



ಕ್ರಮಾಂಕ/No. : MU/ACC/CR.4/2024-25/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ

ಮಂಗಳಗಂಗೋತ್ರಿ - 574 199

Office of the Registrar

Mangalagangothri - 574 199

ದಿನಾಂಕ/Date: 20.08.2024

NOTIFICATION

Sub: Revised syllabus of Ph.D. coursework in Industrial Chemistry Programme.

Ref: Academic Council approval vide agenda

No.: ಎಸಿಸಿ:ಶೈ.ಮ.ವಿ.ಸಂ.2:14 (2024-25) dtd 06.08.2024.

The Revised syllabus of Ph.D. coursework in Industrial Chemistry programme which is approved by the Academic Council at its meeting held on 06.08.2024 is hereby notified for implementation with effect from the academic year 2024-25.

Copy of the Syllabus shall be downloaded from the University Website (www.mangaloreuniversity.ac.in)


REGISTRAR

To,

1. The Registrar (Evaluation), Mangalore University.
2. The Chairman, PG BOS in Industrial Chemistry, Dept. of Industrial Chemistry, Mangalore University.
3. The Chairman, Dept. of Industrial Chemistry, Mangalore University.
4. The Superintendent (ACC), O/o the Registrar, Mangalore University.
5. The Asst. Registrar (ACC), O/o the Registrar, Mangalore University.
6. The Director, DUIMS, Mangalore University – with a request to publish in the website.
7. Guard File.

TABLE OF CONTENTS

Structure and Syllabus of Pre- PhD Course Work

Course Code (Paper NO)	Course work Title	Teaching hours per week	Credits	Marks		
				Internal Exam	Final Exam	Total Marks
IC-PhDCW- RM-01	RESEARCH METHODOLOGY	04	04	30	70	100
IC-PhDCW- RPE-02	RESEARCH AND PUBLICATION ETHICS	02	02	30	70	100
IC-PhDCW- RL-03	REVIEW OF LITERATURE 1. (Literature Review Report Submission) 2. Viva- Voce Examination	-	14	-	150 50	200
Total			20	60	340	400

IMPORTANT POINTS TO NOTE:

- (i) Duration of Course Work: One Semester (6 Months). (ii) Total Marks: 400 (20 credits) . (iii) Students are required to secure minimum 75% attendance (as per University Rules) in each course to qualify for appearing in End semester examination.
- The internal assessment for Paper 1 and Paper 2 comprises, Seminar: 10 marks, Assignment: 05, Internal Theory Examinations:15 marks. Paper 3 comprises submission of literature review report: 150 marks, Viva-Voce examination: 50 marks.
- The final examination question paper pattern for Paper 01 and Paper 02 was provided at the end of the syllabus. Paper 1 consist of (08) questions, from which student are required to attempt (05) questions. Each question is divided in two parts (a), (b), and (c) collectively carrying a total of (5+5+4=14) marks.
- The Paper 01 question paper was structured in a manner such that Question No 1, and 2 pertain to UNIT-01, Question No 3, and 4 pertain to UNIT-02, Question No 5, and 6 pertain to UNIT-03, Question No 7, and 8 pertain to UNIT-04.

5. The Paper 02 question paper was structured in a manner such that Question No 1, and 2 pertain to UNIT-01 and UNIT-02, Question No 3, and 4 pertain to UNIT-03, Question No 5, and 6 pertain to UNIT-04 and UNIT-05 Question No 7, and 8 pertain to UNIT-06.

SYLLABUS
PhD COURSE WORK FOR INDUSTRIAL CHEMISTRY

Course name	RESEARCH METHODOLOGY
Course code	IC-PHDCW-RM-01
Credits	04
Max.Mark	100
Examination time	3hr

Objective:

1. To gain insight into the research process, it is essential to grasp key concepts associated with research design.
2. This course aim is to impart practical knowledge regarding processing, analysing and interpretation of data utilizing appropriate statistical and analytical software.
3. To cultivate the academic writing skills required to integrate findings into detailed reports, dissertations, or articles for publication.
4. This course aim is to equip learners with ability to identify research gaps, articulate clear research problems and formulate testable hypotheses.
5. The primary goal of this course is to improve students research and technical competencies.
6. To understand the principles and applications of IR, ¹HNMR, ¹³CNMR, and Mass spectroscopic techniques in the structural analysis of organic compounds.
7. To gain expertise in structural elucidation by addressing complex structure challenges
8. To recognize the significance of chemical safety protocols for conducting research within the chemical industries.
9. To understand the quality control and quality assurance to be used in the chemical industries.
10. To describe and explain the importance of the concept of “ sampling” in analytical methods of analysis.

Expected Course Outcomes

Upon successful completion, students will be able to:

1. Create and organize clear , actionable, and measurable research objectives and hypothesis.
2. Identify the most suitable research design, sampling methods and data collection instrument to tackle the designed problem.
3. Acquire knowledge regarding quality control and quality assurance applicable in the chemical industries.
4. Cultivate skills for academic writing by producing a well-structured paper with appropriate citations and references.
5. Improve communication abilities to effectively convey research findings.
6. Utilize modern theoretical and experimental techniques to analyzing the structure of organic compounds.
7. To gain knowledge with multivariate's data analysis procedures and their specific applications concerning research questions and hypothesis.

Course Content

UNIT NO	CONTENT	HOURS
UNIT-I:	Research Process, Design and Methods Research processes - Scientific research, formation of the topic, hypothesis and Sources of information. Types and Methods of Research-Classification of Research- Pure and Applied Research- Exploratory 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.	14 hours

	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.	
UNIT-II:	Sampling and Data analysis 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. 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. Quality in analytical laboratories: quality control and quality assurance, accreditation system.	4 hours
UNIT-III:	Methods in Analytical Techniques: Chromatographic techniques: TLC, Column, HPLC Theory and applications, LC-MS. Spectroscopic techniques: IR spectroscopy-Molecular vibrations, selection rules, force constant-band assignments, applications, organic structures, fingerprinting, and identification of common functional groups. Nuclear magnetic resonance spectroscopy: Introduction- Magnetic properties of nuclei-Resonance condition. Instrumentation and Sample handling. ¹H NMR - Chemical shift-	14 hours

	Mechanism and factors influencing of shielding and deshielding, Coupling Constant, First order and second order spectral patterns. NOE. ^{13}CNMR-Off resonance decoupling, ^{19}F-NMR spectroscopy. 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 compounds on the basis of IR, ^1H and ^{13}CNMR and Mass Spectrometry.	
UNIT-IV:	Chemical Safety and Intellectual Property Rights 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 ailed 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. Intellectual property rights and patent law — Trade Related aspects of Intellectual Property Rights.	14 hours

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Model Question Paper for PhD Course Work Examination

SUBJECT: INDUSTRIAL CHEMISTRY

PAPER 1 CODE: IC-PHDCW-RM-01: RESEARCH METHODOLOGY

Time:3 Hours

Max Marks: (5x14= 70)

Note: 1) Answer any FIVE questions

Q1. a)

b)

c)

(5+5+4=14)

Q2. a)

b)

c)

(5+5+4=14)

Q3. a)

b)

c)

(5+5+4=14)

Q4. a)

b)

c)

(5+5+4=14)

Q5. a)

b)

c)

(5+5+4=14)

Q6. a)

b)

c)

(5+5+4=14)

Q7. a)

b)

c)

(5+5+4=14)

Q8. a)

b)

c)

(5+5+4=14)

SYLLABUS
PhD COURSE WORK FOR INDUSTRIAL CHEMISTRY

Course name	RESEARCH AND PUBLICATION ETHICS
Course code	IC-PHDCW-RPE-02
Credits	02
Max.Mark	100
Examination time	3hr

Introduction: This course is designed to enhance awareness among doctoral students about research and publication ethics, along with different types of unethical practice and misconduct in publications. The course consists of 6 units that focus on the essential principles of philosophy of science and ethics, scientific conduct, publication ethics, and including practical sessions are organized to assist in recognizing research misconduct and predatory publications. Furthermore, this course will provide an introduction to indexing and citation databases, Open Access Publication, research metrics (including citations, h-index, impact factor, etc.) and tools for identifying plagiarism.

Objective:

- 1.To gain a comprehensive understanding of the philosophy of science and ethics, including intellectual honesty, research integrity and publication ethics.
- 2.To recognize instances of research misconduct and predatory publications, while educating researchers on how to identify and avoid scientific misconduct such as Falsification, Fabrication, and Plagiarism (FFP).
- 3.To acquire practical skills in utilizing indexing and citation database (e.g., Scopus, Web of Science), research metrics (Impact Factor, \ (h)-index), and Open Access publishing.
- 4.To gain a comprehensive understanding and knowledge about the applications of plagiarism detection tools.

5.To familiarize scholars with the principles of publication ethics, potential conflict of interest, and the international standards set forth by organizations like the Committee on Publication Ethics (COPE) and WAME.

Expected Course Outcomes

Upon successful completion of the course, students are expected to be able to:

- 1.Differentiate between standard scientific research and publication misconducts.
- 2.Critically evaluate the quality and ethical standing of academic research publications.
- 3.Apply ethical decision-making frameworks to resolve challenges encountered in research and publication.
- 4.Identify and avoid dubious, predatory publishers and fraudulent journals.
- 5.Accurately navigate and utilize citation databases, plagiarism detection software (like Urkund / Turnitin), and established evaluation metrics.

Course Title:

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

Course Level:

- 2 Credit course (30 hrs.)

Course Code: IC-PHDCW-RPE-02

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 Content

UNIT	CONTENT	HOURS
UNIT -01	THEORY REP01:PHILOSOPHY AND ETHICS 1.Introduction of philosophy: definition, nature and scope, concept, branches 2. Ethics: definition, moral philosophy, nature of moral judgements and reactions	03
UNIT -02	RPE02:SCIENTIFIC CONDUCT 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	05
UNIT -03	RPE03: PUBLICATION ETHICS 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	(7hrs.)

UNIT -04	PRACTICE RPE04:OPEN ACCESS PUBLISHING 1.Open access publications and initiatives 2. SHERPA / RoMEO online resource to check publisher copyright and 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 Suggested, etc.	(4hrs.)
UNIT -05	RPE05:PUBLICATION MISCONDUCT A. Group Discussions (2hrs.) 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 (2hrs.) 1. Use of plagiarism soft ware like Turnitin, Urkund and other open source software tools	(4hrs.)
UNIT -06	RPE06:DATA BASES AND RESEARCH METRICS A. Databases (4hrs.) 1.Indexing data bases 2.Citation data bases: Web of Science, Scopus, etc. B. Research Metrics (3hrs.) 1.Impact Factor of journals per Journal Citation Report, SNIP, SJR, IPP,Cite Score 2.Metrics: h-index, g-index, i10 -index, altmetrics	(7hrs.)

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Model Question Paper for PhD Course work examination

SUBJECT: INDUSTRIAL CHEMISTRY

PAPER 2 CODES: IC-PHDCW-RPE-02: RESEARCH AND PUBLICATION ETHICS

Time: 3 Hours

Max Marks: (5X14= 70)

Note: 1) Answer any FIVE questions

Q1. a)

b)

c)

(5+5+4=14)

Q2. a)

b)

c)

(5+5+4=14)

Q3. a)

b)

c)

(5+5+4=14)

Q4. a)

b)

c)

(5+5+4=14)

Q5. a)

b)

c)

(5+5+4=14)

Q6. a)

b)

c)

(5+5+4=14)

Q7. a)

b)

c)

(5+5+4=14)

Q8. a)

b)

c)

(5+5+4=14)

SYLLABUS
PhD COURSE WORK FOR INDUSTRIAL CHEMISTRY

Course name	REVIEW OF LITERATURE
Course code	IC-PHD-CW-03
Credits	14
Max.Mark	200
(Literature review report)	150 Marks
Viva-voce Examination	50 Marks

The research student is required to gather previously published research papers relevant to their specific research areas. This direction will be utilized to prepare a literature review report, in which the student must provide a comprehensive overview of the research outputs published in their field of research work. The content of this report will be based on the research area under the guidance of the Research Guide. The review report should encompass an analysis of the previously reported work, identifying research gaps and motivations for the initiated proposed research project work
