

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)

NAAC Accredited with A++ Grade

Name of the Course: Analytical Instrumental Techniques 910119

Proposed By: Dr. Preeti Gupta

Department: Applied Science

Credits: 03

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Course objective: These principles and their application to chemistry are enhance the knowledge of (a) the fundamental principles of instrumental measurements, (b) applications of these principles to specific types of chemical measurements (types of samples analyzed, figures of merit, strengths and limitations), (c) examples of modern instrumentation, and (d) the use of instruments to solve real analytical problems.

Unit 1 Potentiometry

Introduction, reference electrode, indicator electrode, ion selective electrode and their application for chemical analysis, instrumentation and measurement of unit cell, direct potentiometry, potentiometric titration, application and chonopotentiometry.

Unit 2 Conductometry

Conductance and its type, Ohms Law, Conductometry as an analytical tool, conductometric titrations and their applications, direct conductometric measurement and their application, Advantages and disadvantages

Unit 3 Coulometry and Electrogravimetry

Principle, Coulometric methods constant current and constant potential coulometry, electronic coulometer and electrochemical coulometer application electrogravimetry Principle, Constant current and controlled potential electrogravimetric analysis,

Unit 4 Spectrophotometry

NMR- Principle, chemical shift, Factors affecting chemical shift, Spin –spin splitting, Spin spin coupling, coupling constant, NMR Spectra, instrumentation and application ESR- Principle, Origin of signals, Hyperfine coupling, multiplicity, instrumentation and application of ESR in chemical reactions, Medical and biological and Material Characterisation

Unit 5 Thermogravimetric analysis

Thermogravimetric analysis Principle, types, instrumentation, factor affecting of TGA Curve and Application in thermal stability, oxidation and combustion, Differential Thermogravimetric Analysis Principle, instrumentation, DTA Curves and its application.

Course outcome – Upon successful completion of the course, the student will be able to

- CO1** Describe the basic concepts of making a *potentiometric* measurement and different types of electrodes used in industrial process
- CO2** Enable the students to acquire knowledge of conductometric measurements, conductometric titrations and their calculations.
- CO3** Appreciate the knowledge of different types of coulometers and the use of electrogravimetric method for the separation of metals for industrial puposes
- CO4** Integrate the Spectrophotometric methods like NMR and ESR for various engineering applications
- CO5** Summarize the concept of principle, instrumental and thermal analysis of various field of science and engineering

Reference Books: -

1. G.D. Chritian, Analytical chemistry, 6th edition, John Willey & Sons (2001).
2. Vogel, Textbook of quantitative chemical analysis 5th edition Addison Wesley Longman Singapur Ltd (1999)
3. Basic concepts of analytical chemistry SM Khopar, 3rd edition New age international publisher (2008)
4. Instrumental methods of analysis Willard Merritt, Dean and Settle, 7th edition CBS Publishers & Distributers