course Objectives

1. To understand the job search process and the tools required for effective job hunting.
2. To develop a professional resume and cover letter tailored to forensic science positions and Learn techniques for successful job interviews.
3. To gain knowledge about professional networking and using social media for job searching and Understand workplace ethics and professional behavior.

Course Outcomes

On successful completion of the course, students will be able to:

1. Create a compelling resume and cover letter.
2. Demonstrate effective interview skills.
3. Utilize networking strategies and online platforms for job searching.
4. Exhibit professional behavior and understand workplace ethics.
5. Prepare for the transition from academia to the professional workplace.

Course Outline

Module 1: Introduction to Job Readiness (2 hours)

Overview of the Job Market and trends in forensic science, Importance of job readiness skills

Module 2: Resume and Cover Letter Writing (6 hours)

Components of a professional resume, Tailoring resumes for forensic science positions, Common resume mistakes and how to avoid them, Hands-on resume writing workshop. Purpose and structure of a cover letter, Customizing cover letters for specific job applications, Examples and best practices, Hands-on cover letter writing workshop

Module 3: Interview Skills (4 hours)

Types of job interviews: phone, video, and in-person, Common interview questions and how to answer them, Behavioral interview techniques (STAR method), Mock interviews and feedback sessions

Module 4: Professional Networking (4 hours)

Building and maintaining a professional network, Using LinkedIn and other social media for job searching, Networking etiquette and strategies, Informational interviews and job shadowing

Module 5: Workplace Ethics and Professionalism (4 hours)

Understanding workplace culture and expectations, Professional behavior and communication in the workplace, Time management and organizational skills, Handling workplace conflicts and challenges

Practice and Project Components

- **Resume and Cover Letter Workshop:** Students will create and refine their resumes and cover letters through peer reviews and instructor feedback.
- **Mock Interviews:** Conducting mock interviews to practice and improve interview skills.
- **Networking Exercises:** Activities to build and expand professional networks, including setting up LinkedIn profiles and conducting informational interviews.
- **Case Studies:** Analysis of real-life workplace scenarios to understand professional ethics and behavior.

Suggested Readings

1. "What Color Is Your Parachute? 2024: A Practical Manual for Job-Hunters and Career-Changers" by Richard N. Bolles
2. "The 2-Hour Job Search: Using Technology to Get the Right Job Faster" by Steve Dalton
3. "Cracking the Code to a Successful Interview: 15 Insider Secrets from a Top-Level Recruiter" by Evan Pellett
4. "The Elements of Resume Style: Essential Rules and Eye-Opening Advice for Writing Resumes and Cover Letters that Work" by Scott Bennett
5. "Workplace Ethics: Mastering Ethical Practices" by Mia Kennedy

BASKET VI: **VALUE-ADDED** **COURSES**

Course Code: CUFS1043

UNIVERSAL HUMAN VALUES

Credit Hours: 2 Credits (20 hours)

Course Description:

This course on Universal Human Values aims to impart essential values and principles that contribute to the holistic development of individuals. Through project-based learning, students will explore various universal human values, understand their importance, and apply them in real-life scenarios.

Course Objectives:

1. To understand universal human values and their relevance in personal and professional life.
2. To foster a sense of empathy, responsibility, and ethical behavior among students.
3. To enable students to apply universal human values in various contexts through project-based activities.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of key universal human values.
2. Exhibit increased self-awareness and empathy towards others.
3. Apply ethical principles in decision-making processes.
- 4.
5. Complete a project that showcases the application of universal human values.

Course Outline:

Module 1: Introduction to Universal Human Values (4 hours)

Introduction to Human Values: Definition and significance of universal human values; Differentiating between personal, cultural, and universal values.

Core Universal Human Values: Exploring values such as love, peace, truth, non-violence, and righteousness. Case studies and examples.

Module 2: Self-Awareness and Empathy (4 hours)

Understanding Self: Self-reflection exercises, Identifying personal values and beliefs.

Developing Empathy: The importance of empathy in building relationships, Activities and role-playing to practice empathy.



Module 3: Ethics and Responsibility (4 hours)

Ethical Decision Making: Introduction to ethical theories and principles, Ethical dilemmas and case studies.

Responsibility and Accountability: Understanding personal and social responsibility. Projects and discussions on accountability in various roles.

Module 4: Application of Universal Human Values (4 hours)

Real-Life Applications: Identifying areas where universal human values can be applied. Group discussions and presentations.

Project Work: Defining project scope and objectives. Working on projects that address real-life issues through the lens of universal human values.

Module 5: Project Presentation and Reflection (4 hours)

Project Presentation: Students present their projects to the class; Peer review and feedback.

Reflection and Assessment: Reflecting on the learning experience, Self-assessment and course feedback.

Recommended Resources:

1. "The Values Book: Teaching 16 Basic Values to Young Children" by Pam Schiller and Tamera Bryant.
2. "Ethics for the New Millennium" by Dalai Lama.
3. Articles, case studies, and multimedia resources provided during the course.

Course Code: CUFS1044

SUSTAINABLE DEVELOPMENT GOALS (SDGs)

Credit Hours: 2 Credits (20 hours)

Course Description:

This course introduces B.Sc. Forensic Science students to the United Nations' Sustainable Development Goals (SDGs), emphasizing their relevance and application in forensic science to promote sustainable and ethical practices.

Course Objectives:

1. To familiarize students with the SDGs and their significance.
2. To explore the intersection of forensic science and sustainable development.
3. To engage students in projects that address real-world issues related to the SDGs.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the key concepts of the SDGs.
2. Identify the relevance of SDGs in forensic science.
3. Develop skills to apply forensic science in promoting sustainable practices.
4. Complete a project addressing a specific SDG-related challenge.
5. Exhibit enhanced problem-solving and critical-thinking abilities.

Course Structure:

Module 1: Introduction to Sustainable Development Goals (4 hours)

Overview of the SDGs: History and purpose of the SDGs. Detailed exploration of the 17 goals.

Relevance to Forensic Science: Connection between forensic science and SDGs. Case studies showcasing the role of forensic science in achieving SDGs.

Module 2: Forensic Science and Environmental Sustainability (4 hours)

SDG 13: Climate Action: Impact of forensic science on climate change. Techniques for environmental forensics.

SDG 15: Life on Land: Forensic science in wildlife conservation and biodiversity protection. Case studies on combating wildlife crime.

Module 3: Social Justice and Human Rights (4 hours)

SDG 16: Peace, Justice, and Strong Institutions: Role of forensic science in upholding justice and human rights. Examples of forensic investigations in human rights cases.

SDG 5: Gender Equality: Addressing gender-based violence through forensic science. Forensic approaches to support gender equality.

Module 4: Health and Well-being (4 hours)

SDG 3: Good Health and Well-being: Forensic science in public health and safety. Techniques for investigating health-related crimes and epidemics.

Interdisciplinary Applications: Collaboration between forensic science and other fields to achieve SDGs. Practical examples and case studies.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a relevant SDG-related issue. Planning and executing the project.

Project Presentation and Feedback: Presenting projects to the class. Peer review and constructive feedback.

Recommended Resources:

1. "Transforming Our World: The 2030 Agenda for Sustainable Development" by United Nations.
2. "The Sustainable Development Goals Report" by United Nations.
3. "Forensic Science and the SDGs" (articles and case studies provided during the course).
4. "Sustainable Development Goals: Harnessing Business to Achieve the SDGs through Finance, Technology, and Law Reform" by Julia Walker, Alma Pekmezovic, and Gordon Walker.

Course Code: CUFS1045

DISASTER MANAGEMENT

Credit Hours: 2 Credits (20 hours)

Course Description:

This course provides B. Sc. Forensic Science students with an understanding of disaster management principles and practices, emphasizing the role of forensic science in disaster response and recovery.

Course Objectives:

1. To impart knowledge on disaster management frameworks and practices.
2. To explore the role of forensic science in disaster response and recovery.
3. To engage students in practical projects that address disaster management challenges.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Understand the key concepts and frameworks of disaster management.
2. Identify and analyze the role of forensic science in various disaster scenarios.
3. Develop skills to apply forensic science techniques in disaster response and recovery.
4. Complete a project addressing a specific disaster management challenge.
5. Exhibit enhanced problem-solving and critical-thinking abilities in disaster management contexts.

Course Structure:

Module 1: Introduction to Disaster Management (4 hours)

Overview of Disaster Management: Definitions, types, and phases of disasters. Disaster management frameworks and policies; Role of Forensic Science in Disaster Management: Importance of forensic science in disaster scenarios. Case studies of forensic science in disaster management.

Module 2: Preparedness and Mitigation (4 hours)

Disaster Preparedness: Planning and preparedness strategies. Role of forensic science in preparedness. **Risk Assessment and Mitigation:** Techniques for risk assessment and mitigation. Forensic analysis in disaster risk reduction.

Module 3: Response and Recovery (4 hours)

Disaster Response: Immediate response strategies and protocols. Forensic science applications in disaster response. **Disaster Recovery:** Long-term recovery and rehabilitation. Forensic science in post-disaster investigations.

Module 4: Case Studies and Real-World Applications (4 hours)

Natural Disasters: Case studies on earthquakes, floods, hurricanes, etc. Role of forensic science in natural disaster scenarios. **Human-Made Disasters:** Case studies on industrial accidents, terrorist attacks, etc. Forensic science applications in human-made disaster scenarios.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a relevant disaster management issue. Planning and executing the project. **Project Presentation and Feedback:** Presenting projects to the class. Peer review and constructive feedback.

Recommended Resources:

1. "Introduction to Emergency Management" by George Haddow, Jane Bullock, and Damon P. Coppola.
2. "Forensic Science in Disaster Death Investigation: Advances in Research and Techniques" edited by Sue Black and others.
3. "Disaster Management: A Disaster Manager's Handbook" by Asian Development Bank.
4. "The Disaster Recovery Handbook: A Step-by-Step Plan to Ensure Business Continuity and Protect Vital Operations, Facilities, and Assets" by Michael Wallace and Lawrence Webber.

Course Code: CUFS1046

ENVIRONMENTAL SCIENCE

Credit Hours: 2 Credits (20 hours)

Course Description:

This course introduces B.Sc. Forensic science students will learn fundamental environmental science concepts, focusing on the interplay between environmental issues and forensic investigations. Students will engage in projects that explore environmental impacts and forensic methodologies.

Course Objectives:

1. To understand the principles of environmental science and its relevance to forensic science.
2. To explore the impact of environmental factors on forensic investigations and evidence collection.
3. To engage students in project-based learning that addresses real-world environmental challenges.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate knowledge of key concepts in environmental science.
2. Analyze the relationship between environmental factors and forensic science.
3. Apply forensic techniques to environmental science issues.
4. Complete a project addressing a specific environmental challenge.
5. Develop critical thinking and problem-solving skills related to environmental forensics.

Course Structure:

Module 1: Introduction to Environmental Science (4 hours)

Overview of Environmental Science: Definition and importance of environmental science. Key concepts and principles: ecosystems, biodiversity, and ecological balance. Environmental Issues: Major environmental challenges: pollution, climate change, deforestation, and biodiversity loss. Case studies highlighting the importance of environmental awareness in forensic investigations.

Module 2: Environmental Forensics (4 hours)

Introduction to Environmental Forensics: Definition and scope of environmental forensics. Role of forensic science in environmental investigations. Techniques in

Environmental Forensics: Sampling methods, analysis, and interpretation of environmental data. Forensic methods used to identify pollutants and assess environmental damage.

Module 3: Impact of Environmental Factors on Forensics (4 hours)

Environmental Influences on Crime Scene Investigation: Environmental conditions affect evidence preservation and recovery. Case studies where ecological factors played a crucial role in forensic analysis. Forensic Implications of Environmental Degradation: Understanding the consequences of pollution and habitat destruction on forensic investigations. The role of forensic science in environmental restoration efforts.

Module 4: Field Investigations and Case Studies (4 hours)

Field Investigations: Conducting environmental assessments in a real-world setting. Techniques for sampling soil, water, and air for forensic analysis. Case Studies in Environmental Forensics: Analyzing historical and contemporary cases of environmental crime. Group discussions on lessons learned and forensic applications.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying an environmental issue relevant to forensic science. Planning and executing a project that addresses the chosen issue. Project Presentation and Feedback: Presenting projects to the class. Peer review, constructive feedback, and reflection on learning experiences.

Recommended Resources:

1. "Environmental Science: A Global Concern" by William P. Cunningham and Mary Anne Cunningham.
2. "Forensic Environmental Sampling and Analysis" by Kelly L. Smith and others.
3. "Environmental Forensics: Principles and Practice" by Robert D. Morrison and others.
4. "Environmental Pollution and Control" by S. M. Khopkar.
5. "Introduction to Environmental Forensics" by Paul C. M. van der Hoven and others.

Course Code: CUFS1047

INDIAN KNOWLEDGE SYSTEM

Credit Hours: 2 Credits (20 hours)

Course Description:

This course introduces B.Sc. Forensic Science students to the rich and diverse Indian Knowledge System (IKS), exploring its historical significance and contemporary applications in forensic science through project-based learning.

Course Objectives:

1. To provide an understanding of the Indian Knowledge System and its historical context.
2. To explore the applications of traditional Indian knowledge in modern forensic science.
3. To engage students in projects that integrate Indian Knowledge System principles with forensic practices.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of key concepts in the Indian Knowledge System.
2. Analyze the relevance of traditional Indian knowledge in contemporary forensic science.
3. Apply principles of the Indian Knowledge System to forensic science projects.
4. Develop critical thinking and problem-solving skills through project-based learning.
5. Present a project that illustrates the integration of Indian Knowledge System with forensic science.

Course Structure:

Module 1: Introduction to Indian Knowledge System (4 hours)

Overview of Indian Knowledge System: Definition and historical background. Key components of the Indian Knowledge System: Vedas, Upanishads, Ayurveda, and ancient sciences. Relevance to Forensic Science: Importance of traditional knowledge in modern forensic science. Case studies illustrating the integration of IKS with forensic practices.

Module 2: Traditional Indian Medicine and Forensics (4 hours)

Ayurveda and Forensic Applications: Principles of Ayurveda. Use of Ayurvedic knowledge in forensic toxicology and pathology. Project Work: Exploring Ayurvedic practices and their forensic applications. Case studies and practical examples.

Module 3: Ancient Indian Sciences and Technology (4 hours)

Ancient Indian Sciences: Contributions of ancient Indian scientists to various fields. Relevance of ancient scientific knowledge in forensic investigations. Project Work: Investigating an ancient Indian scientific principle and its forensic application. Group discussions and presentations.

Module 4: Indian Philosophies and Ethics in Forensics (4 hours)

Philosophical Foundations: Overview of Indian philosophies (e.g., Yoga, Vedanta). Ethical principles derived from Indian philosophies. Ethics in Forensic Science: Applying ethical principles from Indian Knowledge System to forensic practices. Case studies and discussions on ethical dilemmas in forensics.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a topic within the Indian Knowledge System relevant to forensic science. Planning and executing the project.; Project Presentation and Feedback: Presenting projects to the class. Peer review, constructive feedback, and reflection on learning experiences.

Recommended Resources:

1. "Indian Knowledge Systems" by Kapil Kapoor and Avadhesh Kumar Singh.
2. "Ayurveda and the Mind: The Healing of Consciousness" by David Frawley.
3. "Ancient Indian Knowledge Systems" by Subhash Kak.
4. "Ethics in Forensic Science: Professional Standards for the Practice of Criminalistics" by Peter D. Barnett.
5. "The Essence of Vedanta" by Brian Hodgkinson.

Course Code: CUFS1048

INDIAN SOCIETY AND CULTURE

Credit Hours: 2 Credits (20 hours)

Course Description:

This course provides B.Sc. students with an in-depth understanding of the diverse aspects of Indian society and culture. Through project-based learning, students will explore the historical, social, and cultural dimensions of India.

Course Objectives:

1. To impart knowledge about the historical and cultural heritage of India.
2. To explore the social structure and cultural diversity of Indian society.
3. To engage students in projects that analyze various aspects of Indian society and culture.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of the historical and cultural heritage of India.
2. Analyze the social structure and cultural diversity of India.
3. Develop projects that explore and present various aspects of Indian society and culture.
4. Enhance their research and analytical skills through project-based learning.
5. Present a project that contributes to a deeper understanding of Indian society and culture.

Course Structure:

Module 1: Introduction to Indian Society and Culture (4 hours)

Overview of Indian Society: Historical context and evolution. Key features of Indian society. Cultural Heritage: Major cultural milestones. Contributions of Indian culture to the world.

Module 2: Social Structure of India (4 hours)

Caste System and Social Stratification: Historical background and evolution. Contemporary relevance and issues. Family and Kinship: Structure and dynamics of Indian families. Role of kinship in Indian society.

Module 3: Religious and Cultural Diversity (4 hours)

Major Religions in India: Hinduism, Islam, Christianity, Sikhism, Buddhism, Jainism. Influence of religion on Indian culture and society. Festivals and Cultural Practices: Major festivals and their significance. Cultural practices and traditions.

Module 4: Modern India and Social Change (4 hours)

Post-Independence Developments: Economic, political, and social changes. Impact of globalization on Indian society. Contemporary Issues: Gender, education, and healthcare. Social movements and change.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a topic within Indian society and culture. Planning and executing the project. Project Presentation and Feedback: Presenting projects to the class. Peer review, constructive feedback, and reflection on learning experiences.

Recommended Resources:

1. "Indian Society and Culture" by Nadeem Hasnain.
2. "The Wonder That Was India" by A.L. Basham.
3. "India After Gandhi: The History of the World's Largest Democracy" by Ramachandra Guha.
4. "Caste in Modern India" by M.N. Srinivas.
5. "Indian Religions: A Historical Reader of Spiritual Expression and Experience" by Peter Heehs.

Course Code: CUFS1049

INDIAN CONSTITUTION

Credit Hours: 2 Credits (20 hours)

Course Description:

This course provides B.Sc. Forensic Science students with a comprehensive understanding of the Indian Constitution, emphasizing its significance in the legal framework and its application in forensic science through project-based learning.

Course Objectives:

1. To impart knowledge about the key features and principles of the Indian Constitution.
2. To explore the relationship between the Indian Constitution and forensic science practices.
3. To engage students in projects that apply constitutional principles to forensic investigations.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of the fundamental principles of the Indian Constitution.
2. Analyze the implications of constitutional provisions for forensic science.
3. Apply constitutional knowledge to forensic case studies and projects.
4. Develop critical thinking and legal reasoning skills through project-based learning.
5. Present a project that integrates constitutional principles with forensic science practices.

Course Structure:

Module 1: Introduction to the Indian Constitution (4 hours)

Overview of the Indian Constitution: Historical background and development. Key features: Preamble, Fundamental Rights, Directive Principles of State Policy, and Fundamental Duties. Relevance to Forensic Science: Importance of the Constitution in shaping legal and forensic practices. Case studies illustrating constitutional applications in forensic contexts.

Module 2: Fundamental Rights and Forensic Implications (4 hours)

Understanding Fundamental Rights: Detailed study of Fundamental Rights (Articles 12-35). Protection of individual rights in forensic investigations.

Project Work: Analyzing a forensic case in the context of Fundamental Rights. Group discussions and presentations.

Module 3: Legal Provisions and Forensic Science (4 hours)

Constitutional Provisions Related to Law and Order: Articles related to law enforcement, criminal justice, and public safety. Role of forensic science in upholding constitutional provisions. **Project Work:** Investigating a legal provision and its forensic application. Case studies and practical examples.

Module 4: Judicial System and Forensic Science (4 hours)

Structure and Functioning of the Indian Judiciary: Overview of the judicial system: Supreme Court, High Courts, and subordinate courts. Role of forensic science in the judicial process. Project Work: Exploring a judicial case involving forensic evidence. Group discussions and presentations.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a topic within the Indian Constitution relevant to forensic science. Planning and executing the project. Project Presentation and Feedback: Presenting projects to the class. Peer review, constructive feedback, and reflection on learning experiences.

Recommended Resources:

1. "Introduction to the Constitution of India" by Durga Das Basu.
2. "Indian Constitutional Law" by M.P. Jain.
3. "The Constitution of India: A Contextual Analysis" by Arun K. Thiruvengadam.
4. "Fundamental Rights and Forensic Science" by R.V. Kelkar.
5. "Judiciary and Forensic Science in India" by T.R. Srikantaiah.

Course Code: CUFS1050

HEALTH AND WELLNESS

Credit Hours: 2 Credits (20 hours)

Course Description:

This course provides B.Sc. Science students with a comprehensive understanding of health and wellness principles, focusing on physical, mental, and emotional well-being. Through project-based learning, students will explore various health practices and their applications in daily life.

Course Objectives:

1. To impart knowledge about the fundamental principles of health and wellness.
2. To explore the relationship between lifestyle choices and overall well-being.
3. To engage students in projects that promote health and wellness practices.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of key concepts in health and wellness.
2. Analyze the impact of lifestyle choices on physical, mental, and emotional health.
3. Apply health and wellness principles to develop practical projects.
4. Develop critical thinking and problem-solving skills through project-based learning.
5. Present a project that promotes health and wellness practices in their community.

Course Structure:

Module 1: Introduction to Health and Wellness (4 hours)

Overview of Health and Wellness: Definitions and dimensions of health and wellness. Importance of holistic well-being. Project Work: Identifying key components of personal health and wellness. Creating a personal wellness plan.

Module 2: Physical Health and Fitness (4 hours)

Principles of Physical Health: Importance of physical activity and exercise. Nutrition and its role in maintaining physical health. Project Work: Developing a fitness and nutrition plan. Implementing and tracking the plan over a specified period.

Module 3: Mental and Emotional Well-being (4 hours)

Understanding Mental Health: Importance of mental and emotional health. Techniques for managing stress and anxiety. Project Work: Conducting a study on mental health practices. Creating a mental health resource guide for peers.



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Module 4: Lifestyle Choices and Health (4 hours)

Impact of Lifestyle Choices: Influence of sleep, diet, and exercise on health. Importance of avoiding harmful habits (e.g., smoking, excessive drinking). Project Work: Researching the impact of specific lifestyle choices on health. Developing a public health campaign promoting healthy lifestyle choices.

Module 5: Health Promotion and Community Wellness (4 hours)

Health Promotion Strategies: Techniques for promoting health and wellness in the community. Role of public health initiatives. Project Work: Designing a community health and wellness project. Implementing the project and evaluating its impact.

Recommended Resources:

1. "Health and Wellness" by Gordon Edlin and Eric Golanty.
2. "The Wellness Project: How I Learned to Do Right by My Body, Without Giving Up My Life" by Phoebe Lapine.
3. "The Mind-Gut Connection" by Emeran Mayer.
4. "Why We Sleep: Unlocking the Power of Sleep and Dreams" by Matthew Walker.
5. "The Anxiety and Phobia Workbook" by Edmund J. Bourne.

Course Code: CUFS1051

CLIMATE CHANGE AND SUSTAINABILITY

Credit Hours: 2 Credits (20 hours)

Course Description:

This course provides B.Sc. Science students with an in-depth understanding of climate change and sustainability, emphasizing their scientific basis and practical implications. Through project-based learning, students will explore sustainable solutions to mitigate climate change.

Course Objectives:

1. To impart knowledge about the scientific principles of climate change.
2. To explore sustainable practices and their role in mitigating climate change.
3. To engage students in projects that address climate change and promote sustainability.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of the causes and effects of climate change.
2. Analyze sustainable practices and their impact on mitigating climate change.
3. Develop practical projects that promote sustainability.
4. Enhance their critical thinking and problem-solving skills through project-based learning.
5. Present a project that proposes sustainable solutions to climate change challenges.

Course Structure:

Module 1: Introduction to Climate Change (4 hours)

Overview of Climate Change: Definitions and key concepts. Historical and current climate change trends. Scientific Basis: Greenhouse gases and the greenhouse effect. Impact of human activities on climate change.

Module 2: Effects of Climate Change (4 hours)

Environmental Impact: Changes in weather patterns and extreme events. Effects on ecosystems and biodiversity. Socio-Economic Impact: Impact on human health, agriculture, and economy. Climate justice and equity issues.

Module 3: Sustainable Practices (4 hours)

Principles of Sustainability: Definition and key principles of sustainability. Importance of sustainable development. Sustainable Solutions: Renewable energy sources. Sustainable agriculture and waste management practices.

Module 4: Policy and Climate Action (4 hours)

Global and National Policies: International agreements (e.g., Paris Agreement). National policies and initiatives on climate change. Role of Forensic Science: Contribution of forensic science in climate change investigations. Case studies on environmental forensics.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a topic within climate change and sustainability. Planning and executing the project. Project Presentation and Feedback: Presenting projects to the class. Peer review, constructive feedback, and reflection on learning experiences.

Recommended Resources:

1. "The Sixth Extinction: An Unnatural History" by Elizabeth Kolbert.
2. "Climate Change: The Facts" by John Cook.
3. "This Changes Everything: Capitalism vs. The Climate" by Naomi Klein.
4. "Sustainability: A Comprehensive Foundation" by Tom Theis and Jonathan Tomkin.
5. "Renewable Energy and Climate Change" by Volker Quaschnig.

Course Code: CUFS1052

GENDER AND HUMAN RIGHTS

Credit Hours: 2 Credits (20 hours)

Course Description:

This course explores the concepts of gender and human rights, emphasizing their relevance in forensic science. Students will engage in project-based learning to understand and address gender issues and human rights violations within the context of forensic investigations.

Course Objectives:

1. To provide a comprehensive understanding of gender and human rights issues.
2. To analyze the intersection of gender, human rights, and forensic science.
3. To engage students in projects that address and propose solutions to gender and human rights violations.

Course Outcomes:

On successful completion of the course, students will be able to:

1. Demonstrate an understanding of key concepts in gender and human rights.
2. Analyze the impact of gender and human rights issues on forensic science.
3. Apply knowledge of gender and human rights to forensic case studies.
4. Develop critical thinking and problem-solving skills through project-based learning.
5. Present a project that proposes solutions to gender and human rights issues in the context of forensic science.

Course Structure:

Module 1: Introduction to Gender and Human Rights (4 hours)

Overview of Gender and Human Rights: Definitions and key concepts. Historical and cultural perspectives on gender and human rights. Relevance to Forensic Science: Importance of understanding gender and human rights in forensic investigations. Case studies illustrating the intersection of gender, human rights, and forensics.

Module 2: Gender Issues in Forensic Science (4 hours)

Gender-Based Violence and Forensics: Types of gender-based violence. Role of forensic science in investigating and addressing gender-based violence. Project Work: Analyzing a forensic case involving gender-based violence. Developing strategies for forensic investigations sensitive to gender issues.

Module 3: Human Rights Violations and Forensic Science (4 hours)

Understanding Human Rights Violations: Types of human rights violations. Role of forensic science in documenting and addressing human rights violations. Project Work: Investigating a human rights violation case. Developing a forensic report on the findings.

Module 4: Intersectionality and Forensics (4 hours)

Concept of Intersectionality: Understanding how various forms of discrimination intersect. Implications for Forensic Science. Project Work: Exploring a case study that demonstrates intersectionality. Developing recommendations for forensic practices that consider intersectionality.

Module 5: Project Work and Presentations (4 hours)

Project Development: Identifying a topic within gender and human rights relevant to forensic science. Planning and executing the project. Project Presentation and Feedback: Presenting projects to the class. Peer review, constructive feedback, and reflection on learning experiences.

Recommended Resources:

1. "Gender and Human Rights" by Suzanne Zwingel.
2. "Human Rights: A Very Short Introduction" by Andrew Clapham.
3. "Gender Violence: A Comprehensive Introduction" by Laura L. O'Toole, Jessica R. Schiffman, and Margie L. Kiter Edwards.
4. "Forensic Science and Human Rights" by Helen E. Murray.
5. "Intersectionality" by Patricia Hill Collins and Sirma Bilge.

BASKET VII

CUTM1054 INTERNSHIP (04 CREDITS)

Duration: 4 /8 weeks

Course Description: The **Internship** in Forensic Science provides students with practical experience in a professional forensic setting, enabling them to apply their academic knowledge to real-world forensic challenges. Students will work alongside forensic experts on cases and projects related to crime scene investigation, forensic analysis, legal processes, and evidence management. This course bridges the gap between academic learning and professional practice, preparing students for a career in forensic science by exposing them to various aspects of forensic investigations, laboratory analysis, and judicial reporting.

Course Objectives:

1. To provide students with hands-on experience in applying forensic science concepts and techniques in real-world forensic investigations.
2. To develop professional skills and competencies relevant to the forensic science industry, including laboratory analysis, crime scene management, and expert testimony.
3. To facilitate the integration of academic knowledge with practical scenarios, fostering a deeper understanding of forensic investigation and the criminal justice system.

Course Outcomes:

Upon successful completion of the internship, students will be able to:

1. Apply theoretical knowledge of forensic science to real-world forensic investigations, including evidence collection, analysis, and reporting.
2. Develop and implement effective strategies for crime scene processing, forensic analysis, and legal procedures in a professional setting.
3. Gain practical experience in a professional forensic environment, improving both technical skills (e.g., forensic techniques, laboratory protocols) and soft skills (e.g., communication, teamwork, and project management).
4. Evaluate and contribute to the development of forensic policies, procedures, and best practices within the forensic organization or laboratory.
5. Demonstrate professional growth and preparedness for a career in forensic science through reflective practice and constructive feedback from industry mentors

BASKET VIII

CUTM1055 RESEARCH PROJECT / DISSERTATION (12 CREDITS)

Duration: 4 months (approximately 300 hours)

Course Description: The Capstone Project and Thesis course is the culmination of the B.Sc. Forensic Science program, designed to integrate and apply the knowledge and skills acquired throughout the coursework. Students will undertake a comprehensive research project or a practical, industry-relevant project that addresses a significant problem or challenge within the field. This course emphasizes independent research, critical analysis, and practical application, culminating in a formal thesis and project presentation. The Capstone Project and Thesis aim to demonstrate the student's ability to conduct high-quality research, solve complex problems, and contribute to the field of forensic science.

Course Objectives:

1. To enable students to apply advanced research methods and problem-solving techniques to a significant project or thesis topic in forensic science.
2. To develop students' ability to conduct independent research, including data collection, analysis, and interpretation, culminating in a well-documented thesis.
3. To enhance students' skills in presenting and communicating their research findings and project outcomes effectively to both academic and professional audiences.

Course Outcomes:

Upon successful completion of the Capstone Project and Thesis course, students will be able to:

1. Demonstrate proficiency in conducting independent, original research or practical projects that address significant problems in forensic science.
2. Apply advanced analytical and methodological skills to develop and execute a research plan or project strategy.
3. Produce a high-quality thesis that adheres to academic standards and showcases the ability to critically evaluate and synthesize research findings.
4. Effectively communicate research findings and project results through a formal thesis and oral presentation.
5. Demonstrate the ability to manage and complete a substantial research or project task within a set timeframe, exhibiting project management and organizational skills.