

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE-15)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/Practice		
RESEARCH METHODOLOGY IN POLYMER SCIENCE	4	3	0	1	Class 12th with Physics, Chemistry	---

Learning objectives

- To understand some basic concepts of research and its methodologies
- To learn research problem and parameters
- To learn about preparation a project proposal
- To study components of research paper, report and thesis

Learning outcomes

After studying this paper, students will be able to

- Select a particular research method.
- Apply research skills in qualitative and quantitative data analysis and presentation.
- Write the research paper, project and thesis with advanced critical thinking skills.

SYLLABUS OF DSE-15

THEORY COMPONENT

UNIT 1: **(10 Hours)**

RESEARCH METHODS

Identification and selection of the research problem, Literature survey for required information, Search engines (Scopus, Science direct, Web of science, Google scholar) for scientific information, Encyclopaedia, Reference books, abstraction of a research paper – drawing inferences from data, - qualitative and quantitative analysis, Reference, Management Software like Zotero/Mendeley, Software for paper writing and formatting like chem draw, origin,

LaTeX and MS Office. Developing a research plan, Format of research proposal: individual research proposal and institutional proposal.

UNIT 2: (10 Hours)

Research TOOLS, Paper and report writing

Correct usage of technical language and scientific peer network, ethics with respect to science and research, intellectual honesty and research integrity, scientific misconduct: falsification, fabrication and plagiarism (FFP), redundant publications: duplicate and overlapping publication, salami slicing, selective reporting and misrepresentation of data. Thesis and Paper writing, General format, page and chapter formation. Analysis and presentation of data, Statistical test: choosing and using suitable statistical tests. The use of quotation - footnotes - tables and figures - referencing - appendices - revising the paper or thesis - editing and evaluating and the final product - proof reading - the final types copy.

Thesis and Paper writing: Format of thesis- title, abstract, introduction, objectives, methods, results, tables, figures, graphs, discussion, summary, acknowledgement, in-text citations, reference list, and appendix. Presentation skill, them of conferences and workshops - Oral presentation skills – Post presentation of research outcome, Abstracts, Proceedings of technical deliberation - Publication in journals, conference proceedings and in book or as book chapters.

Research article & Research Proposals

Components of research article - Title, abstract, key words, introduction, citations, introduction, objectives, methods, results, tables figures, graphs, discussion summary, and references. Instruction to authors by journal for writing a research paper. Components of proposal document- Title, aim, research background, project outline, research methodology & budgeting, time schedule, deliverables and references.

UNIT 3: (15 Hours)

PUBLICATION ETHICS

Publication ethics: definition, introduction and importance, Best practices / standard setting initiatives and guidelines COPE (Committee on publication ethics), conflicts of interest, publication misconduct: definition, concept, problems that lead to unethical, behaviour and vice-versa, types, violation of publication ethics, authorship and contributor ship, identification of publication misconduct, complaints and appeals, predatory publishers and journals. Software for detection of Plagiarism determining the mode of action, literature survey, mode of approach of actual investigation.

- Literature survey (scopus, sciencedirect, elsevier, scifinder etc.)
- Report writing
- Reference writing using softwares like Endnote, Mendley etc.
- Drawing of chemical structures using software like chem draw etc.
- Poster making
- Paper writing
- Graphical representation using excel, origin etc.

ESSENTIAL/RECOMMENDED READINGS

- Kothari, C. K. Garg, G.(2018) Research Methodology: Methods and Techniques, New Age International, 4th Edition,
- Rajaraman V., (2008) Computer Oriented Numerical Methods, Prentice Hall of India.
- Jain M. K., Iyengar S. R. K. and Jain R.K., (2007) Numerical Methods for Scientific and Engineering Computation, New Age International.

SUGGESTIVE READINGS

- Bhattacharya D. K., (2009) Research Methodology, Excel Books India.
- Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., (2002) An introduction to Research Methodology, RBSA Publishers.
- Kothari, C.R., (1990) Research Methodology: Methods and Techniques. New Age International. 418p.
- Sinha, S.C. and Dhiman, A.K., (2002). Research Methodology, Ess Ess Publications. 2 volumes.
- Trochim, W.M.K., (2005). Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.
- Wadehra, B.L., (2000). Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.