

ಮಂಗಳೂರು
MANGALORE



ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY

(Accredited by NAAC with 'A' Grade)

ಕ್ರಮಾಂಕ/ No. : MU/ACC/CR.46/2014-15/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ

ಮಂಗಳಗಂಗೋತ್ರಿ - 574 199

Office of the Registrar

Mangalagangothri - 574 199

ದಿನಾಂಕ/Date: 15.02.2016

NOTIFICATION

Sub : Revised syllabus for Ph.D. Course work in Industrial Chemistry
Ref: Academic Council decision No.: 3:20(2015-16), dated 25.01.2016.

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The revised Syllabus for Ph.D Coursework in Industrial Chemistry which approved by the Academic Council at its meeting held on 25.01.2016 is hereby notified for implementation with effect from the academic year 2015-16.

REGISTRAR.

KM. J.

To:

- 1) The Chairmen of P.G. Departments/ Co-ordinators of P.G. Courses/ Principals of the Recognised Colleges/ Directors of Recognised Institutions of Mangalore University.
- 2) The Chairman, Board of Studies in subject concerned.
- 3) The Superintendent (ACC), O/o the Registrar, Mangalore University.
- 4) Guard File.

**MANGALORE UNIVERSITY**

SCHEME OF EXAMINATION FOR Ph.D. COURSE WORK IN INDUSTRIAL CHEMISTRY

| 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        | 16                            | -                      | -     | -      | 150   | 8       |
|         | Viva                 | -                             | -                      | -     | -      | 50    | 2       |
|         |                      |                               |                        |       |        |       | 14      |

**MANGALORE UNIVERSITY**  
**DEPARTMENT OF INDUSTRIAL CHEMISTRY**  
**Ph.D. COURSE WORK SYLLABUS**

**IC 601: RESEARCH METHODOLOGY**

**UNIT-I: Research Methodology**

**14 Hours**

**Research processes** - Scientific research, formation of the topic, hypothesis, Sources 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, Description, 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, ScienceDirect, SciFinder, Scopus. Familiarity with ideas and concepts of 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 “F” test rejection of results, gathering of data, analysis of data, revising of hypothesis, presentation of data and Conclusion.

**Sampling**- Introduction – definitions – theory of sampling – techniques of sampling – Representative sample, sample storage, sample pretreatment 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: Analytical 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.  $^1\text{H}$  NMR - Chemical shift- Mechanism of shielding and deshielding, Coupling Constant, NOE.  $^{13}\text{C}$  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; 1 edition, 2013.
5. R. Panneerselvam, Research Methodology, Phi Learning publication, 2009.
6. Nicholas Walliman, Research Methodology, 2010
7. J. Mohan, Organic Spectroscopy Principles and Applications, CRC; 2nd Ed., 2004.
8. W. Kemp, Organic Spectroscopy, 3rd Ed., MacMillon, 1994.
9. P.M. Silverstein, F.X. Wester, Spectroscopic Identification of Organic Compounds, 6th Ed., Wiley 1998.
10. Douglas A. Skoog, Donald M. West, F. James Holler, Fundamentals of analytical Chemistry, Saunders College Pub., 1988.

11. S M Khopkar Basic Concepts Of Analytical Chemistry New Age International, 1998.
12. Gupta R. N. Chemical warfare and casualty Management 2011.
13. Vyas M N. Safety and hazards management in chemical industries 2013. Atlantic Publication
14. Dikshith T.S.S Safety evaluation of environmental chemicals. New Age International 1996.
15. Chemical Safety Matters-IUPAC -IPCS, Cambridge Univ. Press, 1992.
16. Fundamental of Research Methodology and Statistics, Yogesh Kumar Singh, New Age International Publishers, 2006.

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UNIVERSITY

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ಕ್ರಮಾಂಕ/ No. : MU/ACC/CR 67/2020-21/A2

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ದಿನಾಂಕ/Date: 25.11.2021

**NOTIFICATION**

Sub: Revised syllabus for Ph.D. Coursework in Industrial Chemistry  
Ref: Academic Council approval vide agenda

No.: ಎಸಿಸಿ:ಶೈ.ಸಾ.ಸ.2: 18(2021-22) dated 27.10.2021

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The revised syllabus for Ph.D. Coursework in Industrial Chemistry which has been approved by the Academic Council at its meeting held on 27.10.2021 is hereby notified for implementation with effect from the academic year 2021-22.

  
REGISTRAR

To,

1. The Chairman, Dept. of Industrial Chemistry, Mangalore University, Mangalagangothri
2. The Chairman, PG BOS in Industrial Chemistry, Dept. of Industrial Chemistry, Mangalore University.
3. The Registrar (Evaluation), Mangalore University.
4. The Superintendent (ACC), O/o the Registrar, Mangalore University.
5. The Asst. Registrar (ACC), O/o the Registrar, Mangalore University.
6. Guard File.

**MANGALORE UNIVERSITY**  
**DEPARTMENT OF INDUSTRIAL CHEMISTRY, MANGALAGANGOTRI-574 199**

**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.

### Course structure

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

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

### 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: SCIENTIFIC CONDUCT (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 behaviour 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](http://www.insaindia.res.in/pdf/Ethics_Book.pdf)

**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 |        |            | Cred      |
|------------|-----------------------------------------------|--------------------------------|-------------------------------|-------|--------|------------|-----------|
|            |                                               |                                |                               | 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<br>Review Report<br>Viva | 14                             | -                             | -     | -      | 150<br>50  | 6<br>2    |
|            |                                               | <b>Total</b>                   |                               |       |        | <b>400</b> | <b>14</b> |

  
Chairperson  
Department of Industrial Chemistry  
Mangalore University  
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