UTTARANCHAL UNIVERSITY
(Established vide Uttaranchal University Act, 2012)
(Uttarakhand Act No. 11 of 2013)
Arcadia Grant, P.O. Chandanwari, Premnagar, Dehradun, Uttarakhand

| Programme Name | Pre-Ph.D. Course Work | Programme Code | |
|---|---|---|---|
| Course Code | DSE704 | Credit | 3 |
| Year/Sem | 1/1 | L-T-P | 3-0-0 |
| Course Name | **Forensic Chemistry** | | |

**Objectives of the Course:**

By the end of the course, students will be able to:

- Understand the role of chemistry in forensic investigations.
- Apply analytical and instrumental techniques to real-world forensic problems.
- Interpret chemical evidence in the context of law and criminal justice.
- Conduct laboratory experiments with proper safety and documentation.
- Critically evaluate forensic case studies and present findings.

**Unit 1: Foundations of Forensic Chemistry**

**Introduction to Forensic Science & Chemistry's Role:** Overview of forensic disciplines, history, and how chemistry supports criminal investigations. **Evidence Collection, Preservation, and Chain of Custody:** Proper handling of samples, contamination risks, and legal admissibility. **Chemical Safety & Ethics in Forensic Labs:** Lab protocols, hazardous materials handling, and ethical responsibilities of forensic chemists.

**Unit 2: Analytical Chemistry in Forensics**

**Qualitative vs. Quantitative Analysis:** Identifying vs. measuring substances in forensic samples. **Chromatography Techniques (TLC, GC, HPLC):** Separation of mixtures—inks, drugs, explosives. **Spectroscopy Methods (UV-Vis, IR, Raman):** Identifying molecular structures and functional groups in unknown samples.

**Unit 3: Instrumental Techniques**

**Mass Spectrometry in Forensics:** Determining molecular weights and structures of drugs, toxins, and explosives. **Atomic Absorption & ICP for Trace Metals:** Detecting metals in soil, paint, or gunshot residue. **Microscopy & Microchemical Tests:** Examining fibers, hair, and micro-traces under high magnification.

**Unit 4: Applications in Criminal Investigation**

**Forensic Toxicology (Drugs, Poisons, Alcohol):** Detecting and quantifying toxins in biological samples. **Explosives & Fire Debris Analysis:** Identifying accelerants and residues from arson or bombings. **Paints, Fibers, and Polymer Evidence:** Comparing trace evidence from crime scenes to suspects.

**Unit 5: Advanced Topics**

**Focus:** Cutting-edge developments and integration with law.

**DNA Chemistry & Biochemical Evidence:** Chemical basis of DNA profiling and forensic biology. **Emerging Techniques (Nanotechnology, Portable Devices):** New tools for rapid, on-site analysis. **Case Studies & Mock Trial Presentations:** Students act as expert witnesses, presenting evidence in simulated court settings.