

## DISCIPLINE SPECIFIC ELECTIVE COURSE – 1B (DSE 1B): SCIENCE EDUCATION

### Credit distribution, Eligibility and Prerequisites of the Course

| Course title & Code           | Credits | Credit distribution of the course |          |                     | Eligibility criteria                  | Pre-requisite of the course (if any) |
|-------------------------------|---------|-----------------------------------|----------|---------------------|---------------------------------------|--------------------------------------|
|                               |         | Lecture                           | Tutorial | Practical/ practice |                                       |                                      |
| Science Education<br>DSE – 1B | 4       | 3                                 | 1        | 0                   | Completed 4 core courses in education | NIL                                  |

### Learning Objectives

The Learning Objectives of this course are as follows:

- Develop an insight of the Nature and History of Science.
- Know and comprehend Indian contribution to the world of Science in both Ancient and Modern times.
- Elaborate and summarize the development of science in the international perspective.
- Develop comprehension of science and scientists in India, including its institutions, research, and development.
- Identify and explore potential learning resources in the area of science including indigenous knowledge and traditional ecological knowledge.
- Analyze the nature of learning and assessment in the area of science.

### Learning outcomes

On completion of this course, learners will be able to:

- Explain the Nature and History of Science and summarize the development of Science in the International Perspective
- Learn and appreciate Indian Contribution to the world of Science in both Ancient and Modern times
- Critically examine potential learning resources in the area of science including indigenous knowledge and traditional ecological knowledge
- Critically evaluate the Nature of learning and assessment in the area of science

### SYLLABUS OF DSE 1B

**45 Hours**

#### Unit I: Nature and History of Science (15 hours)

- Scientific Inquiry: Tentative and Revisionary Nature of Science
- Place of Science Education in Indian School Curriculum
- Science for Sustainable Development - Role of Indian Cultural Heritage and Indigenous Knowledge Systems
- Contribution of Indian Thoughts and thinkers in the Domain of Scientific Knowledge like Baudhayan Sulbha-Sutra, Aryabhat and Aryabhatika, Varahmihira and his Panchsidhant, Sushrut, Ayurveda, Yoga etc.

- Ancient Indian Classification of Animals, Measurement of Distance and Time
- Development of Science in International Perspective

## Unit 2: Practice of Science

(15 hours)

- Criteria for selecting/designing Learning Resources in Science
- Improvisations and Science Kits
- Science in Everyday Practices
- Present and Past Institutions of Research & Development of Science and Technology in India including Taxshila and Nalanda Vishvavidyalaya
- Role of activities like science quiz, science fair, science corner/resource room, science club, excursion and related SUPW in learning science
- Some Eminent Indian Scientists like Sir J. C. Bose, Ramanujan, Meghnad Saha, Sir C.V. Raman, Janaki Ammal

## Unit 3: Science Learning: Resources and Assessment (15 hours)

- Potential of Traditional Ecological Knowledge as local learning resource in Different States in India
- Role of Textbooks, reference books, encyclopaedia, newspapers etc. in dissemination of science
- Learning science through multi-media packages, interactive software, websites, Open Education Resources (OER) etc.
- Role and limitations of Science Laboratories
- Assessment in Science, Assessment of laboratory work and project work, Assessment through creative expression-drawing, posters, drama, poetry, etc
- Nature of learning and assessment, analysis and critique of the present pattern of examinations.

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

- Observe and document the traditional ecological knowledge available around you
- Engage in self-reflection and document the role of different learning resources in your learning of Science
- Interview five elderly of your community to explore the Traditional Ecological Knowledge available through their life experiences and practices in which they engaged so far
- Watch either 'The Man Who Knew Infinity (2015)' or 'Mission Mangal' (Bollywood Films) and describe how life and experiences of scientists unfolds in them.

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

## Essential/ Recommended Readings

- Mehrotra, A., Khirwadkar, A., Koul, A., Jha, A. K., Sharma, K., Mohapatra, M., Tyagi, P., Garg, R., Kumar, R., Koireng, R. R., Sindhu, R. S., Sharma, S., Abdullah, S., Aziz, T., & Bhatia, V. B. (2013). *Textbook of Pedagogy of Science (Physical Science) (Part I)* ISBN 978-93-5007-224-0. National Council of Educational Research and Training.
- Mehrotra, A., Khirwadkar, A., Koul, A., Jha, A. K., Sharma, K., Mohapatra, M., Tyagi, P., Garg, R., Kumar, R., Koireng, R. R., Sindhu, R. S., Sharma, S., Abdullah, S., Aziz,

- T., & Bhatia, V. B. (2013). *Textbook of Pedagogy of Science (Physical Science) (Part II)* ISBN 978-93-5007-225-7. National Council of Educational Research and Training.
- Mishra, K. (2003). *Sanskrit Vangmay me Vigyan Kaitihas (संस्कृतवाङ्मयमेविज्ञानकाइतिहास)* (1st ed.). National Council of Educational Research and Training.
  - Jain, N. K. (1982). *SCIENCE AND SCIENTISTS IN INDIA*. Indian Book Gallery.

#### **Additional Readings**

- Sarukkai, S. (2012). *What is Science?* National Book Trust, Govt. of India.
- Singh, S. (2017). *The Educational Heritage of Ancient India*. NotionPress.
- Singh, G., & Kumar, R. (2017). *Science: Perspective and Nature*. In *Pedagogy of Science* (pp. 7-30). Indira Gandhi National Open University School of Education. <http://ignoubbsr.org/BES-141>

#### **Audio Visual Material: Across Units**

1. 'The Man Who Knew Infinity (2015)' (Bollywood Film)
2. 'Mission Mangal' (Bollywood Film)

#### **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**

Tentative and Revisionary Nature of Science, Contribution of Indian Thoughts and thinkers, Science in International Perspective, Learning Resources in Science, Traditional Ecological Knowledge, Open Education Resources (OER), Assessment in Science

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