

Master of Education (M.Ed.)

Title of the Course: S.Sc.6 (e): Philosophical and Historical Perspectives in Science

(Semester: I, II, III, & IV)

Credits: 4

MM: 100 (External: 70 Internal: 30)

Contact Week 15

Introduction of the Course

This course aims to develop an understanding of the philosophical and historical aspects of science. How science and its process has been understood. What are the epistemological underpinnings in scientific endeavour. How philosophy and history of science can enhance science education. The course would also focus on episodes from history of science, which would highlight the struggles and debates involved in development of science. It will expose students to a selection of writings (and films/videos) by philosophers, historians, sociologists and scientists, to see how ideas have developed, through contestations or collaborations, shaped by social, historical, political and cultural influences. It will help students appreciate how the process of scientific research cannot always be well defined. It also looks upon the processes of science and technology and their relationship with society and the environment.

Learning Outcomes

After completion of the course student will be able to:


1. Appreciate epistemological basis and underpinnings of science
2. Understand what happens to the structure of a scientific theory when conceptual change takes place
3. Develop understanding about the nature of history and how it can help in understanding the nature of science.
4. How did technicians and craftspeople shape modern science?
5. What is the process of science? Is there a 'scientific method'?
6. How have social, historical, political and cultural influences shaped scientists' work?
7. Major debates and paradigm shifts in science

Number of Units (4)

Weeks 15 = 60 hours

Unit 1: Philosophical Perspective

(4 weeks = 16 hours)


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- What is Science? -epistemological underpinning
- How do philosophies of science affect the Nature of Science?

Unit 2: Historical Perspective

(4 weeks = 16 hours)

- Histories of science that shaped ideas about humans
- How social, political, historical and cultural influences shaped scientists' work?
- What is technology? How did technicians and craftspeople shape modern science?

Unit 3: The Process of Science

(4 weeks = 16 hours)

- Is there a scientific Method?
- Doing Science : autobiographical and biographical writings of scientists
- What is the process of science?

Unit 4: Developing Critical Perspective

(3 weeks = 12 hours)

- Major debates in Science
- Paradigm Shifts

Practicum/ Suggested Projects / Assignments (Any Two)

1. Critically analyse on the method/s of scientific discoveries
2. Review and reflect on philosophical and historical perspectives in science
3. Write a reflective essay on your initiation into science

Note: On the basis of the above, the teacher may design his/her own relevant projects/ assignments.

Essential/ Recommended Readings

- Boudanis, D. (2000) E=mc²: A biography of the world's most famous equation. Pan Books. p11-54,195-203 (on Chandrasekhar).
- Film available at:
Part I :<https://www.youtube.com/watch?v=jqiRoKy0Gyo>
Part II :<https://www.youtube.com/watch?v=jbmFcGhTnS0>
- Bronowski, J. (1981). The Ascent of Man. London: Macdonald Futura Publishers. Chapters VI, VII, VIII, X, XII and the film series on DVD
- Carey, J. Ed. (2003) The Faber Book of Science. Penguin Books India and Faber & Faber, Delhi-1100. Selections('The colour of radium', Eve Curie (p. 191-201); 'The secret of the mosquito's

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stomach', Ronald Ross (204-210); 'The man who mistook his wife for a hat', Oliver Sacks (p. 460-466); 'The story of a carbon atom', Primo Levi (p 338-344); 'The discovery of X-rays', W. Roentgen and others (p 181-187))

- Chalmers A. F. (2013). What is this thing called science (4th ed.). University of Queensland Press.
- Conner, C. (2005) A People's History of Science: Miners, Midwives and 'Low Mechanicks'. p 1-22, 276-294. Nation Books, New York.
- Derry, G.N. (1999). What Science is and How it Works. Princeton, New Jersey: Princeton University Press. Chapters I-VIII
- Feynman, R. (1999) The Pleasure of Finding Things Out. Penguin, London. p 1-25, 53-96, 141-149, 171-188.
- Interview video at <https://www.youtube.com/watch?v=FXiOg5-13fk>;
- Gould, S.J. (1964). The Mismeasure of Man. New York: W.W. Norton. Chapter V; 'Ladders and Cones: Constraining evolution by canonical icons'. In Silvers, R.B. (1997) (Ed.)
- Hidden Histories of Science. Granta, London, (p 40-67)
- Hacking, I. (1983). Representing and intervening: Introductory topics in the philosophy of natural science. Cambridge university press.
- Harré, R. (2002). Great scientific experiments: Twenty experiments that changed our view of the world. Courier Corporation.
- Hellman, H. (1998) Great Feuds in Science: Ten of the liveliest disputes ever. John Wiley & Sons. ('Urban VIII vs Galileo' p.1-20; 'Evolution Wars' p. 81-103; 'Wegener vs Everybody' p. 141-158)
- Kuhn, T. (1964). The Structure of Scientific Revolutions. University of Chicago Press. Chapters IV, VI, VII, VIII, IX, X
- Mathews, M. R. (2015). Science Teaching,
- Miller, J. Going Unconscious. In R.B. Silvers, R.B. (1997) (ed.) Hidden Histories of Science. Granta, London, (p 1-34)
- Ramachandran, V.S. (2010) The Tell-Tale Brain. Random House India, (p163-212)
- Ronan, C. A. (1983). The Cambridge illustrated history of the world's science.
- Suppe, F. (Ed.). (1977). The structure of scientific theories (Vol. 634, No. 8). University of Illinois Press.
- BBC Documentary The Voyage of Charles Darwin (Parts 1-7)
- Part I : <https://www.youtube.com/watch?v=1hoDaxVIVPE>
- Part VI & VII <https://www.youtube.com/watch?v=zXY-EWZU5qo>

- Okasha, S., (2016), *Philosophy of Science: Very Short Introduction*, 2nd edn, Very Short Introductions, Oxford Academic
- Johnsen, H. C. G. (2023). *Science Meets Philosophy What makes Science divided but still significant*. London: Routledge.
- Sarukai, S. (2018). *What is Science?* National Book Trust, India.
- Lavine, T. Z. (1894). *From Socrates to Sartre: The Philosophic Quest*. USA: Banta Book.
- Popper, K. (2021). *The Logic of Scientific Discovery*. London: Routledge.

Additional Readings

- Idhe, A.J. (1984), *The Development of Modern Chemistry*. Dover, New York. Jaimie Wisniak (2004), *Phlogiston: the rise and fall of a theory*, *Indian Journal of Chemical Technology*
- Holton, G. J. and Brush S. G. (2001). *Physics- A human Adventure*. 3rd Ed. Rutgers University Press, New Brunswick.
- Collins, H. and Pinch, T. (2002). *The Golem: What you should know about science*. Cambridge University Press, Cambridge, UK.
- Brockway, L. (1979), *Science and colonial expansion, the role of the British Botanical Gardens*. *American Ethnologist*, 6(3), *Interdisciplinary Anthropology*. Sir Albert Howard (1940). *An Agricultural Testament*, London.

Teaching Learning Process

The course will be taught through interactive pedagogic methods such as classroom discussion, debates, film discussions, critical media analysis, collaborative learning tasks which enhance reading comprehension of core writings in the area and innovative projects. Reflective expression and learning will be encouraged.

Assessment Method

The assessment will be formative in nature and will factor in student participation. Individual and group tasks and assignments will be given. Summative evaluation will be done through end-semester examination.

Key words: Nature of science, Historical, Perspective, Critical.