

Semester – III			
Core X		Research Methodology	
Code : 19PCHE31	Hrs / Week : 4	Hrs / Sem : 60	Credits : 4

**Vision:**

To provide resources to the students to stimulate basic research interest and other creative endeavors that promote entrepreneurial culture.

**Mission:**

- Explain about various thermal and electrochemical instrumentation techniques.
- Learn about all the hyphenated techniques used for the separation of compounds.
- Interpret the results of analysis with accuracy.

**Course Outcome:**

CO No.	Upon completion of this course, students will be able to	PSOs addressed	CL
CO 1	Select the research topic and able to survey the literature.	3	Ev
CO 2	Submit the project proposals to the funding agency.	8	Ap
CO 3	Explain about the principle, instrumentation and applications of TGA, DTA and DSC.	3,6	Un
CO 4	Compare between principle, instrumentation and applications of potentiometry, coulometry and voltammetry.	5	An
CO 5	Describe different types of Atomic spectroscopy.	1,5	Un
CO 6	Interpret data using TEM, SEM, XRD and EDAX techniques.	5,7	Ev
CO 7	Separate compound from a mixture using various chromatographic techniques.	3,4	An
CO 8	Improve the accuracy of data in chemical analysis.	5	Ev

## **Unit I            Research methodology**

Introduction of research- selection of a research topic- Surveying the literature- - Sources- primary source and secondary source. Identification of research problem - Assessing the status of the problem guidance from the supervisor- Actual investigation and analysis of experimental results- Reporting the results in the form of communication, paper etc - Dissertation and thesis writing- Project proposals to the funding agency.

## **Unit II            Thermo and electro analytical methods**

**Thermoanalytical Methods** - Principle, instrumentation and applications of Thermogravimetry (TGA), Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC).

**Electroanalytical Techniques** - Coulometry- Principle, Instrumentation and Applications. Voltammetry - Types (Stripping voltammetry, Cyclic voltammetry, Amperometry) - Principle, instrumentation and applications

## **Unit III          Spectroscopic techniques**

Atomic spectroscopy - Classification (Absorption, emission and fluorescence methods), Principle, Instrumentation and Application.

Principle, instrumentation and data interpretation of Transmission electron microscopy (TEM), Scanning electron microscope (SEM), Energy dispersive spectroscopy (EDAX) and X-ray diffraction (XRD) analysis.

## **Unit IV          Chromatography techniques**

Principle, instrumentation and specific applications of Column chromatography, Thin layer chromatography, Gas Chromatography (GC-MS, GC-FTIR), High Performance Liquid Chromatography (HPLC), Size-Exclusion Chromatography (SEC), Ion Chromatography (IC).

## **Unit V          Data analysis**

Errors in chemical analysis – Classification of errors – Determination of accuracy of methods – Improving accuracy of analysis - Comparison between precision and accuracy – Significant figures – Mean, median and standard deviation – Comparison of results - “t” test, “F” test and “chi” square test – Rejection of results – Presentation of data - Correlation and linear regression.

**Text Books:**

1. Gurdeep R. Chatwal, Sham K. Anand, Instrumental Methods of Chemical Analysis, 5<sup>th</sup> edition, Himalaya Publishing House, Mumbai.
2. Skoog. D.A, West. D.M F, Holler. J, Crouch. S.R, Fundamentals of Analytical Chemistry, Thomson Asia Pvt. Ltd., Eighth Edition, Third Reprint, 2005.
3. Banwell. C.N, Fundamentals of molecular spectroscopy.

**References**

1. Anderson. J, Durston. B. H, Poole. M, Thesis and Assignment Writing, Wiley Eastern, New Delhi, 1986.
2. Sharma. B.K, Instrumental Methods of Chemical Analysis, Goel Publishing House, 23<sup>rd</sup> edition 2004.
3. Willard. H, Merrit Jr. L and Dean. A, Instrumental methods of analysis.
4. [http://www.dst.gov.in/whats\\_new/whats\\_n07/tsd-format.pdf](http://www.dst.gov.in/whats_new/whats_n07/tsd-format.pdf)
5. [http://www.ugc.ac.in/financialsupport/xiplan/mrp\\_xiplan.pdf](http://www.ugc.ac.in/financialsupport/xiplan/mrp_xiplan.pdf)