



RESEARCH METHODOLOGY IN NATURAL SCIENCE

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INTENDED AUDIENCE :

This is a compulsory course for all PhD students as mandated by UGC. Bachelor's and Master's students interested in pursuing a research career may also take it. The course content is suitable for students of all disciplines of basic science, medical science and engineering.

COURSE OUTLINE :

The course covers all the conceptual and methodological issues that go into successful conduction of research. That includes philosophy of science, the methodological issues in measurement, proposing and testing hypotheses, scientific communication and the ethical issues in the practice of science.

ABOUT INSTRUCTOR :

Prof. Soumitro Banerjee did his B.E. from the Bengal Engineering College (Calcutta University) in 1981, M.Tech. from IIT Delhi in 1983, and Ph.D. from the same Institute in 1987. He was in the faculty of the Indian Institute of Technology, Kharagpur, since 1986, and moved to the Indian Institute of Science Education & Research, Kolkata, in 2009. Dr. Banerjee's area of research interest is nonlinear dynamics. He has published four books: "Nonlinear Phenomena in Power Electronics" (Ed: Banerjee and Verghese, IEEE Press, 2001), "Dynamics for Engineers" (Wiley, London, 2005), "Wind Electrical Systems" (Oxford University Press, New Delhi, 2005), and "Research Methodology in Natural Sciences" (IISc Press, 2022). He is a recipient of the S. S. Bhatnagar Prize (2003), and was recognized as a "Highly Cited Author" by Thomson Reuters from 2004 to 2014. He is a Fellow of the Indian Academy of Sciences, the Indian National Academy of Engineering, the Indian National Science Academy, The World Academy of Sciences, and the IEEE.

COURSE PLAN :

- Week 1:** Philosophy of Science (subjective versus objective, materialism versus idealism, causality, etc.)
- Week 2:** Logical Reasoning (inductive logic, deductive logic, syllogistic logic)
- Week 3:** History of development of science and the influence of philosophy
- Week 4:** What Scientists Actually Do
- Week 5:** Forming a Hypothesis
- Week 6:** Techniques of Scientific Measurement
- Week 7:** Testing of hypothesis
- Week 8:** Methods of Theoretical Research
- Week 9:** The Art of Scientific Communication
- Week 10:** Presentation in Seminars and Conferences
- Week 11:** Sponsored Research
- Week 12:** Ethical Conduct in Science