

GURU KASHI UNIVERSITY



Doctor of Philosophy

Session: 2025-26

Department of Chemistry

**Faculty of Sciences, Humanities and
Languages**

Program Structure										
Sr. No	Course Code	Course Title	Course Type	L	T	P	Credits	Internal	External	Total Marks
1	PPH101	Research Methodology	Core	4	0	0	4	30	70	100
2	PPH102	Research and Publication Ethics	Core	2	0	0	2	30	70	100
3	PPH125	Current Trends in Chemistry	Core	4	0	0	4	30	70	100
4	PPH104	Computer Applications in Research	Skill Based	0	0	4	2	30	70	100
Total				10	0	4	12	120	280	400

Course Title: Research Methodology**Course Code: PPH101**

L	T	P	Credits
4	0	0	4

Total Hours: 60**Learning Outcomes****On the completion of the course the students will be able to**

1. Formulate research problems by conducting comprehensive literature reviews utilizing web sources
2. Apply appropriate research design choices based on research questions and objectives.
3. Explore the integration of qualitative and quantitative data and the concept of triangulation and complementarity of data sources.
4. Utilize statistical software packages commonly used in research for importing, managing, cleaning, and analyzing data.
5. Apply different statistical techniques to summarize and analyze data effectively.

Course Content**Unit-I****15 Hours****Introduction to Research**

Meaning, Objectives, Characteristics, Significance and Types of Research.

Understanding a Research Problem, Literature Review, Methods and Reporting, Selecting the Research Problem, Steps in Formulation of a Research Problem,

Unit-II**15 Hours****Research Process and Hypothesis**

Constructing Hypotheses; Conceptualizing a Research Design-Meaning and Types of Research Design.

Parametric and Non-Parametric Test, Errors and Level of Significance.

Completely randomized design, Random block design, Latin square design, Statistical analysis.

Components of time series, Analysis of time series, Measurement of trend, Measurement of seasonal variations.

Unit-III**15 Hours****Sampling Design and Data Analysis**

Sampling Techniques-Probability and Non-Probability, Qualities of a good Sample, Sample Size and its Determination. Introduction to Qualitative, Quantitative and Mixed Methods, Quantitative Methods-Univariate, Bivariate and Multivariate, Qualitative Methods-Grounded Theory and Triangulations, Mixed Methods- Convergent Parallel, Explanatory Sequential, Exploratory Sequential and Transformative.

Implementation of statistical techniques using statistical packages viz. SPSS R including evaluation of statistical parameters and data interpretation, Regression Analysis, Covariance, analysis of variance.

Unit-IV

15 Hours

Report Writing

Types of Reports- technical and Popular Reports, Significance of Report Writing, Different Steps in Writing Report, Art of Writing Research Proposals, Research Papers, Projects Reports and Thesis; Basics of Citation and Bibliography/Reference Preparation Styles; Report Presentation: Oral and Poster Presentations of Research Reports.

Suggested Reading

1. Gupta, S. (2010). *Research Methodology and Statistical Techniques*. Deep & Deep Publications (P) Limited, New Delhi.
2. Kothari, C.R., Garg, G. (2019). *Research Methodology: Methods and Techniques*. 4th Edition, New Age International (p) Limited. New Delhi.
3. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in Life Sciences*. Anmol Publications. New Delhi.
4. Kauda J. (2012). *Research Methodology: A Project Guide for University Students*. Samfunds literature Publications.
5. Dharmapalan B. (2012). *Scientific Research Methodology*. Narosa Publishing

Course Title: Research and Publication Ethics**Course Code: PPH102**

L	T	P	Credits
2	0	0	2

Total Hours 30**Learning Outcomes****On the completion of the course the students will be able to**

1. To have awareness about the publication ethics and publication misconducts.
2. To understand indexing and citation databases, open access publications, research metrics (citations, h-index, impact factor etc)
3. Develop hands-on skills to identify research misconduct and predatory publications.

Course Content

- **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** (5 Hrs.)
 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 Suggested, etc.

- **RPE 05: PUBLICATION MISCONDUCT (4 Hrs.)**
 - 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 (7 Hrs.)**
 - 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

Suggested Readings

1. Bird, A. (2006). *Philosophy of Science*. Routledge.
2. MacIntyre, A. (1967) *A Short History of Ethics*. London.
3. P. Chaddah, (2018) *Ethics in Competitive Research: Do not get scooped; do not get plagiarized*, ISBN:978-9387480865
4. 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.
5. Rensik, 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/resources/bioethics/whatis/index.cfm>
6. Beall, J. (2012). *Predatory publishers are corrupting open access*. *Nature*, 489(7415), 179-179. <https://doi.org/10.1038/489179a>

Course Title: Current Trends in Chemistry**Course Code: PPH125**

L	T	P	Credits
4	0	0	4

Total Hours: 60**Learning Outcomes****On the completion of the course the students will be able to**

1. Get deep knowledge into the advanced mechanism and relevant theories required for future research and development.
2. Gain an insight into the recent international practices being followed worldwide.
3. Achieve qualitative and quantitative skills required for academic and research activities.
4. Get prepared for future challenges and to solve the relevant Problems.

s**UNIT-I****15 Hours**

Application of Spectroscopic Studies in Chemical Research Advanced treatment of IR and UV-Visible Spectroscopy; Luminescence Spectral Studies; Mass Spectrometry at advanced level; NMR and ESR Spectrometric application. NMR –¹³C, Chromatography (TLC, PC, Column)

UNIT-II**15 Hours**

Thermal Analysis: Principles, instrumentation and applications of Differential Scanning calorimetric (DSC), Thermo Mechanical Analysis (TMA), Thermo gravimetric Analysis (TGA), Dynamic Mechanical Spectroscopy (DMS), Differential Thermal Analysis (DTA), Thermal Conductivity, Thermal Diffusivity, Effusively

UNIT-III**15 Hours**

Advanced Organic Synthesis: Application of photochemistry and radical chemistry in Organic Synthesis, Pericyclic Reactions, Total synthesis with retro synthetic analysis. Spectroscopy and Asymmetric Synthesis ¹H, ¹³C, ²D & other nuclei, Mass Spectrometry, Asymmetric Synthesis. Emerging greener methodologies: Sonochemistry and green aspects; Microwave in chemical synthesis: Basic principles, advantages and examples; Electrochemical Techniques-Polarography; Cyclic Voltammetry, Impedance measurement, AC Voltammetry, Electrolytic and controlled current methods.

UNIT-IV**15 Hours**

Molecular Weight Determination: - Principles, Instrumentation (basic components) and application of Osmometric Techniques – Vapor Pressure Techniques (VPO), Membrane Osmometric (MO), Differential Refractometer and Light Scattering techniques, Surface analysis-principles, instrumentation and applications of Secondary Ion Mass Spectroscopy (SIMS), X-ray Photoelectron Spectroscopy (XPS).

Suggested Readings

1. Vogel, J.S., Turteltaub, K. W., Finkel, R., & Nelson, D. E. (1995). *Accelerator mass spectrometry. Analytical chemistry.*
2. Kalsi, P. S. (2000). *Organic reactions and their mechanisms. New age international.*
3. Lancaster, M. (2002). *Green Chemistry: An Introductory Text. Royal Society of Chemistry.*
4. Silverstein, R.M. and Webster F.X. (2003). *Spectroscopic Identification of organic compounds, 6th Edition. John Wiley, New York.*
5. Sharma, Y. R. (2007). *Elementary organic spectroscopy. S. Chand Publishing.*
6. Hollas, J.M. (2004). *Modern Spectroscopy. 4th Edition. John Wiley and Sons, Chichester.*
7. Warren, S., & Wyatt, P. (2008). *Organic synthesis: the disconnection approach. John Wiley & Sons.*
8. Bard, A.J. and Faulkner, L.R. 2001, *Electrochemical Methods: Fundamentals and Applications; 2nd Edition. John Wiley & Sons, New York.*

Course Title: Computer Applications in Research**Course Code: PPH104**

L	T	P	Credits
0	0	4	2

Total Hours 30**Learning Outcomes****On the completion of the course the students will be able to**

1. The students will become familiar with the usage of software for managing the reference.
2. To make literature reviews easily.
3. To make reference management by using open software.

Couse Content**Unit-I****06 Hours**

MS Word Essentials- Create a document with styled headings and subheadings, Add headers, footers, and page numbers, Adjust page layout settings (margins, orientation, page size).

Table Creation and Management- Insert, format, and style tables, Adjust cell size, merge/split cells, and sort/filter data.

Working with Graphics- Insert and format images, shapes, SmartArt, and text boxes, Apply text wrapping around objects.

Unit-II**08 Hours**

Basics of PowerPoint- Slide layouts, themes, and templates, Adding multimedia: Images, audio, and videos.

Advanced Techniques- Animations and transitions for visual effects, Slide master for consistent formatting, Interactive elements: Hyperlinks and action buttons.

Design Best Practices- Typography, color schemes, and visual hierarchy, Tips for engaging presentations.

Unit-III**08 Hours**

Introduction to Mendeley- Installing and setting up Mendeley Desktop and Web, Importing references from various sources.

Organizing References- Creating folders and tagging references, Annotating and highlighting PDFs.

Citations and Bibliography- Integrating Mendeley with MS Word, using citation styles (APA, MLA, Chicago), Generating a bibliography automatically.

Unit-IV**08 Hours**

AI Tools for Productivity- Text-Based AI Tools (e.g., ChatGPT) Writing assistance, summarization, and brainstorming, Grammar and style checking, Image and Design Tools, Speech and Audio Tools

Suggested Readings

1. *Office 2007 in Simple Steps*, Kogent Solutions, (Wiley Publishers).
2. *MS-Office 2007 Training Guide*, S. Jain (BPB Publications).
3. *Computer Fundamentals* by P.K. Sinha (BPB Publications).
4. <https://www.mendeley.com/reference-management/reference-manager>
5. <https://chat.openai.com>
6. <https://edu.google.com/workspace-for-education/classroom/>