Periyar E.V.R. College (Autonomous),Tiruchirapalli-620023.
Post Graduate and Research Department of Chemistry
Ph.D. Programme-Syllabus for Course Work

Name of Research Supervisor : Dr .P.Arockia sahayaraj
Name of Ph.D. Candidate : Mr .S.Manikandan
Register No. : BDU2120192779159
Subject Code : 21PHDCHECWI 4 Credits

Course Work-1
Research Methodology

UNIT I : Literature Survey

Print : Sources of information – Primary, Secondary, Tertiary sources –Journals – Journal abbreviations – Abstracts – Current titles – Reviews –Monographs – Dictionaries – Textbooks – 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, Chem Industry, Wiki –Databases, Chem Spider, Science Direct, SciFinder, Scopus.

UNIT II : Methods of scientific research and writing scientific papers

General principles of research, inculcation of scientific temper, avoidance of prejudices and lax judgements, undue admiration of authority, false distinction between theoretical and applied research, impulses of a strong will to do research, persistent hard work and concentration, developing high-minded independence of judgement and thirst for scientific originality, various stages of scientific research, observation, experimentation, working hypotheses, proof etc., On writing scientific papers – justification for scientific contributions, bibliography, justice and courtesy in decisions, description of methods, conclusions, the need for illustration, style, publications of scientific works, Writing methods – Writing the first draft, revising the first draft on content and structure, revising the second draft on style, writing a thesis, writing review article and book reviews, preparing research proposals for grants– funding agencies.

UNIT III : 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 useof hazardous chemicals, procedure for working with substances that posehazards, flammable or explosive hazards, procedures for working with gases at above or below atmospheric pressures – 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 sewage system , incineration and transportation of hazardous chemicals .

UNIT IV : Data Analysis

Types of Error – Accuracy, precision, significant figures, use of calculation in the estimation of errors – Frequency distribution, the binomial distribution, the Poisson distribution and normal distribution – describing Data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements – Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, paired t-Test – Analysis of variance (ANOVA) –Correlation and Regression – Curve fitting, Fitting of linear equations, simplelinear cases, weighted linear case, analysis of residuals – General polynomial fitting, linearizing transformations, exponential function fit – r and its abuse – Basic aspects of multiple linear regression analysis.

UNIT V : Electronics and Computer Packages

Basic aspects of electronic circuits and their components used in common instruments like spectrophotometers and electrochemical instruments like cyclic voltammeter. Elementary aspects of digital electronics. Applications of some computer packages like MS-Excel, Origin, Chem Draw, Sciplot, ISIS draw, Chem Sketch and SPSS.

References:

1. J. March, 'Advanced Organic Chemistry; Reactions, Mechanisms and Structure', 6th Ed., Wiley– Interscience, 2016.
2. Maeve O'Connor, 'Writing successfully in science' Chapman and Hall, London, 1995.
3. Analytical Chemistry , K.Gopalan, S.Chand year
4. D. B. Hibbert and J. J. Gooding, 'Data Analysis for Chemistry', Oxford University press, 2006
5. For computer applications any commonly available books as well as common materials available in the web.

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DEPARTMENT OF CHEMISTRY

Ph.D., Course Work – Syllabus

Name of the Candidate: Ms. **M. SANGAVI**

Ref: No: BDU1910190070, Ph.D. Chemistry

Paper I - Research methodology

Sub Code: 21PhDCW01

UNIT –I - Literature Survey

Print: Sources of information – Primary, Secondary, Tertiary sources – Journals – Journal abbreviations – Abstracts – Current titles – Reviews – Monographs – Dictionaries – Textbooks – 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, ChemIndustry, Wiki – Databases, ChemSpider, ScienceDirect, SciFinder, Scopus.

UNIT –II - Methods of scientific research and writing scientific papers:

a) General principles of research, inculcation of scientific temper, avoidance of prejudices and lax judgments, undue admiration of authority (i.e. excessive admiration of the work of great minds), false distinction between theoretical and applied research, impulses of a strong will to do research, persistent hard work and concentration, developing high-minded independence of judgment and taste for scientific originality, various stages of scientific research, observation, experimentation, working hypotheses, proof etc.,

b) On writing scientific papers – justification for scientific contributions, bibliography, justice and courtesy in decisions, description of methods, conclusions, the need for illustration, style, publications of scientific works.

c) Writing methods - Writing the first draft, revising the first draft on content and structure, revising the second draft on style, writing a thesis, writing review article and book reviews, preparing research proposals for grants.

UNIT –III - 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 .

UNIT –IV - Data Analysis

Types of Error – Accuracy, precision, significant figures, use of calculus in the estimation of errors – Frequency distributions, the binomial distribution, the Poisson distribution and normal distribution – describing Data, population and sample, mean, variance, standard deviation, way of quoting uncertainty, robust estimators, repeatability and reproducibility of measurements – Hypothesis testing, levels of confidence and significance, test for an outlier, testing variances, means t-Test, paired t-Test – Analysis – of variance (ANOVA) – Correlation and Regression – Curve fitting, Fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals – General polynomial fitting, linearizing transformations, exponential function fit – r and its abuse – Basic aspects of multiple linear regression analysis.

UNIT – V - Electronics and Computer Packages

Basic fundamentals of electronic circuits and their components used in circuits common instruments like spectrophotometers, typical circuits involving operational amplifiers for electrochemical instruments. Elementary aspects of digital electronics. Applications of some computer packages like MS-Excel, Origin, Chem draw, Sciplot, ISIS draw, Chemsketch.

References:

1. http://www.inflibnet.ac.in
2. http://spingerlink.com
3. http://www.pubs.acs.org
4. J. March, „Advanced Organic Chemistry; Reactions, Mechanisms and Structure", 6th Ed., Wiley- Interscience.
5. Maeve O"Connor, „Writing succMaeve O"Connor, „Writing successfully in science" Chapman and Hall, London.
6. Chemical safety matters-IUPAC –IPCS, Cambridge Univ. Press.
7. J. Topping, "Errors of Observation and Their Treatment", Fourth Edn., Chapman Hall, London.
8. R. L. Tokheim, "Digital Electronics-Principles and Applications", 5th Edn., Tata Mc Graw-Hill, New Delhi.
9. Alan Jhonson, "Electronics, A Systems Approach" Hodder and Stoughton, London.

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DEPARTMENT OF CHEMISTRY
Ph.D., Course Work – Syllabus

Name of the Candidate: Mr. A. PERIYASAMI
Ref. No: BDU2020192778534 - Ph.D. Chemistry Sub Code: 21PhDCW01

Paper – I : Research and Publication Ethics

Unit I: **Philosophy and Ethics**

Introduction to philosophy: definition, nature and scope, concept, branches - Ethics: definition, moral philosophy, nature of moral judgements and reactions. Ethics with respect to science and research - Intellectual honesty and research integrity - Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP) – Redundant Publications: duplicate and overlapping publications, salami slicing - Selective reporting and misrepresentation of data.

Unit II: **Publication Ethics**

Publication ethics: definition, introduction and importance - Best practices / standards setting initiatives and guidelines: COPE, WAME, etc. - Conflicts of interest - Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types - Violation of publication ethics, authorship and contributor ship - Identification of publication misconduct, complaints and appeals - Predatory publisher and journals.

UNIT III : **Methods of Scientific Research and Writing Scientific Papers**

General principles of research, inculcation of scientific temper, avoidance of prejudices and lax judgement's, undue admiration of authority, false distinction between theoretical and applied research, impulses of a strong will to do research, persistent hard work and concentration, developing high-minded independence of judgement and thirst for scientific originality, various stages of scientific research, observation, experimentation, working hypotheses, proof etc.,

On writing scientific papers – justification for scientific contributions, bibliography, justice and courtesy in decisions, description of methods, conclusions, the need for illustration, style, publications of scientific works.

Unit IV: **Open Access Publishing**

Open access publications and initiatives - SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies - Software tool to identify predatory publications developed by SPPU - Journal finger / journal

M GAYATHRI MARIAMMAL

Dr K THANIKASALAM

BDU2110192779713

COURSE III -RESEARCH METHODOLOGY

COURSE CODE: PHD22RM03

Objectives :

- To learn the computer application skill for teaching and research
- To understand the principles of research, literature survey and writing research paper and thesis writing
- To create the awareness on laboratory hygiene and safety
- To gain some knowledge about the statistical analysis of data which will be highly helpful for research
- To gain an idea about digital electronics and computer package

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Print : Sources of information – Primary, Secondary, Tertiary sources – Journals – Journal abbreviations – Abstracts – Current titles – Reviews – Monographs – Dictionaries – Textbooks – Current contents – Introduction to Chemical Abstracts and Beilstein – Subject Index, Substance Index, Author Index, Formula Index and other Indices with examples.

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UNIT II : Methods of scientific research and writing scientific papers

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Applications of some computer packages like MS–Excel, Origin, ChemDraw, Sciplot, ISIS draw, ChemSketch and SPSS.

References:

Unit I

1. http://www.inflibnet.ac.in
2. http://spingerlink.com
3. http://rsc.org
4. http://www.pubs.acs.org
5. J. March, 'Advanced Organic Chemistry; Reactions, Mechanisms and Structure', 6th Ed., Wiley– Interscience, 2016.

Unit II

1. Santiago Ramon y Cajol, (translated by Neely S Wanson and Larry W Swanson) 'Advice for a young Investigator' A Bradford Book, The MIY Press, Massachusetts, London, England 1999.

2. Maeve O'Connor, 'Writing successfully in science' Chapman and Hall, London, 1995.

Unit III

1. Chemical safety matters–IUPAC –IPCS, Cambridge Univ. Press, 1992.
2. Analytical Chemistry , K.Gopalan, S.Chand year

Unit IV

References:

1. D. B. Hibbert and J. J. Gooding, 'Data Analysis for Chemistry', Oxford University press, 2006.
2. J. Topping, 'Errors of Observation and Their Treatment', Fourth Edn., Chapman Hall, London, 1984
3. S. C. Gupta, 'Fundamentals of Statistics', Sixth Edn., Himalaya publ. House', Delhi, 2006
4. H. E. Solbers, 'Inaccuracies in Computer Calculation in Standard Deviation', Anal. Chem. 55, 1611 (1983)
5. P. M. Wanek et al., 'Inaccuracies in the Calculation of Standard Deviation with Electronic Calculators', Anal. Chem. 54, 1877 (1982)

Unit V

1. R. L. Tokheim, 'Digital Electronics–Principles and Applications', 5th Edn., Tata Mc Graw–Hill, New Delhi, 1999.
2. Alan Jhonson, 'Electronics, A Systems Approach' Hodder and Stoughton, London, 1987.
3. Robert Boylested, Louis Nashelsky, 'Electronic Devices and Circuit Theory', Prentice Hall, 9th Edn., May 2005.
4. Thomas L Floyd, 'Principles of Electric Circuits: Conventional Current Version', Prentice Hall, 7th Edn., Jan 2006.
5. For computer applications any commonly available books as well as common materials available in the web.

Course outcomes:

- The scholars will know the different routes to design a research problem
- General terminology including various methods for the research shall be the outcome of the course.
- To improve the numerical aptitude and computational knowledge in the basic of collection and presentation of data.
- The scholars will acquire knowledge of safe laboratory practices by handling laboratory glassware, equipment, and chemical reagents.

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Periyar E.V.R College (Autonomous), Triuchirappalli-620 023.

Department of Botany

Ph.D. Programme – Syllabus for Course Work

Name of Research Supervisor : Dr. R.SARALA
Name of Ph.D. Candidate : Ms. K.BHARATHI
Register No. : 24942/Ph.D. K1/Botany/Full Time/January 2018 dt.18.12.2017
Course Code : 18PHDBOCW01

Credits - 4

RESEARCH METHODOLOGY

Unit I Introduction to Research

Foundations of Research: Meaning – Objectives – Motivation - Utility. Concept of theory – empiricism- deductive and inductive theory. Classification of Research - Pure and Applied Research – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem

Unit II Literature Review

Importance of literature review in defining a problem – Literature review – Primary and secondary sources - reviews, treatise, monographs- patents. Web as a source – searching the web - Note Taking - Identifying gap areas from literature review - Development of working hypothesis

Unit III Research Design

Need for a research design — Features of good design – Important concepts relating to research design – Observation and Facts - Laws and Theories - Prediction and explanation – Induction – Deduction - Development of Models. Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance

Unit IV Reporting and thesis writing

Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance= Different steps in the preparation – Layout, structure and language -Illustrations and tables – Bibliography- referencing and footnotes - Oral presentation – Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective communication.

Unit V Application of results and ethics

Environmental impacts - Ethical issues - ethical committees - Commercialization Intellectual property rights an patent law – Trade Related aspects of Intellectual Property Rights. Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

REFERENCES

- Garg, B. L., Karadia, R., Agarwal, F. and Agarwal, U.K. 2002. An introduction to Research Methodology, RBSA Publishers.
- Kothari, C. R. 1990. Research Methodology: Methods and Techniques. New Age International.
- Sinha, S. C. and Dhiman, A. K. 2002. Research Methodology, EssEss Publications. 2 volumes.
- Trochim, W. M. K. 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing.
- Wadehra, B. L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.

R. Sarala 23/7/18

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Trichy – 2

J. James

Dr. S.R. SENTHILKUMAR
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