M.Phil. CHEMISTRY

SEM	COURSE CODE	COURSE	COURSE TITLE	NO. OF HOURS	CREDIT	CIA MARKS	SE MARKS	TOTAL MARKS
I	14MPCH1C1	CORE - I	Research Methodology in Chemistry	4*	4	40	60	100
	14MPCH1C2	CORE - II	Physical Methods in Chemistry	4*	4	40	60	100
	14MPCH1C3	CORE-III	Research Topics in Chemistry	4*	4	40	60	100
	14MPCH1C4	CORE -IV	Teaching Methodology	4*	4	40	60	100
* **One hour library for each course**								
TOTAL				**16**	**16**	**160**	**240**	**400**
II	14MPCH2PW	PROJECT WORK	Dissertation**	-	8	-	-	200
GRAND TOTAL				**-**	**24**	**-**	**-**	**600**

** (Evaluation of the Dissertation shall be made jointly by the Research Supervisor and the External Examiner)

Project (M.Phil)
Maximum Marks: 200

I review	20 Marks
II review	20 Marks
Evaluation of project	120 Marks
Viva voce	40 Marks

SEMESTER –I: CORE - I

RESEARCH METHODOLOGY IN CHEMISTRY

Course Code : 14MPCH1C1 **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- ***To understand the principles of research, literature survey and writing research paper and thesis writing.***
- ***To study the statistical analysis of data, C and C++ programming.***

Unit - I **Principles of Research** **12 hours**

Definition - Need for research. Objectives – Motivation – Types of research – Significance - Formulation of Research Problem – Developing Hypothesis - Preparing Research Design - Selection of Research Problem – Determining Sample Design Characteristics of a Good Sample Design - Collection of Data – Methods of Data Collection - Execution of Work. Analysis of Data – Hypothesis, Testing - Generalization and Interpretation - Preparation of Report - # Submission of Report in the form of Thesis #.

Unit - II **Survey of Literature** **12 hours**

Need for literature survey – Primary, Secondary and Tertiary Sources. Journals, Chemical Abstracts – Subject index, Substance index, Author index, Formula index and other indices. Other similar abstracts for special topics. Current Titles – Reviews – Monographs – Selection of Research topic – Selection of Research Facility – Location of Journals and Articles. Use of computers in the Literature Survey – Websites – Search Engines - chemspider, google scholar, scifinder, scopus, Internet, E-mail. # Scientific Information and Documentation Centers – INSDOC, BANSDOC, NCSI, British Library – Digital Library – e-Journals – e-Content #.

Unit - III **Assignment, Research Paper and Thesis Writing** **12 hours**

Assignment – Topic selection, Front Page, Text and References. Research Paper – Preparation of Manuscript for Publication in International Journals Published by Elsevier, Interscience, Wiley and Springer. Submission Procedure.

Thesis - Rough drafting – Title, Abstract, Introduction, Scope of the Work, Literature Review, Problem and Time Limitation, Experimental Methods, Results and Discussion Foot Notes. Data Presentation - Figures and Tables. Sign Conventions followed. Bibliography – Conclusion and Recommendations. Abbreviations used. # Storing and Retrieval of Information using Computer – CD, Pen Drive, DVD #.

Unit – IV **Statistical Analysis of Data** **12 hours**

Various types of errors – precision and accuracy – significant figures, various statistical tests on the accuracy of results, positive and negative deviation from accurate results – the Gaussian distribution – the normal distribution of random errors, mean value, variance and standard deviation, reliability interval, deviations from the Gaussian law of error distribution, t-tests-comparison of the mean with the expected value, comparison of the results of two different methods, comparison of the precision of two methods by F-test, Gross errors and elimination of outlying results, graphical methods – Linear regression, regression line, # standard deviation, correlation coefficient – # Multiple Linear regression (one variable with two other variables).

Unit – V **C and C^{++} Programming** **12 hours**

Fundamentals of C – Character set – identifiers – keywords – data types – Constants – Variables – symbolic constants – operators – expressions – evaluation of expressions. Input and Output functions – get char – put char – scanf – Printf – gets and puts functions. Control Statements – if, if-else, nesting of if-else, Switch case and break statements. Looping Statements: while, do-while, for and go to Statements. Arrays – one dimensional, two dimensional and multi dimensional arrays – pointers – Structures and union. Functions – need for defined function -Category of Functions – call by value and call by reference – recursion – # File management in C #.

C^{++} Programming

Object oriented programming - principles, Classes – Examples and structure. Declarations, reference arguments , arguments by value, Constructors and destructors. Virtual functions, Inheritance (Simple examples only). Overloading (Simple examples), # file handling techniques #.

#_____# Self study

TEXT BOOKS:

1. Research Methodology (Methods & Techniques) , C.R. Kothari. 2nd Edn., Wishwa Prakasam,2002.
2. Analytical Chemistry, Scoog, West, Holler and Crouch. Thomson – India 8th Edn., 2007.
3. Programming in C ANSI C by E. Balagurusamy, 2nd edition Tata McGraw Hill, 2001.
4. Programming in C^{++} Ansi C by E.Balagurusamy 2nd edition Tata McGraw Hill, 2001.

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1
UNIT IV : Text Book 2
UNIT V : Text Book 3,4

REFERENCES:

1. Thesis and Assignment writing, J. Anderson, B.H.Durston and M.Poole, John Wiley Publications, Sydney. 1970.
2. How to write a research paper, R.Berry, Pergoman, 1969.
3. Computers in Chemistry , K.V. Raman, Tata McGraw-Hill Publishing company Limited, New Delhi, 2005.
4. Analytical Chemistry (Theory and Practice) by R.M. Verma. CBS Publishers and Distributers, 2001.

SEMESTER –I: CORE - II

PHYSICAL METHODS IN CHEMISTRY

Course Code : 14MPCH1C2 **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- *To study the applications of UV- Vis, IR , Raman, ^{1}H NMR, ^{13}C NMR and mass spectroscopy*
- *To study the application of computer modeling*
- *To understand the X-ray, neutron and electron diffraction studies*

Unit – I **12 hours**

Combined applications of UV- Vis, IR and Raman, ^{1}H NMR, ^{13}C NMR and mass spectral data for solving the structure of organic molecules, applications of NMR study relevant to stereochemistry of organic molecules. Calculation of λ-max for conjugated systems and carbonyl compounds, # Application of UV-Vis to study geometrical isomers#, Calculation of hydrogen index.

Unit – II **12 hours**

Combined applications of UV-Vis, IR, ^{1}H NMR and EPR spectral data for solving the structure of metal complexes. Calculation of g-value for Cu^{2+}, Mn^{2+}, Co^{2+} and Ni^{2+} and to establish geometry of the complexes. # Application of UV – Visible to study geometry of the complexes#.

Unit – III : Computational Chemistry **12 hours**

Molecular Modeling: Introduction – Coordinate Systems – Potential Energy surfaces- Molecular graphics – Surfaces – Mathematical concepts-molecular mechanics. Introduction to non-bonded interactions – electrostatic interactions – van der Waals interactions – Many-body effects in empirical potentials – effective pair potentials – hydrogen bonding in molecular mechanics – force field models for the simulation of liquid water.

#Computer simulation methods: Introduction – calculation of simple thermodynamic properties – phase space – practical aspects of computer simulation#.

Unit- IV:Application of XRD studies in structural analysis **12 hours**

Diffraction Methods: Crystal symmetry – combination of symmetry elements – crystal classes – screw axis and glide planes – space group – crystal axes – crystal systems, unit cell, Bravais lattices, asymmetric unit – Relationship between molecular symmetry and crystallographic symmetry – basic concepts and examples.Concept of reciprocal lattice and its application – X –ray diffraction by single crystals – structure factor – determination of space group by heavy atom method –# Fourier synthesis – refinement of structure#.

Neutron diffraction – magnetic scattering – application and comparison with X- ray diffraction.

Electron diffraction – basic principles and applications to simple molecules.

Unit – V **12 hours**

Principles and applications of special techniques such as SEM, TEM, AFM and AAS.

Electro analytical techniques : Polarography – Principle, factors affecting limiting current, Ilkovic equation, Half wave Potential, Instrumentation, Polarographic analysis, Evaluation of Polarographic waves, # applications of polarography#.

#_____# Self study

TEXT BOOKS:

1. P.S. Kalsi – "Spectroscopy of Organic Compounds", 6st Ed., New Age International Publishers. 2004.
2. R.S. Drago – "Physical Methods in Chemistry", W.B. Sounders.
3. Andrew R. Leach, Molecular Modelling second edition Pearson Prentice Hall, England 2001.
4. Grudeep.R.Chatwal, Sham. K Anand Instrumental methods of chemical analysis, Himalaya publishing house pvt ltd., Mumbai reprint- 2008.
5. H.Kaur, Instrumental methods of chemical analysis, Pragati prakasan, Meerut 2006.
6. P.S. Kalsi – "Spectroscopy of Organic Compounds", 6st Ed., New Age International Publishers. 2004.

UNIT I : Text Book 1,6
UNIT II : Text Book 2
UNIT III : Text Book 3
UNIT IV : Text Book 4
UNIT V : Text Book 5

REFERENCES:

1. B.P. Straughan and S.Walker " Spectroscopy", Vol. 1 , Chapman and Hall 1967.
2. H. Kaur – "Spectroscopy", 3rd Ed., Pragati Prakasan Publications, Meerut, 2006.
3. E.A.V. Ebsworth, W.H. Rankin, Cradock – "Structural Methods in Inorganic Chemistry", ELBS, 1987.
4. Robert M. Silverstein, Francis X. Webster, David Kiemle "Spectrometric Identification of Organic Compounds", John Wiley & sons (2005).
5. A.K.Srivastava and P.C. Jain, Instrumental approach to chemical analysis, S.chand company ltd . Fourth revised edition-2009.
6. Willard, Merrit, Dean and Settle, "Instrumental Methods of Analysis" CBS Publishers and Distibutors , 6th ed., 1986.

SEMESTER –I: CORE - IV

TEACHING METHODOLOGY

Course Code : 14MPCH1C4 **Max. Marks : 100**
Hours/Week : 4 **Internal Marks : 40**
Credit : 4 **External Marks : 60**

Objectives:

- *To study the computer application, communication and education skill*
- *To study the teaching strategies and education technology*

Unit – I **Computer Application Skill** **12 hours**

Internet – meaning – importance – types of networking – LAN, WAN, MAN – Internet – WWW, website and webpage's, Internet connectively – Browsing the internet – Browsing software – URL addresses, search engines, exploring websites and downloading materials from websites, E-mail – sending, receiving and storing mail and chatting. Power point – creating a presentation – slide preparation – # popular websites for data collection in chemistry#.

Unit - II **Communication and Interaction** **12 hours**

The theory of communication – communication cycle – Types of communication, communication and language, communication in the class room, Lecture and Lecture demonstration as communication. Interaction methods – Interaction analysis, observation schedule and record. Bale's interaction process categories – Flander's system of interaction analysis – verbal interaction category system. # Reciprocal category system – Equivalent talk categories#.

Unit – III **Educative Skill** **12 hours**

Psychology – Definition – Nature – Meaning of Educational Psychology – Definition – Nature – Scope. Teaching and learning – meaning – characteristics –effective teaching – concept of learning –comparison between teaching and learning. Mental health – Frustration –# concept of adjustment – Defence mechanism# – Mental hygiene.

Unit – IV **Uses of teaching strategies** **12 hours**

Group methods of instruction – lecture – demonstration – seminars – workshops – case analysis – panel discussion – team teaching – individual approaches – Teleconferencing – Video conferencing – Description – Advantages – Micro teaching –Characteristics of Micro teaching – Teaching skills - Programmed Instruction - Computer Assisted Instruction (CAI) – # Language Laboratory#.

Unit – V **Educational Technology** **12 hours**

Educational technology – definition – objectives – teaching technology – characteristics of teaching technology – behavioural technology – pedagogy of teaching – General advantage of using teaching aids – Broad classification of teaching aids – Hardware and software in teaching aids. Instructional media – media attributes – multimedia and instructional development – # Multimedia centre – uses and abuses of multimedia# .

_____ # Self study

TEXT BOOKS:

1. Zikr – ur Rahman , Modern teaching methods and techniques , Anmol Publication Pvt. Ltd. New Delhi, (2006).
2. R.A.Sharma, Educational technology and management models media and methods, R. Lall Book Depot. Meerut,(2007).
3. Vanaja, Educational technology –, Neel Kamal publications Pvt. Ltd. Hyderabad, (2004).

UNIT I : Text Book 1
UNIT II : Text Book 2,3
UNIT III : Text Book 2,3
UNIT IV : Text Book 2,3
UNIT V : Text Book 2,3

References:

1. B.N. Dash, Elementary Educational Psychology and Methods of teaching, Neel Kamal publications Pvt. Ltd., New Delhi, (2004 and 2007).
2. P. Sambasiva Rao and D. Bhaskar Rao, Techniques of Teaching Psychology, Sonali publications New Delhi, (2006).
3. S. K. Kochhar,Methods and Techniques of Teaching, Sterling Publisher Pvt. Ltd, (2004).
4. K. Sampath, A. Panner selvam and S. Santhanam, Introduction to Educational Technology, 4th revised ed., Sterling Publisher Pvt. Ltd (2000).
5. S. Robinson, Fundamentals of Education Psychology, 2nd ed., Ane Books Pvt. Ltd, (2008).
6. T.M. Srinivasan, Use of Computers and Multimedia in Education, Aavisakar publication, Jaipur (2002).
7. K. Sundarrajan, Internet, Kannadhasan publications, Chennai (1998).