

# **THIRUVALLUVAR UNIVERSITY**

## **MASTER OF PHILOSOPHY**

### **CHEMISTRY**

**(FT/PT)**

**(with effect from 2014-2015)**

#### **PART I**

##### **CORE COURSE I**

##### **RESEARCH METHODOLOGY**

#### **UNIT-I: RESEARCH METHODOLOGY**

Meaning of research - Objectives of research - motivation of research - Types, approaches and significance - Methods versus methodology - Research in scientific methods - Research process - Criteria for good research - Problem encountered by research in India - Funding agencies.

#### **UNIT-II: RESEARCH DESIGN**

Research Problem: Selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem - Research design - Needs and features of good design - Different research design - Basic principles of experimental designs.

#### **UNIT-III: DATA COLLECTION AND DOCUMENTATION**

Data collection methods - Data types - Processing and presentation of data - Techniques of ordering data - Meaning of primary and secondary data - The uses of computers in research - The library and internet - Uses of search engines - virtual libraries - common software for documentation and presentation.

## **UNIT-IV: DATA AND ERROR ANALYSIS**

Statistical analysis of data - Standard deviation - Correlation - Comparison of sets of data - Chi squared analysis for data - Characteristics of probability distribution - Binomial, Poisson and normal distribution - Principle of least square fittings - Curve fitting - Measurement of errors - Types and sources of errors - Determination and control of errors.

## **UNIT-V: RESEARCH COMMUNICATION**

Meaning of research report - Logical format for writing thesis and paper - Essential of scientific report: abstract, introduction, review of literature, materials and methods and discussion - Write up steps in drafting report - Effective illustrations: tables and figures - Reference styles: Harvard and Vancouver systems.

## **REFERENCE BOOKS:**

1. Research Methodology, Methods and Techniques - C.R. Kothari - Wishwa Prakasam Publications, II Edition.
2. Research: An introduction - Robert Ross - Harper and Row Publications.
3. Research methodology - P. Saravanel - Kitlab Mahal, Sixth Edition.
4. A Hand book of Methodology of Research - Rajammal P.A. Devadass - Vidyalaya Press
5. Introduction to Computers - N. Subramanian
6. Statistical methods - G.W. Snedecor and W. Cochran - Oxford and IBH, New Delhi.
7. Research Methodology Methods and Statistical Techniques - Santosh Gupta.
8. Statistical Methods - S.P. Gupta
9. Scientific social surveys and research - P. Young - Asia Publishers, Bombay.
10. How to write and publish a scientific paper - R.A. Day - Cambridge University Press.
11. Thesis and Assignment writing - Anderson - Wiley Eastern Ltd.

**PART I**  
**CORE COURSE II**  
**ADVANCED PAPER I**

**UNIT-I:**

Instrumental methods of analysis: Atomic absorption and emission spectroscopy, chromatography including GC and HPLC and electro-analytical methods (Coulometry, cyclic voltammetry, polarography, amperometry, and ion selective electrodes).

**UNIT-II:**

Spectroscopy:

Principle and applications in structure elucidation:

- (i) Rotational: Diatomic molecules; isotopic substitution and rotational constants.
- (ii) Vibrational: Diatomic molecules, linear tritomic molecules, specific frequencies of functional groups in polyatomic molecules.
- (iii) Electronic: Singlet and triplet states;  $n \rightarrow p^*$  and  $\pi \rightarrow \pi^*$  transitions; application to conjugated double bonds and conjugated carbonyls-Woodward-Fieser rules; Charge transfer spectra.
- (iv) Nuclear Magnetic Resonance ( $^1\text{H}$  NMR): Basic principle; chemical shift and spin-spin interaction and coupling constant.
- (v) Mass Spectrometry: Parent peak, base peak, metastable peak, McLafferty rearrangement.

**UNIT-III:**

Applications of UV-visible, IR, NMR and Mass spectrometry in the determination of structures of organic molecules.

**UNIT-IV:**

Applications of UV-visible, IR, NMR and Mass spectrometry in the determination of structures of inorganic molecules.

## **UNIT-V:**

Symmetry elements; point groups; (ii) optical activity its origin, atomic and conformation asymmetry; (iii) Variation of optical activity with wave length. Optical rotatory dispersion and circular dichroism curves and their application, in determining the configuration and conformation of different compounds. (iv) conformational analysis.

## **REFERENCE BOOKS:**

1. H.H. Willand, L.L. Merrit and J.A. Dean, Instrumental Methods of Analysis - D. Ven. NostroundCo.
2. H.A. Stobel, Chemical Instrumentalism - Addition - Wesley Publishing Co.