

PG AND RESEARCH DEPARTMENT OF CHEMISTRY
JAMAL MOHAMED COLLEGE (Autonomous), Tiruchirappalli-620 020
M.Phil. Programme – Course Structure under CBCS
(For the candidate admitted from the academic year 2017-2018 onwards)

SEM	SUB CODE	COURSE	SUBJECT TITLE	HRS / WEEK	CREDIT	CIA Mark	SE MARK	TOTAL MARK
I	17MPCH 1C1	CORE I	Research Methodology in Chemistry	4*	4	40	60	100
	17MPCH 1C2	CORE II	Advanced Physical Methods and Molecular Modelling in Chemistry	4*	4	40	60	100
	17MPCH 1C3	CORE III	Research Topics in Chemistry	4*	4	40	60	100
	17MPCH 1C4	CORE IV	Teaching Methodology	4*	4	40	60	100
		*One hour library for each course						
	TOTAL			16	16	160	240	400
II	17PDCH2PW		Dissertation**	-	8	-	-	200
GRAND TOTAL				-	24	-	-	600

** Evaluation of the Dissertation and Viva Voce shall be made jointly by the Research Supervisor and the External Examiner.

Project (M.Phil)

- Maximum Marks : 200 Marks
- 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: 17MPCH1C1

Hours/Week: 4

Credit: 4

Objectives

- *To understand the principles of research, literature survey and writing research paper and thesis writing.*
- *To study the statistical analysis of data*
- *To learn the computer application skill for teaching and research*

Max. Marks: 100

Internal Marks: 40

External Marks : 60

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 Computer Application Skill**12 hours**

Internet – meaning and importance, types of networking – LAN, WAN and MAN – Internet – WWW, website and webpage's, mode of connection, network protocol, browsing the internet – browsing softwares, URL addresses, domain name, 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[#].

#..... # 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. Zikr – ur Rahman , Modern teaching methods and techniques , Anmol Publication Pvt. Ltd. New Delhi, (2006).
4. T. M. Srinivasan, Use of Computers and Multimedia in Education, Aavisakar publication, Jaipur (2002).

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

ADVANCED PHYSICAL METHODS AND MOLECULAR MODELLING IN CHEMISTRY

Course Code: 17MPCH1C2

Hours/Week : 4

Credit: 4

Max. Marks: 100

Internal Marks : 40

External Marks : 60

Objectives:

- *To appreciate the applications of various analytical tools for the characterization of materials.*
- *To highlight the importance computer modeling in chemistry.*

Unit – I

Characterization and applications of nano materials

12 hours

Surface morphology and nanostructure – Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) and Atomic Force Microscope (AFM); #Structural Characterization - UV-Visible and FT-IR spectroscopy[#]; Structure orientation and micro texture- X-ray Diffraction (XRD); Elemental analysis – Energy Dispersive X-ray Micro analysis (EDX) and Atomic Absorption Spectroscopy(AAS).

Applications of carbon nanomaterials in the field of fuel cells and batteries; Energy and environmental applications- Energy production and storage - Applications of nanomaterials in electronics- semiconductors and chemical sensors, biotechnology- detection of biomolecules and medicine-drug design and drug delivery.

Unit II– 2D-NMR and NQR spectroscopy

12 hours

2D- NMR – basic principle and types-homonuclear through-bond correlation methods- Correlation spectroscopy (COSY- ^1H - ^1H COSY & ^1H - ^{13}C COSY), Exclusive correlation spectroscopy (ECOSY), Total correlation spectroscopy (TOCSY), Incredible natural-abundance double-quantum transfer experiment (INADEQUATE)- Heteronuclear through-bond correlation methods-Heteronuclear single-quantum correlation spectroscopy (HSQC), Heteronuclear multiple-bond correlation spectroscopy (HMBC)- Through-space correlation methods-Nuclear Overhauser effect spectroscopy (NOESY), Rotating frame nuclear Overhauser effect spectroscopy (ROESY)-[#] Resolved-spectrum methods-Higher-dimensional methods[#].

NQR spectroscopy – Characteristics of quadrupolar nucleus – effects of field gradient and magnetic field upon quadrupolar energy levels – NQR transitions – applications of NQR spectroscopy.

Unit – III –Inorganic Spectroscopy

12 hours

³¹P, ¹⁴N and ¹⁵N NMR spectra – basic theory, standard reference, chemical shift, coupling constants and biological applications. Combined applications of UV-Visible, FT-IR, Raman and EPR spectral data for solving the structure of metal (Co, Ni, Cu and Zn) complexes- ¹H-NMR spectra of zinc complexes[#]- Magnetic studies for the characterization of the complexes by VSM.

Unit -IV Molecular Modeling-I

12-hours

Molecular Modeling – definition and importance-types of molecular model- spheres, ball-and-stick, skeletal, polyhedral, composite and computer-based models- molecular mechanics- software for molecular mechanics modeling - coordinate systems- potential energy surfaces- molecular graphics- definition, relation with molecular models- [#]non-bonded interactions- electrostatic and van der Waals interactions in molecular modeling[#]- hydrogen bonding in molecular mechanics.

Unit-V Molecular Modeling –II

12-hours

Computer simulation methods- definition and advantages- data preparation and process for the preparation of computer simulation model- softwares for simulation- differences between simulation and model- types of simulation models- force field model for the simulations of liquid water-[#]calculation of simple thermodynamic properties, phase space[#], drug design and delivery using simulating models.

#..... # Self study

TEXT BOOKS:

1. F. J. Ownes, “Introduction to Nano technology”, John Wiley and New Jersey, 2003.
2. P. S. Kalsi, “Spectroscopy of Organic Compounds”, 6th Edition, New Age International Publishers. 2004.
3. William Kemp, “NMR in Chemistry” Macmillan Education Ltd, London, 1986.
4. R. S. Drago, “Physical Methods in Chemistry”, W. B. Saunders, 1983.
5. Alan Hinchliffe, “Molecular Modelling for Beginners”, 2nd Edition, Wiley Publication, 2008.
6. Andrew R. Leach, “Molecular Modelling” 2nd Edition, Pearson Prentice Hall, England 2001.

UNIT I: Text Book 1

UNIT II: Text Book 2

UNIT III: Text Book 3, 4

UNIT IV: Text Book 5

UNIT V: Text Book 6

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: 17MPCH1C4

Hours/Week : 4

Credit: 4

Objectives:

Max. Marks: 100

Internal Marks : 40

External Marks : 60

- *To study the teaching strategies and education technology*
- *To learn the concepts and benefits of Guidance and Counselling*

Unit - I 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 – II 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 – III 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 – IV Educational Technology

12 hours

Educational technology – definition – objectives – teaching technology – characteristics of teaching technology – behavioral 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#.

Unit-V Guidance and Counselling

12 hours

Meaning and definition of Guidance and Counselling- need for guidance – aims of guidance- nature of guidance - principles of guidance philosophy- types of guidance-educational, vocational, personal and social guidance- benefits of guidance- benefits to students, teachers, parents community and administrators – role and functions of guidance cell – Counsellor- definition, qualities of a good counsellor, characteristics of counselling, #types of counselling# class teacher as a counsellor- specific duties of a teacher in guidance service, differences between guidance and counselling.

#..... # 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).
4. K. Nagarajan and Deva Seetharaman, Psychology of learning and Human Development, Sriram Publishers, Second Edition (2014) Chennai-600 093.

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 4

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. Sundarajan, Internet, Kannadhasan publications, Chennai (1998).