MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12
DEPARTMENT OF CHEMISTRY
UNIVERSITY DEPARTMENT
M.Phil - Chemistry
(Effective From July 2016)

Eligibility Norms:

55% of marks in M.Sc. degree in Chemistry or any other equivalent Master Degree. For SC/ST candidates there will be 5% relaxation in marks.

Admission Procedure:

Admission will be based on (i) the total marks obtained in the entrance test (50%) and the qualifying M.Sc. degree examination (50%) and (ii) by following the govt. norms of reservation.

Course Structure

S.No.	Semester	Subject	Credits	Hours /week	Marks			Passing Minimum	
					Int.	Ext.	Tot.	Ext.	Tot.
1	I	**Core -I (Theory):** Research Methodology	8	8	25	75	100	38	50
2	I	**Core – I (Theory) :** Advanced Paper (Course work)	8	8	25	75	100	38	50
3	I	**Elective –I (Theory): Project Oriented**	8	8	25	75	100	38	50
4	II	**Project and Viva-voce**	16	-	25	75	100	38	50
Total			40	-	-	-	400	-	-

MSU/2016-17/ Univ.Depts/M.Phil(Chemistry)/Semester –I/Ppr.-1/Core-1

Research Methodology

Unit I

Introduction to research, selection of a research topic, reviewing the literature, preparing the proposal and design of study. Experimentation and interpretation of results. Formation, testing and rejection of hypothesis. Application of microcal origin and chemdraw. Preparation and presentation of report; dissertation and thesis writing.

Primary and secondary literature: Journals, patents, Reviews, Chemical abstracts, treatises and monographs. Printed materials and online literature search; websites, search engine for locating information and chemical data bases. E-mail operation and online submission of manuscripts for publication.

Unit II

Limitations of analytical methods; accuracy, precision and minimization of errors. Systematic and random errors and reliability of results. Replicate determination and t-test. Correlation, linear regression and analysis of variance.

Unit III

Principles, sampling techniques and application of UV VIS spectrophotometry, far, near and FTIR spectrophotometry and ICP spectrometry. Thermo analytical techniques: TGA, DTA, DSC and thermometric titrations. Magnetic susceptibility and EPR spectroscopy measurements and characterization of samples.

Unit IV

Chromatographic methods of analysis – column, paper, thin layer, gas, ion exchange, gel permeation, VPC and HPLC

Reagents in Organic Synthesis:

Gilman's reagents – DCC – Girard reagents – NBS – crown ethers – NBS – BF_3 complexes – SeO_2 – 1,3-dithiane, tri-n-butyltin hydride – phase transfer catalysts – Wilkinson's catalyst.

Unit - V

Principles and applications of cyclic voltammetry, oscillographic polarography, ac polarography, chronopotentiometry, controlled potential coulometry.

Scanning electron microscopy (SEM) – instrumentation – applications – surface area analysis, particle size determination – Scanning Probe Microscopes – Scanning Tunneling microscope (STM) and Atomic Force Microscope (AFM) – Principles and applications.

Diffraction techniques – XRD, Neutron and electron diffraction – principles and applications.

Emission spectrography and flame spectroscopy – Atomic absorption, atomic emission and atomic fluorescence spectroscopy.

References:

1. Rajammal P. Devadas, A Handbook of Methodology of Research, S.R.K. Vidyalaya Press, Chennai, 1976.
2. J. Anderson, B.H. Durstan and M. Poole, Thesis and assignment writing, Wiley Eastern, New Delhi, 1977.
3. R.O. Butlet, Preparing thesis and other manuscript.
4. Jerry March, Advanced Organic Chemistry, 4th Edn. John Wiley & Sons, 1992.
5. Vogel's Textbook of Quantitative Chemical Analysis, 5th Edn. ELBS, 1978.
6. H.H. Willard, L.L. Merritt, J.A. Dean and F.A..Settle, Instrumental Methods of Chemical Analysis, 6th Edn. CBS Publishers, New Delhi, 1986.
7. Chromatographic Methods – R. Stock and B.R. Rice (Chapman & Hall 1974)
8. Reaction Mechanism and Reagents in Organic Chemistry – Gurdeep R. Chatwal
9. A.J. Bard and L.R. Faulkner, Electrochemical Methods : Fundamentals and Applications, 2nd Edn., John Wiley and Sons, New York, 2004.
10. L. Antropov, Theoretical Electrochemistry, Mir Publication, Moscow, 1972.
11. D.A. Skoog and J.J. Leary, Principles of Instrumental Analysis, 4th Edn., Saunders College Publishing, 1992.
12. D.A. Skoog, F.S.Holler, S.R.Crouch, Principles of Instrumental Analysis, 6th Edn., Thomson Brooks/cole, 2007.
13. A.K. Cheetham, P.Day, Solid State Chemistry: Techniques, Oxford University Press, Oxford, 1987.
14. G. E. Bacon, Neutron diffraction, Oxford Universtiy Press, Oxford, 1975.
15. R.S. Drago, Physical Methods in Chemistry, Saunders, 1999.

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Advanced Paper (Course work)

Unit I: Retrosynthetic Analysis

Introduction to disconnections – one group disconnections – two group disconnections – pericyclic reactions – Heteroatoms and heterocyclic compounds – small rings: three membered, four membered, and five membered.

Unit II: Applications of Advanced Organic Spectroscopy

NMR: Basic principles of two-dimensional NMR spectroscopy – HOMOCOSY, HETCOSY and NOESY spectra and their applications – use of INEPT and DEPT methods and their applications.

Mass: Molecular ions, isotope peaks, fragmentation pattern – McLafferty rearrangement - measurement techniques (EI, CI FI, FD, FAB, SIMS, MALDI) – M + 1 and M + 2 ions – calculation of molecular formula from P_{M+1} and P_{M+2}

Road-map problems covering UV, IR, ^{1}H-NMR, ^{13}C-NMR and mass spectral data.

Unit III: Advanced Inorganic Chemistry

Mixed ligand complexes – Stabilities dynamics of formation and dissociation of ternery complexes. Reactions of coordinated ligands mimicking biological systems.

Isomerization and racemization reactions of bidentate mixed ligand and tris chelate complexes of unsymmetrical ligands; application of ORD & CD for study of such reactions. Atom (or group) transfer processes.

Enzymes in redox catalysis: NAD, ascorbate oxidase, peroxidases and catalases, superoxide dismutase and cysteine – cystine system. Neurotransmitters and related hormones.

Supramolecular Chemistry: Cation binding hosts of crown ethers, cryptands and spherands and their metal ion selectivity.

Unit IV: Advances in Linear Free-Energy Relationships

An introduction to linear free-energy relationships (LFER) – the Hammett equation – the duality of substituent constants and the Yukawa-Tsuno equation – the general validity of the Hammett equation – deviations from the Hammett equation in its various forms; the separation of polar, steric and resonance effects – Taft's equations; the ortho-effect; application of LFER to organic reactions; Influence of solvent on organic reactivity; the reactivity-selectivity principle.

Unit V: Advanced Photochemistry

Artificial photosynthesis and solar energy conversion – Photoelectrochemical cells – dynamics of excited state processes (excited state energy, redox properties, emission lifetime and its temperature dependence) in micelles, reverse micelles and biomembranes – Fluorescence – quenching and anisotropy concepts; fluorescence sensing – mechanism and applications; Radioactive decay engineering – metal-enhanced fluorescence and surface plasmon-coupled emission.

References:

1. Designing Organic Synthesis: A Programmed Introduction to the Synthon Approach – Stuart Warren
2. Spectrometric Identification of Organic Comounds – Silverstein, Bassler and Morril.
3. Organic Spectroscopy – William Kemp
4. Basic and Two-dimensional NMR Spectroscopy – V. Fibrolein, VCH, 1982.
5. Principles of Instrumental Analysis – S. Skoog, Holler and Nieman, Saunders, 1998.
6. Practical Spectroscopy – P.R. Young – Brooks / Cole, 2000.
7. D. Banerjea, Coordination Chemistry, Second Edition, Asian Books Pvt. Ltd., New Delhi, 2007.
8. H. Douglas, D. McDaniel and J. Alexander, Concepts and Models of Inorganic Chemistry, 3rd edn. John Wiley & Sons, New York, 1994.
9. J.W. Steed and J.L. Atwood, Supramolecular Chemistry, John Wiley & Sons, New York 2000.
10. R.M. Roat – Malone, Bioinorganic Chemistry 2nd Edn., Wiley Interscience, New York, 2007.
11. S.J. Lippard and J.M. Berg, Principles of Bioinorganic Chemistry, University Science Books, California, 1994.
12. Bertini, Gray, Lippard, Valentine, Bioinorganic Chemistry, Viva Books Pvt. Ltd., New Delhi, 1998.
13. N.B. Chapman and J. Shorter, Eds., Advances in Linear Free-Energy Relationships, Plenum Press, London, 1972.
14. J. Shorter, Correlation Analysis in Organic Chemistry – An Introduction to Linear Free-Energy Relationships, Clarendon Press, Oxford, 1973.
15. N.B. Chapman and J. Shorter, Eds., Correlation Analysis in Chemistry-Recent Advances, Plenum Press, New York, 1978.
16. J. Shorter, Correlation Analysis of Organic Reactivity, Research Studies Press, England, 1982.
17. A. Juris, V. Balzani, F. Barigelletti, S. Campagna, P. Belser, A. Von Zelewsky, Coordination Chemistry Reviews, 84, 1988, pp. 85-227.
18. J.R. Lakowicz, Principles of Fluorescence Spectroscopy, Plenum Press, New York, 2006.
19. K. Kalyanasundaram, Photochemistry in Microheterogeneous Systems, Academic Press, Orlando, 1987.

Project oriented optional paper (Review of Published Research / Indepth study of published literature). The syllabus for this paper is to be given by the project guide by taking 10 research publications/articles published in journals in the research field of project work for which the M.Phil student is allotted. There will not be a common syllabus for all the M.Phil students for this paper.