Mangalore University

Department of Industrial Chemistry

Ph. D Programme

Scheme of Assessment and Examination

Courses	Particulars	Hours of Instructions per week	Duration of Examination (Hrs)	Marks			Credits
				IA	Theory	Total	
Course I	Research Methodology	4	3	30	70	100	4
Course II	Research and Publication Ethics	2	3	30	70	100	2
Course III	Review of Literature Review Report Viva	14	-	-	-	 150 50	 6 2
		Total				**400**	**14**

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Course structure

- The course comprises of six modules listed in table below. Each module has 4-5 units.

Modules	Unit title	Teaching hours
Theory		
RPE 01	Philosophy and Ethics	4
RPE 02	Scientific Conduct	4
RPE 03	Publication Ethics	7
Practice		
RPE 04	Open Access Publishing	4
RPE 05	Publication Misconduct	4
RPE 06	Databases and Research Metrics	7
	Total	**30**

Syllabus in detail

THEORY

- **RPE 01: PHILOSOPHY AND ETHICS (3 hrs.)**

1. Introduction to philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgements and reactions

- **RPE 02: SCIENTIFICCONDUCT (5hrs.)**

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
4. Redundant publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

- **RPE 03: PUBLICATION ETHICS (7 hrs.)**

1. Publication ethics: definition, introduction and importance
2. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interest
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

PRACTICE

- **RPE 04: OPEN ACCESS PUBLISHING(4 hrs.)**

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies
3. Software tool to identify predatory publications developed by SPPU
4. Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4hrs.)**

A. Group Discussions (2 hrs.)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interest
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2 hrs.)

Use of plagiarism software like Turnitin, Urkund and other open source software tools

- **RPE 06: DATABASES AND RESEARCH METRICS (7hrs.)**

A. Databases (4 hrs.)

1. Indexing databases
2. Citation databases: Web of Science, Scopus, etc.

B. Research Metrics (3 hrs.)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g index, i10 index, altmetrics

References

Bird, A. (2006). *Philosophy of Science*. Routledge.

MacIntyre, Alasdair (1967) *A Short History of Ethics*. London.

P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865

National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.

Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1–10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179–179. https://doi.org/10.1038/489179a

Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance(2019), ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

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Ph.D. Course Work – 2
Title: Research and Publication Ethics

~~ANNEXURE~~

Course Title:

- **Research and Publication Ethics (RPE)**-Course for awareness about the publication ethics and publication misconducts.

Course Level:

- 2 Credit course (30 hrs.)

Eligibility:

- M.Phil., Ph.D. students and interested faculty members (It will be made available to post graduate students at later date)

Fees:

- As per University Rules

Faculty:

- Interdisciplinary Studies

Qualifications of faculty members of the course:

- Ph.D. in relevant subject areas having more than 10 years' of teaching experience

About the course

Course Code: CPE- RPE

Overview

- This course has total 6 units focusing on basics of philosophy of science and ethics, research integrity, publication ethics. Hands-on-sessions are designed to identify research misconduct and predatory publications. Indexing and citation databases, open access publications, research metrics (citations, h-index, Impact Factor, etc.) and plagiarism tools will be introduced in this course.

Pedagogy:

- Class room teaching, guest lectures, group discussions, and practical sessions.

Evaluation

- Continuous assessment will be done through tutorials, assignments, quizzes, and group discussions. Weightage will be given for active participation. Final written examination will be conducted at the end of the course.

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Ph.D. COURSE WORK SYLLABUS

Ph. D. Programme outcome

- The candidate learns how to plan and execute research work in a given time line.
- The candidate learns to analyze, tabulate and write the data in the form of scientific article and the steps involved in the scientific publication.
- Knowledge about the IPR and copy right issues would be gained during the course of study.
- The outcome of the work would form the basis of a thesis to be submitted for the award of Ph.D. Degree

Ph.D. programme Specific Outcome

- To understand the methodologies adopted during research work.
- To learn how to survey and document the existing knowledge in chosen field of research.
- To carryout studies on the chosen field of research to obtain novel results.
- To prepare a thesis on the work carried out during the research tenure for the award of Ph.D. Degree.

IC 601: RESEARCH METHODOLOGY

Objectives of Course:

- To understand the overview of research
- To refresh the basic knowledge in the respective subject.
- To create a link between the chosen subject of study and research problem.
- To understand safety measures and good lab practices.

Course Outcome:

- It gives a better idea how to construct and solve the problem within a time frame.
- Learning of data interpretation by statistical and non statistical methods.
- How to correlate the problems associating with the research and solve it in an innovative way.
- It emphasizes on the conducting experiments by adopting good lab practices.

UNIT-I: Research Methodology 14 Hours

Research Process – Scientific research, formation of the topic, hypothesis, Source of information, 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.

Research design and methods – Basic Principles, Need of research design, important concepts relating to research design – Observation and Facts, Development of Models- developing a research plan – Exploration, Diagnosis and Experimentation.

Writing methods – Introduction, word processing and layout, writing and formatting with the computer, 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. Collection and Citation of Literature: Acquisition of information, building up of own literature collection, anatomy of source description.
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, Science Direct, SciFinder, Scopus, Familiarity with ideas and concepts investigation.

Unit-II: Data Analysis and Sampling 14 Hours

Data analysis: Classification of errors-systematic, errors-sources, Random errors-sources and distribution. Accuracy and precision-Determination of accuracy of methods, improving accuracy of analysis, significant figures, mean, standard deviation, Analysis of variance (ANOVA) – Correlation and Regression. Graphical methods – Linear regression line, correlation coefficient-Multiple linear regression (one variable with two other variables), Comparison of results: "t" test and rejection of results, gathering of data, analysis of data, revising o hypothesis, presentation of data and Conclusion.
Sampling- Introduction, Definitions, theory of sampling, techniques of sampling, Representative sample, Sample storage, sample pre-treatment and sample preparation. Statistical criteria of good sampling and required size – stratified sampling v/s random sampling.
Quality in analytical laboratories – quality control and quality assurance, accreditation system.

Unit - III: Analysis Techniques 14 Hours

IR Spectroscopy – Molecular vibrations – selection rules – force constant – band assignments – applications – organic structures – finger printing – identification or common functional groups.

Nuclear magnetic resonance spectroscopy – Introduction – Magnetic properties of nuclei – Resonance condition. Field frequency diagram, Precession of nuclei, Relaxation – CW and PFT methods – Instrumentation and sample handling. ^{1}H NMR – Chemical shift – Mechanism – of shielding and deshielding, Coupling constant, NOE. ^{13}C NMR – Off resonance decoupling – coupling of carbon to fluorine.

Mass spectrometry – Theory – instrumentation – production and reactions of gaseous ions – isotopic abundance – determination of molecular weights and formulae – metastable peaks – nitrogen rule – ion fragmentation mechanisms – rearrangements. Elucidation of structure of compound on the basis of IR, NMR and Mass Spectrometry.
Chromatographic techniques – TLC, Column, HPLC – Theory and applications, LC-MS.

UNIT - IV: Chemical Safety and Ethics of Research **14 Hours**

General safety and operational rules - Safety equipments, personal protective equipments, compressed gas safety, 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.
Emergency response - Chemical spills, radiation spills, biohazard spills, leaking compressed gas cylinders, fires, medical emergency accident reporting. Safety rules of laboratory acquaintance of experimental set up and instruments, intellectual property and intellectual property rights. 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.
Application of results and ethics - Environmental impacts – 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.

Total: 56 Hours

Reference Books

1. C.R. Kothari, Research methodology: Methods and Techniques. New Age international, 1990.
2. D.R. Kapoor & Pooja Saigal, Research Methodology Methods & Techniques, Regal Publications, 2013.
3. D.K. Bhattacharya, Research Methodology Pillappa; Third edition, 2013.
4. Suresh Chandra & Mohit K. Sharma, Research Methodology, Alpha Science Intl Ltd; edition 2013
5. R. Panneerselvam, Research Methodology, Phi Learning publications, 2009.
6. Nicholas Walliman, Research Methodology, 2010
7. J. Mohan, Organic Spectroscopy Principles and Application, CRC; 2nd edition, 2004.
8. W. Kemp, Organic Spectroscopy, 3rd edition, Mac Millon, 1994.
9. P.M. Solverstein, F.X. Wester, Spectroscopic Identification of Organic Compounds, 6th edition, Wiley 1998.
10. Douglas A. Skoog, Donald M. West, F. James Holler, Fundamentals of analytical Chemistry, Saunders College publications, 1988.

LITERATURE REVIEW

Course Objectives

- To know the proper use of search engines and survey methods.
- To understand volume of the work carried out in the respective field of research.
- To formulate research problem in the chosen field of research.