

1. CHROMATOGRAPHIC TECHNIQUES FOR DESIGNING FORENSIC AND INDUSTRIAL APPLICATIONS

NSQF Level: 5

SECTOR: Life Sciences

ELIGIBILITY: Bachelor's degree in any Science Stream

FEES: Tuition Fees- Rs 3000/- (Rs 100/- per credit)-30 credits, Laboratory Fees- Rs 2000/-(Rs 2000/- per Semester) Other Fees- 1449.

Total Fees- Rs 6449/- *Non Maharashtra candidates Fees as per university rules

CERTIFICATE COURSE: 6 months

Course co-ordinator: Dr. Pooja J. Doshi, Asst. Professor, Department of Chemistry, SPPU, Pune

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KEY COMPETENCIES: The course covers just a portion of analytical chemistry and aligns to a job role at Level 5 named "Research Associate-Analytical & Bioanalytical". The course is designed exclusively for forensic and industrial application .It is related to more voluminous job role of "Quality Control Chemist" at Level 5.

ASSESSMENT: Assessment includes continuous assessments which will comprise of following:

- ✓ 20 marks of theory component
- ✓ 20 marks of internal assessments
- ✓ 60 marks of skill assessment conducted by assessors of SSC

Course Structure: The course can be run in any of the 2 semesters in a year. The course is designed exclusively for forensic and industrial application involving 60 hrs theory and related sophisticated techniques including practical with hands on training as follows:

(1) Thin layer chromatography (TLC) and High performance thin layer chromatography (HPTLC) (6hrs)

Fundamentals and Principles of Thin Layer Chromatography (TLC), High performance Thin Layer Chromatography (HPTLC), Mobile- Stationary phases, Normal- Reverse phases, Visualizing reagent (KMnO₄, Ninhydrin, DD and others), Applicability and Importance with examples. Applications: TLC and HPTLC technique are applicable for the separation and identification of samples like poisons (like Pesticides/Herbicides/Organic volatile/and non-volatiles poisons/Plant poisons), Narcotic drugs and psychotropic substances, Alkaloids, Benzodiazepines, Hallucinogens, Barbiturates, Organic Explosive, Dyes, Oils, Food stuffs and substances etc.

(2) Gas Chromatography (GC) 14 hrs

Fundamentals and Principles of Gas Chromatography (GC), Instrumentation, Sample preparation, Carrier gases, Injectors (split/splitless, PTV, Head Space, Pyrolyzer and others), Pack and Capillary Columns, Detectors (TCD, FID, ECD, NPD, TEA, Ion Mobility Scan), Applications and importance with examples, Limitations, Data processing and interpretation, Hands-on training Applications: Gas Chromatography technique applicable to separate, identify and quantify samples like Petroleum products (Kerosene, Diesel, Petrol, Low boiling solvents etc. and their residues.) Poisons, Narcotic drugs and psychotropic substances, Explosives (RDX, TNT, PETN, CE etc.), Alcohol percentage in blood, Pharmaceutical drugs, Natural products, various organic solvents and chemicals, etc.

(3) Gas Chromatography–Mass Spectrometry (GC-MS) (14 hrs)

Fundamentals and Principles of Gas chromatography–mass spectrometry (GC-MS), Instrumentation, Ionization, Detectors–Mass Selective Detector (MSD), Time of flight (TOF) and others, Data analysis, Applications with examples, Hands-on training Applications: GC-MS technique applicable to identify and quantify samples like Narcotic drugs and psychotropic substances, Different class of poisons, Petroleum products and their residues, Miscellaneous drugs, Pharmaceutical drugs, etc.

(4) High Performance Liquid Chromatography (HPLC) (16 hrs)

Fundamentals and Principles of High Performance Liquid Chromatography (HPLC), Instrumentation, Types of HPLC–Normal phase HPLC, Reverse Phase HPLC, Ion Exchange Chromatography (IEC), Size exclusion chromatography, Mobile phases, Sample preparation, Limitations of HPLC, HPLC injectors, HPLC pumps, HPLC columns, HPLC detectors (UV-Visible, fluorescence, PDA, RI and others), Elution systems-Isocratic and Gradient, Applications with examples, Hands-on training Applications: High Performance Liquid Chromatography (HPLC) technique applicable for to Chromatographic Separation, Identifications and Quantifications of Thermoraliabile samples, various drugs, pesticides explosive, snake venom and blood samples etc.

5) Liquid Chromatography–Mass Spectrometry (LC–MS) (10 hrs)

Fundamentals and Principles of Liquid Chromatography–Mass Spectrometry (LC–MS), Instrumentation, Ionization, MS analysis, Applications with examples, Hands-on training Applications: LC-MS technique applicable to identify and quantify Thermoraliabile samples, Narcotic drugs and psychotropic substances, Different class of poisons, Petroleum products and their residues, Miscellaneous drugs, Pharmaceutical drugs, etc.