MANGALORE UNIVERSITY
DEPARTMENT OF CHEMISTRY,
Mangalagangothri-574199

Ph.D. Course work in Chemistry
Revised Syllabi (Papers-1 & 2)
2015

Mangalore University
Department of Chemistry, Mangalagangothri-574199

Preamble:

As per the letter from the University (No:MU/ACC/CR.46/2014-15/A2 dt.6-3-2015) number of papers for the Ph.D course work in chemistry has been reduced from the present FOUR to TWO. They are Paper 1:Research methodology and Paper 2: Review of Literature

Accordingly PG BOS in Chemistry revised the syllabus wth the paper 1 as - CH 601 and Paper 2 as CH 602 and also decided to frame the Regulation governing the Ph.D. course work in Chemistry as per the University letter.

Papers	Particulars	Hours of Instruction per week	Duration of Exam (hrs)	Marks			
				IA	Theory	Total	Credits
Paper 1	Research methodology	4	3	30	70	100	4
Paper 2	Review of Literature						
	Review Report	3	-	-	-	150	6
	Viva	-	-	-	-	50	2
Total Credit							12

PROGRAMME OUTCOMES

The PhD program in Chemistry provides highly trained manpower:

- With the in-depth knowledge in chemistry field with sufficient background in related fields through advanced course work and laboratory research to actively participate in the development and growth of chemistry at all levels in the industry or in research and teaching in a university or a research organization.

- With good understanding and awareness of professional, ethical and safety applications of their knowledge for the advancement of the society.

- Able to demonstrate originality in the application of knowledge, together with a practical understanding of how research is used to create and interpret knowledge in their field.
- Capable of carrying out independent research with competency in research design, data gathering and interpretation, and communication of research results through scientific publications in peer reviewed scientific journals and scientific presentations.

PROGRAMME SPECIFIC OUTCOMES

- Develop in depth knowledge of various fundamental and advanced aspects, understanding and expertise in the chemical science and field of able to apply them to advanced studies.
- Acquire sound knowledge in classical laboratory techniques and modern instrumentation to perform new experiments, obtain experimental data and its interpretation through theoretical principles.
- Understand the access, search and the use of chemical literature.
- Gain ability to integrate knowledge gained in Chemistry to various academic, Industry and Pharmaceutical needs.
- Provide opportunity to propagate chemical knowledge through presentations and discussion in chemistry forums and publication of research findings.
- Give opportunities to excel in academics, research or Industry

- Demonstrate professionalism in teaching, industries and research through ethical principles
- Undertake the setting up of small scale industries with the available resources.

Paper -1: CH 601: Research Methodology in Chemistry (56 hrs.)

COURSE OUTCOMES

Enable the students:

- To learn about the foundation of research, types and methods of research, literature survey and planning of research
- To understand the research problem and sampling techniques or methods
- To acquire knowledge of computer system, softwares, application and uses of common softwares in chemistry.\
- To know about the chemical safety and ethical handling of chemicals.
- To understand the advanced techniques of analysis such as UV-Vis, IR, NMR, Mass, ESR spectroscopy, XRD, thermal and electorchemical analysis and ethics of research.

UNIT-I: Foundation of Research- What is Research? Objectives of Research, Scientific Research, Research and Theory-Conceptual and theoretical Models-Importance of research methodology in scientific research. Research design, Basic Principles- Need of research design, Features of good design, important concepts relating to research design.

Types and Methods of Research, Classification of Research, Pure and Applied Research, Exploring or Formulative Research, Descriptive Research, Diagnostic Research/Study, Evaluation research/Studies, Action Research, Experimental Research-Problem selection, Literature Survey : Sources of information, Need for Reviewing Literature, Primary, Secondary, Tertiary sources, Journals, Journal abbreviations, Abstracts, Current titles, Reviews: Monographs, Dictionaries, Text books, Current contents, Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, Formula Index and other Indices with examples. Digital: Web resources, E-Journal, Journal access, TOC alerts. Hot articles: Citation index, Impact factor, H-Index, E-Consortium, UGC infonet, E-Books, Internet discussion groups and communities, Blogs, Preprint server, Search engines, Scirus, Google Scholar, Chemical Industry, Wiki- Databases, ChemSpider, ScienceDirect, SciFinder, Scopus. Familiarity with ideas and concepts of investigation. Field Studies. Planning of Research- The planning process-Selection of a Problem for Research- Formulation of the Selected Problems- Hypothesis formation- Measurement-Research Design/Plan. 14hrs.

UNIT-II: Research problem-Identification, statement of research problem, objectives, design and execution of experiments, collection and interpretation of experimental data, arriving at conclusions. Reporting the results of research-style and format - title, abstract and the text.

References, tables, figures, elucidations, quotations and footnote. Writing of monographs, review articles and dissertations**.**

Sampling Techniques or Methods- Choice of sampling Techniques-Sample size- Sampling and Non-Sampling errors- Estimation of Population and Proportion, Mean- Estimation of Standard Error and Confidence Interval. Errors and statical analysis of Data, Classification of errors, statistical analysis of errors, Curve fitting and Tests of statistical significance. 14hrs.

UNIT-III: Basic knowledge of computer systems, softwares - System software and application software, Programming languages: machine language, assembly language and high level languages. Interpreter and compiler. Flow charts and Algorithms. General awareness of operating systems: Disk operating system, Windows, MaCintosh, Linux. General awareness of Software packages and other scientific application. Application and uses of common softwares in chemistry, Origin, Chemsketch, Chemdraw. Basic ideas on the use of Internet in Chemistry education.

Concepts of Chemical safety- Chemical Safety and Ethical Handling of Chemicals, Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation, Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric, safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, in incineration and transportation of hazardous chemicals. 14hrs

UNIT-IV: Advanced Techniques of Analysis and Ethics of Research: Applications of UV-Visible, IR, NMR, Mass, ESR, XRD for the structural elucidation of compounds. COSY, NOSEY, INDOR and DEPT spectra, Thermal analysis and electrowork station.

Ethical issues, ethical committees, Commercialization, Copy right, royalty, Intellectual property rights and patent law, Trade Related aspects of Intellectual Property Rights, Reproduction of published material. Plagiarism. Citation and acknowledgement. Reproducibility and accountability.

Safety rules of laboratory acquaintance of experimental set up and instruments. Intellectual property and intellectual property rights. Environmental impacts, Data management, importance of safety and security of data, evaluation of inventions. Communication with patent council and publication of data, communication with investors, IP sales process. 14hrs

REFERENCES:-

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2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. .
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing.
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6. Madric and Donevan, Understanding Computers, McGraw Hill.
7. K.V. Raman, Computers in Chemistry, Tata McGraw Hill, 1993.
8. P Lykose, Personal Computers in Chemistry, John Wiley and Sons, New York,1981.
9. Ramesh Kumari, Computers and their applications to Chemistry, 2nd Ed., Alpha Sci.
10. Biggs Pete, Computers in Chemistry, Oxford University Press, 2000
11. Chemical Safety Matters-IUPAC –IPCS, Cambridge Univ. Press, 1992.
12.Fundamental of Research Methodology and Statistics, Yogesh Kumar Singh, New Age International Publishers, 2006.
13. Jefrey A. Lee, The scientific Endeavor-Methodology and Perspectives of Science, Pearson

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Paper -2: CH 602: Review of Literature-(3 hrs of Instruction per week)

COURSE OUTCOMES

Enable the students:

- To learn the review of literature about the developments in the fields of synthetic organic chemistry, heterocyclic chemistry, medicinal chemistry, structural chemistry, analytical chemistry, polymer chemistry and polymer composites.
- Conduct a thorough literature review and provide a properly referenced written report to acquire thorough knowledge of the literature and a comprehensive understanding of scientific methods and techniques applicable to their own research.
- To understand the analysis of research work, compilation and presentation of past work in the respective field and design of new research in the chosen area.

Content is based on the research field undr the direction of the Research Guide. Content of the Review report shall include the art of research work analysis, related implementation issues and motivation for the stated research work.