

ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ  
MANGALORE UNIVERSITY  
(Accredited by NAAC Grade)



ಕ್ರಮಾಂಕ/No. : MU/ACC/CR.2/2025-26/A2

ಕುಲಸಚಿವರ ಕಛೇರಿ

ಮಂಗಳಗಂಗೋತ್ರಿ - 574 199

Office of the Registrar

Mangalagangothri - 574 199

ದಿನಾಂಕ/Date: 31.07.2025

**NOTIFICATION**

Sub: Revised syllabus for Ph.D. Coursework in Chemistry.

Ref: Academic Council approval vide agenda No.: ಎಸಿಸಿ:ಶೈ.ಮ.ಸಾ.ಸ.1:1

(2025-26) dtd 18.07.2025.

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The revised syllabus for Ph.D. Coursework in Chemistry which has been approved by the Academic Council at its meeting held on 18.07.2025 is hereby notified for implementation with effect from the academic year 2025-26 and onwards.

Copy of the Syllabus shall be downloaded from the University Website ([www.mangaloreuniversity.ac.in](http://www.mangaloreuniversity.ac.in))

  
REGISTRAR

To,

1. The Registrar (Evaluation), Mangalore University.
2. The Chairman, Board of Studies in Chemistry (Including Applied Chemistry & Organic Chemistry), Dept .of Chemistry, Mangalore University.
3. The Chairman, Dept .of Chemistry, Mangalore University, Mangalagangothri.
4. The Asst. Registrar (ACC), O/o the Registrar, Mangalore University.
5. The Director, DUIMS, Mangalore University – with a request to publish in the website.
6. Guard File.

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**Department of Studies in Chemistry**  
**Mangalagangothri-574199**

**Syllabus for Ph.D. Coursework in**

**CHEMISTRY**

*(With effective from the Academic Year 2025-26)*

# Syllabus for Ph.D. Coursework in

## CHEMISTRY

### PREAMBLE

Revision of syllabus for One Semester (Six months) Coursework of Ph.D. Programme in Chemistry

PG BOS in Chemistry has revised and prepared the syllabus for the Ph.D. Coursework in Chemistry by offering three papers with a total of 12credits. The programme consists of 3 courses namely Research Methodology (4 Credits), Research and Publication Ethics (2 Credits) and Review of Literature (6 Credits). Therefore, grand total of the credits for the Ph.D. Coursework is 12. A detailed skeleton of the coursework is given in the table below. Other important aspects such as University question paper pattern, internal assessment examinations, allotment of marks and the approximate dates of the internal examinations are being tabulated with a discussion in the BOS.

| Course      | Course Code | Course Name                     | Hours of Instruction per week | Duration of Exam. (Hours) | Marks |        |       |         |
|-------------|-------------|---------------------------------|-------------------------------|---------------------------|-------|--------|-------|---------|
|             |             |                                 |                               |                           | IA    | Theory | Total | Credits |
| Course 1    | PHDCHM101   | Research Methodology            | 4                             | 3                         | 30    | 70     | 100   | 4       |
| Course 2    | PHDCHM102   | Research and Publication Ethics | 2                             | 2                         | 15    | 35     | 50    | 2       |
| Course 3    | PHDCHM103   | Review of Literature            |                               |                           |       |        |       |         |
|             |             | Review Report                   | 6                             | -                         | -     | -      | 150   | 6       |
|             |             | Viva                            | -                             | -                         | -     | -      | 50    |         |
| Grand Total |             |                                 |                               |                           |       |        | 350   | 12      |

Duration: One Semester (Six months)

Total Credits: 12 Credits

**BASIS FOR INTERNAL ASSESSMENT:** Internal assessment marks in Course-1 and Course-2 shall be theory papers shall be based on two tests conducted for 30 marks for each course. The tests may be conducted 12 and 25 weeks after the commencement of the Coursework. Average of two test marks will be considered as internal assessment marks. Question Papers for Internal Assessment shall consist of four (4) descriptive answer questions (if required with two sub-divisions, a and b) carrying 10 marks each, out of which three (3) questions are to be answered.

**QUESTION PAPER PATTERN:** The syllabus of Course-1 shall be grouped into four units of 15 teaching hours each and Course-2 shall be grouped into two units of 15 teaching hours each. Question paper of Course-1 shall contain eight (8) brief and/or long answer questions carrying 14 marks each drawn from all the four units of the syllabus (2 questions per unit). There may be a two (a, b) or three (a, b, c) sub-divisions per question, carrying 3 or more marks per sub-division. Five (5) out of eight (8) questions are to be answered choosing at least one question from each unit. For Course-2, question paper shall consist of Part A and B. Part-A shall contain four (4) brief answer questions carrying 5 marks each drawn from both units of the syllabus (2 questions per unit). Three (3) out of four (4) questions are to be answered. Part B shall contain three (3) long answer questions carrying 10 marks each drawn from both the units of the syllabus (2 questions per unit). Part B shall contain two (2) long answer questions with internal choice carrying 10 marks each drawn from both the units of the syllabus.

**Ph.D. Coursework (Chemistry) Examination**  
**Course-1**  
**PHDCHM101: Research Methodology**

**Time: 3 Hours**

**Max. Marks: 70**

**Note:** i) Answer any **Five full** questions.

ii) Figures to the right indicate marks.

(5x14=70)

- |                   |    |                         |    |                         |
|-------------------|----|-------------------------|----|-------------------------|
| 1. a) }<br>b) }   | Or | 1. a) }<br>b) }<br>c) } | Or | 2. a) }<br>b) }<br>c) } |
| <b>Unit – II</b>  |    |                         |    |                         |
| 3. a) }<br>b) }   | Or | 3. a) }<br>b) }<br>c) } | Or | 4. a) }<br>b) }<br>c) } |
| <b>Unit – III</b> |    |                         |    |                         |
| 5. a) }<br>b) }   | Or | 5. a) }<br>b) }<br>c) } | Or | 6. a) }<br>b) }<br>c) } |
| <b>Unit – IV</b>  |    |                         |    |                         |
| 7. a) }<br>b) }   | Or | 7. a) }<br>b) }<br>c) } | Or | 8. a) }<br>b) }<br>c) } |

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**Ph.D. Coursework (Chemistry) Examination**  
**Course-2**  
**PHDCHM102: Research and Publication Ethics**

**Time: 2 Hours**

**Max. Marks: 35**

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Note: i) Answer any **three** questions from Part A and **all** questions from Part B.

ii) Figures to the right indicate marks.

**PART A**

Answer any **three** questions

**(3x5=15)**

- 1.
- 2.
- 3.
- 4.

**PART B**

Answer **both** questions

**(2x10=20)**

- 5.
- Or
- 6.
- 7.
- Or
- 8.

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**REVIEW OF LITERATURE EXAMINATION PATTERN:** Review of Literature shall consist of Review Report and Viva. It shall be evaluated by the Doctoral Committee members including the concerned guides for 150 marks based on the content and presentation of the Review Report. Viva-Voce examination shall be conducted as per the University regulations for 50 marks. The total of the average marks allotted to Review Report and Viva by the doctoral Committee members and the concerned guides shall be considered for Review of Literature.

### **PROGRAMME OUTCOMES**

The PhD program in Chemistry provide 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.

**Course-1**  
**PHDCHM101: Research Methodology**  
**[60 Hours]**

**COURSE OUTCOMES**

Enable the students to:

- Learn about the foundation of research, types and methods of research, literature survey and planning of research
- Understand the research problem and sampling techniques or methods
- Acquire knowledge of computer system, software, application and uses of common software in chemistry.
- Know about the chemical safety and ethical handling of chemicals.
- Understand the advanced techniques of analysis such as UV-Vis, IR, NMR, Mass, ESR spectroscopy, XRD, thermal and electrochemical analysis and ethics of research.
- Gain knowledge about the safety rules of laboratory, intellectual property rights, environmental aspects, data management, patenting and IP sales process.

**UNIT-I**

**[15 Hours]**

**Research Methodology:** Introduction to research methodology, design and implementation of research methods, types of research, the research process, formulating, reviewing the literature.

**Literature Searching:** On-line searching, Database, Scifinder, Scopus, CA on CD, Locating research article.

**Writing scientific report:** Planning, preparation, draft, revision and refining; writing project proposal to funding agency, Paper writing for International Journals, submitting to editors. Conference presentation, preparation of effective slides and presentation.

**UNIT-II**

**[15 Hours]**

**Data Collection and Analysis:** Sampling Techniques, 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 statistical analysis of Data, Classification of errors, statistical analysis of errors, Curve fitting and Tests of statistical significance.

**Computer Applications in Chemistry Research:** Uses of common software systems for Chemical Structure Drawing, Molecular Modelling and Simulations, Spectroscopic Data Analysis and Data Base Management.

**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, 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, incineration and transportation of hazardous chemicals, Good laboratory practices (GLP).

### UNIT-III

[15 Hours]

**Purification Techniques:** General methods of isolation and purification of chemicals. Solvent extraction, crystallization, fractional crystallization, sublimation, distillation; fractional distillation, distillation under reduced pressure, steam distillation. Drying methods of solvents.

**Separation techniques:** Principle and applications of Thin Layer Chromatography, Column Chromatography, Gas chromatography and High Performance Liquid Chromatography, Hyphenated (MS) Techniques. Supercritical Fluid Extraction and Electrophoresis.

### UNIT-IV

[15 Hours]

**Advanced Techniques of Chemical Analysis:** Applications of UV-Visible, IR, NMR, Mass and ESR spectroscopic methods for the structural determination of compounds. COSY, NOSEY, INDOR and DEPT spectra, Analytical applications of the X-ray diffraction methods (single crystal and powder method), Thermoanalytical methods (TGA, DSC, DTA) and Microscopic methods (SEM, TEM, AFM). Surface Properties (XPS, BET), Cyclic Voltammetry.

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## **Course-2**

### **PHDCHM102: Research and Publication Ethics**

**[30 Hours]**

This course is a mandatory requirement as per the UGC directives. The objective of the course is to help research scholars understand the fundamental relevance of ethical practice in academics, and to provide researchers with an overview of the current and emerging ethical issues in scientific research and publishing. The course will have lectures on ethics in scientific research and will have practice sessions.

#### **COURSE OUTCOMES**

By completion of course the student is able to:

- Understand the ethics in conduct of scientific research.
- Identify research misconduct and predatory publications.
- Understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact factor, etc.).
- Understand the usage of plagiarism tools.

#### **UNIT I**

**[15 Hours]**

##### **Philosophy and Ethics**

**[3 Hours]**

Introduction to Philosophy: Definition, nature and scope, concept, branches. Ethics: Moral philosophy, nature of moral judgments and reactions.

##### **Scientific Conduct**

**[5 Hours]**

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.

##### **Publication Ethics**

**[7 Hours]**

Publication Ethics: Definition, introduction and importance. Best Practices/standards setting initiatives and guidelines: Committee on Publication Ethics (COPE), World Association of Medical Editors (WAME) etc. Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa types. Violation of Publication ethics,

authorship and contributorship. Identification of Publication misconduct, complaints and appeals. Predatory publishers and journals.

**UNIT-II** **[15 Hours]**

**Open Access Publishing** **[4 Hours]**

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 finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

**Publication Misconduct** **[4 Hours]**

**Group Discussions** **[2 Hours]**

Subject specific ethical issues, FFP, authorship. Conflicts of interest.

Complaints and appeals: examples and fraud from India and abroad.

**Software Tools** **[2 Hours]**

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

**Databases and Research Metrics** **[7 Hours]**

**Databases** [4 Hours]

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

**Research Metrics** **[3 Hours]**

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

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### **Course-3**

#### **PHDCHM103: Review of Literature**

**[6 Hours 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.

The content of Review of Literature is based on the research field chosen by the candidate under the direction of the Research Guide. Content of the Review Report shall include the art of research work analysis, related implementation issues and the motivation for the stated research work. The report shall consist of Introduction, Literature Review, Research Gaps, Objectives, Future Work and References.

