

## Master of Education (M.Ed.)

### Title of the Course: S.Sc. 1(e) Introduction to Science Studies (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 relationship of science and technology with society and the environment. It looks at the emergence of modern science in India, influenced by colonialism and the national struggle for independence; the role of citizen science and people's science movements for social transformation. The course addresses issues of equity and diversity, through feminist and multicultural perspectives that allow a relook at the discipline as well as its reflection in the school curriculum.

This course can be of interest to any M.Ed. I year student (having a basic background in school science) wishing to understand the field from a historical, sociological, cross-cultural, and interdisciplinary perspective.

#### Learning Outcomes

After completion of the course student will be able to:

1. Critically analyse the emergence of modern science and technology in India
2. Appreciate the role of citizen science with its varied and competing perspectives
3. Relook at the discipline as it was institutionalised and the debates which emerged and its reflection on school curriculum
4. Critically look at the discipline from feminist and multicultural perspective in the light of equity, diversity and accessibility
5. Understanding the role of science in nurturing democratic values

Number of Units: 3

Weeks 15 = 60 hours

Unit 1: Development of Modern Science in India

(5 weeks = 20 hours)

- Everyday technology in the making of modern India
- Colonialism and nationalist science
- Impact of major developments in science and technology on society (eg. Green Revolution, White Revolution etc.)
- The role of 'scientific temper'
- People Science Movements for social transformations
- Science and warfare: concerns about social responsibility



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**Unit 2: Institutionalisation and Professionalization of Science** (5 weeks = 20 hours)

- Institutionalisation of Natural Philosophy
- Professionalisation of science after Industrial revolution
- Distancing 'pure, academic science' from technology
- Socio-Scientific issues and dilemma
- New modes of knowledge production;
- Organisation and Collectivization;
- Intellectual Property vs Knowledge Commons

**Unit 3: Democratising Science and its Education** (5 weeks = 20 hours)

- Multicultural science as socially and culturally constructed
- Feminist perspectives
- Humanist science: respect and responsibility
- Role of Traditional Ecological Knowledge (TEK) about relationships between living beings and the environment
- Critical review of educational dichotomies and hierarchies – knowledge and skill, academic and vocational, 'pure' and applied; historical dominance of the 'academic' school curriculum over 'science of the common things'
- Critical reading of international debates on the aims of school science; place-based science education, implications for equity and justice

**Practicum/ Suggested Projects / Assignments (Any Two)**

1. Case study on any one of the socio-scientific issues such as Green Revolution, Traditional Ecological Knowledge etc.
2. Critically review any one scientific debate
3. Write a reflective essay on democratising science education

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

**Essential/ Recommended Readings**

- Aikenhead, G.S. and Solomon, J. (Eds.) (1994) STS Education: International Perspectives on Reform. New York: Teachers College Press. Chapter II
- Aikenhead, G.S. (2006) Science Education for Everyday Life. Teachers College Press.



- Chapters II, III, VII 1-23, 107-127
- Chakrabarti, P. (2010) 'Science and Swadeshi: The Establishment and Growth of the Bengal Chemical & Pharmaceutical Works', in Uma Das Gupta (ed), Science and Modern India: An Institutional History c.1784-1947, Pearson Education, New Delhi.
- Shiva, V. (1993) The Violence of the Green Revolution. Third World Network.
- <http://www.trabal.org/courses/pdf/greenrev.pdf>
- Making Peace with the Earth (2010) Sydney Peace Foundation Lecture
- [http://sydneypeacefoundation.org.au/wp-content/uploads/2012/02/2010-SPP\\_Vandana-Shiva1.pdf](http://sydneypeacefoundation.org.au/wp-content/uploads/2012/02/2010-SPP_Vandana-Shiva1.pdf)
- Arnold, D. (2013) Everyday Technology: Machines and the Making of India's Modernity. University of Chicago Press. Chapters III and V.
- Bhargava, P. M. and Chakrabarti, C. (2010) Angels, Devil and Science: A Collection of Articles on Scientific Temper, National Book Trust, New Delhi, India.
- Mahanti, S. (2013) A Perspective on Scientific Temper in India, Journal of Scientific Temper, Vol 1, 1 & 2, 46-62
- Varma, R. (2001) People's Science Movements and Science Wars? Economic and Political Weekly, Dec 29. p4796-4802
- Alexis de Greiff A. and Olarte, M.N. (2006) What we still do not know about South-North technoscience exchange. In R.E. Doel and T. Soderqvist (Eds) The Historiography of Contemporary Science, Technology and Medicine. Routledge, New York p.239-50
- Ziman, J. (2000) Real Science: What it is, and what it means? Cambridge University Press. (pages 12-74)
- Kourany, J. (2010) Philosophy of Science after Feminism. Oxford University Press. p3-20
- Maddox, B. (2002) Rosalind Franklin: The Dark Lady of DNA. Harper Collins, London. p165-213.
- Lee, O. and Buxton, C. (2010) Diversity and Equity in Science Education. Teachers College Press. p23-35 (chapter 2- Conceptual grounding and policy context)
- Hodson, D. (1988). 'Science curriculum change in Victorian England: A Case Study of the Science of Common Things.' In International Perspectives in Curriculum History. London, Routledge
- Rampal, Anita, & Mander, H. (2013) Lessons on Food and Hunger: Pedagogy of Empathy for Democracy. Economic & Political Weekly, 48(28), 51-57.
- Slaton, A. And Calabrese Barton, A. (2011) 'Respect and Learning'. In B. Fraser, K.G. Tobin and C.J. McRobbie, (Eds.) The Second International Handbook of Science Education, Springer. p513-526

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- Kawalkar, A. (2017). Creating a Culture of Scientific Inquiry in the classroom. In TISS (2017). Reflective Teaching with ICT. Tata Institute of Social Science.
- Dhakulkar, A. (2017). Science Education in the Information and Communication Technology Era. In TISS (2017). Reflective Teaching with ICT. Tata Institute of Social Science.
- Shiva, V. and Jalees, K. (2007). Roti Kapda aur Makaan. Navdanya Publisher.
- Chaudhari, P. (2022). Reviving Science Education. In Chaudhari, P. (Ed.). Teaching Learning Resource for Science Teacher.
- Feynman, R. P. (1988). QED: The Strange Theory of Light and Matter. Princeton University Press.
- Watts, M. (2013). Debates in Science Education. Routledge.
- Wallace, J., & Loudon, W. (2002). Dilemmas of Science Teaching: Perspectives on Problems of Practice. Routledge.

### 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:** Science Education, Democratization, Modern Science



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