

**School of Computer and Systems Sciences
Jawaharlal Nehru University
New Delhi-110067**

Doctor of Philosophy (Ph.D.)

Revised PhD Course Structure & Syllabus for students who shall be admitted from the academic year 2022-23 onwards

- School of Computer & Systems Sciences offers Ph.D programme within the broad ambit of Computer Science / Microsystems.
- The candidates who would join the programme are required to complete the course work of minimum 12 credits by the end of the first semester and/or the second semester.
- Two compulsory courses related to research methodology namely “Research Methodology” and “Research and Publication Ethics” have been prescribed. The compulsory courses “Research Review” and “Research Seminar” are prescribed as advanced level courses preparing the students for Ph.D. degree.
- The objective of the course ‘Research Methodology’ is to develop a research orientation by acquainting the student with basics of research methods. The course would develop understanding of the research process, research designs and techniques.
- The objective of the “Research and Publication Ethics” course is to create awareness about the publication ethics and publication misconducts. The course would focus on basics of philosophy of science and ethics, research integrity and publication ethics. This may be jointly taught by faculty members of the School.
- The objective of “Research Review” course is to train the scholars to refine their skills of research, searching published scholarly articles and information in the relevant field, reviewing literature, assisting in writing research proposal/papers. This course would be evaluated by the research advisory committee of the concerned student.
- The course “Research Seminar” would involve reading of recent research papers in the area of their research interest and presenting them to enhance their teaching and research skills.
- Students is required to opt for a specialized course, as elective “Elective-I”, related to the area of their research interest, during the first semester or the second semester, as recommended by the concerned supervisor. This course can be opted from the list of courses offered to the students of M.Tech. (Computer Science & Technology) / M.Tech. (Data Science) programme in the respective semester.
- Students may opt for additional courses, as non-credit, related to the area of their research interest, during the first semester and/or the second semester, as recommended by the concerned supervisor. These courses can be opted from the list of courses offered to the students of M.Tech. (Computer Science & Technology) / M.Tech. (Data Science) programme in the respective semesters.
- The Ph.D student should obtain minimum required CGPA, as prescribed by the academic ordinance of the University, to continue in the Ph.D. programme.

Course Structure

S.No.	Course Name		Credits	Semester
1.	Research Methodology CS-791	Core	3	Semester-I
2.	Research and Publication Ethics CS-792	Core	2	Semester-I
3.	Research Review CS-793	Core	2	Semester-I
4.	Research Seminar CS-794	Core	2	Semester-I
5.	Elective-I	Elective	3	Semester-I OR Semester-II

Course Syllabus

1. Research Methodology

Fundamentals of research, role and objectives of research, types of research, research process, meaning of methodology, problems and hypothesis, verification versus falsification, objectivity in research: Facts, theory and concepts, Steps involved in research, formulation of research problem, experimental and non-experimental research design, data collection, analysis and hypothesis, quantitative methods for data analysis - statistical and numerical methods, performance analysis, technical writing and reporting of research.

Suggested Readings:

1. Michael P. Marder, Research Methods for Science, Cambridge University Press, 2011.
2. C. Radhakrishna Rao, Statistics and Truth, CSIR, 1989.
3. Sheldon M Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, 2010.
4. Day RA, How To Write and Publish a Scientific Paper, Cambridge University Press, London, 1992.
5. Latour, B. and Woolgar., Laboratory Life: The Construction of Scientific Facts, 2nd Edition, Princeton: Princeton University Press, 1986

2. Research and Publication Ethics

The course would focus on basics of philosophy of science and ethics, research integrity and publication ethics. The course would involve teaching philosophy of ethics, scientific conduct, publication ethics, open access publishing, publication misconduct and software tools for plagiarism. Indexing and citation databases, open access publications, research metrics (citations, h-index, impact factor etc) and plagiarism tools would be introduced in this course. This course would be jointly evaluated by the faculty members teaching the course.

Suggested Readings:

1. Bird, A. (2006). Philosophy of Science, Routledge (ISBN 9781857285048)
2. MacIntyre, A. (1998). A Short History of Ethics: A History of Moral Philosophy from the Homeric Age to the Twentieth Century, Second Edition. Routledge (ISBN: 978-0268017590).
3. Chaddah, P. (2018). Ethics in Competitive Research: Do not get scooped; do not get plagiarized, (ISBN: 978-9387480865)
4. Committee on Science, Engineering, and Public Policy; 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 (ISBN: 978-0-309-11970-2)
5. Resnik, D. B. (2015). What is ethics in research and why is it important? National Institutes of Health. <https://www.niehs.nih.gov/research/resources/bioethics/whatis>
6. Beall, J. (2012). Predatory publishers are corrupting open access. Nature 489, 179-179. <https://doi.org/10.1038/489179a>
7. Muralidhar, K., Ghosh, A., Sanghvi, A.K. (2019). Ethics in Science Education, Research and Governance. Indian National Science Academy. (ISBN: 978-81-939482-1-7)

3. Research Review

This course is an advanced level course preparing the students for their Ph.D. degree. This course would involve searching published scholarly articles and information in the relevant field, reviewing literature, assisting in writing research proposal/papers. Further in this course, the student would review research in the area related to PhD under the guidance of the concerned supervisor. This course would be evaluated by the research advisory committee of the concerned student.

4. Research Seminar

This course is an advanced level course preparing the students for their Ph.D. degree. Students should read the recent research papers in the area of their research interest. As part of the course, the students are required to prepare the research seminar report and present it before the seminar evaluation committee. This course would be evaluated by the seminar evaluation committee.

5. Elective-I

Elective course Elective-I can be opted during the first semester or the second semester, as recommended by the concerned supervisor, from the list of courses offered to the students of M.Tech. (Computer Science and Technology) / M.Tech. (Data Science) programme in the respective semester.