

Master of Education (M.Ed.)

**Title of the Course: S.Sc.5 (e): Introduction to STEM Education
(Semester: I, II, III & IV)**

Credits: 4

MM: 100 (External: 70 Internal: 30)

Contact Week 15

Introduction of the Course

This course aims to introduce Science, Technology, Engineering and Mathematics education to learners tracing its evolution from past till present. It will try to critically look at the socio-economic and political needs leading to viewing these disciplines in an integrated manner. The ways in which policies are evolving on the global landscape, leading to innovative curricula using emerging technologies. Amidst this gamut of advancement the course will also shed light on the basic issue of equity and access.

Learning Outcomes

After completion of the course student will be able to:

1. appreciate the journey of Science to STEM
2. critically analyse the socio-economic and political influences
3. analyse policies, curricula and teacher preparation initiatives of various developed and developing nations of the world
4. critically analyse the challenges of education such as access and equity in this changing landscape

Number of Units (Unit 4)

Weeks 15 = 60 hours

Unit 1: Evolution of STEM


(4 weeks = 16 hours)

- Tracing the idea of 'Integration' historically
- Epistemological perspective of 'Integration' of disciplines
- STEM: Dimensions and Extensions

Unit 2: Policy Perspective

(4 weeks = 16 hours)

- International Policies on STEM
- Idea of Integration of Disciplines :Policy outlook in India from past till present
- NEP 2020: Vision and Initiatives


Head/Dean
विभागाध्यक्ष एवं संकाय अध्यक्ष
शिक्षा विभाग/Deptt. of Education
दिल्ली विश्वविद्यालय, दिल्ली-110007
University of Delhi, Delhi-110007

Unit 3: Curriculum in STEM

(4 weeks = 16 hours)

- Approaches to curriculum construction
- Nature and structure of Courses
- Teaching and Learning- philosophical underpinnings, frameworks, strategies and resources and assessment practices
- Equity and Access

Unit 4: Teacher Preparation and STEM

(3 weeks = 12 hours)

- Programme Structures and Curriculum Frameworks
- Pre-service and In-service Teacher Education
- Professional Development of Teachers : Experiences and Challenges

Practicum/ Suggested Projects / Assignments (Any Two)

1. Critically analyse the policy initiatives on STEM of any one country.
2. Visit Atal Tinkering Lab and analyse any one project taken up by learners through its full journey from inception of idea to completion.

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

Essential/ Recommended Readings

- Aikenhead, G.S., & Solomon, J. (Eds.) (1994) STS Education: International Perspectives on Reform. New York: Teachers College Press.
- Bunch, B. (2021). STEM Chronology: The History of Science, Technology, Engineering, and Mathematics. United States: Bryan Bunch Books.
- Chesky, N. Z., Wolfmeyer, M. R. (2015). Philosophy of STEM Education: A Critical Investigation. United Kingdom: Palgrave Macmillan.

- Critical Questions in STEM Education. (2020). Germany: Springer International Publishing.
- Dare, E. A., Ellis, J. A., & Roehrig, G. H. (2018). Understanding science teachers' implementations of integrated STEM curricular units through a phenomenological multiple case study. *International journal of STEM education*, 5, 1-19.
- Department of Education, Australia (2015). National STEM School Education Strategy 2016-2026.
- Erasmus & European Commission for Innovation, Research, Culture, Education and Youth (2015). EU STEM Coalition. <https://www.stemcoalition.eu/>
- Government of India (2005). National Curriculum Framework. <https://ncert.nic.in/pdf/nc-framework/nf2005-english.pdf>
- Government of India (2009). Report of 'The Committee to Advise on Renovation and Rejuvenation of Higher Education'
[dfsdgfhg Report of 'The Committee to Advise on Renovation and Rejuvenation of Higher Education'](#)
- Government of India (2013). Science, Technology & Innovation Policy 2013. <https://dst.gov.in/st-system-india/science-and-technology-policy-2013>
- Government of India (2020). National Education Policy. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Government of India (2023). National Curriculum Framework for School Education. <https://dsei.education.gov.in/sites/default/files/NCF2023.pdf>
- Integrated Approaches to STEM Education: An International Perspective. (2020). Germany: Springer International Publishing.
- Kelley, T. R., & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. *International Journal of STEM education*, 3, 1-11.
- Marginson, S., Tytler, R., Freeman, B., & Roberts, K. (2013). STEM: Country comparisons. International comparisons of science, technology, engineering and mathematics (STEM) education: Final report. Australian Council of Learned Academies (ACOLA).
- Ministry of Education People's Republic of China, Beijing Normal University, & Beijing World Education and Information Technology Research Institute. (2017). China STEAM development report. Beijing Normal University.

- Ministry of Education Malaysia. (2013). Malaysia education blueprint 2013–2025. (Preschool to post-secondary education). Kementerian Pendidikan Malaysia.
- National Academies of Sciences (2005). Rising above the gathering storm: Energizing and employing America for a brighter economic future. National Academies Press.
- National Research Council (2014). STEM integration in K-12 education: Status, prospects, and an agenda for research. National Academies Press.
- Office Of Science And Technology Policy (2019) Progress Report On The Federal Implementation Of The Stem Education Strategic Plan
<https://www.ed.gov/sites/default/files/documents/stem/2019-stem-progress-report.pdf>
- Reinholz, D. L., & Andrews, T. C. (2020). Change theory and theory of change: what's the difference anyway?. *International Journal of STEM Education*, 7(1), 1-12.
- STEM Education: An Emerging Field of Inquiry. (2018). Netherlands: Brill.
- STEM Education 2.0: Myths and Truths – What Has K-12 STEM Education Research Taught Us?. (2019). Netherlands: Brill.
- STEM Road Map: A Framework for Integrated STEM Education. (2015). United Kingdom: Taylor & Francis.
- The Age of STEM: Educational Policy and Practice Across the World in Science, Technology, Engineering and Mathematics. (2014). United Kingdom: Taylor & Francis.


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, Technology, Engineering and Mathematics, STEM


Head/Dean

विभागाध्यक्ष एवं संकाय अध्यक्ष
शिक्षा विभाग/Deptt. of Education
दिल्ली विश्वविद्यालय, वि. सं-110007
University of Delhi, Delhi-110007