

## **Science and Society:** “Syllabus Elaboration”

### **Unit I: Introduction to Science**

**A. From Ptolemy to heliocentric theory:** Early notions of the sun, planets and the universe. Copernicus and his contribution to heliocentrism, Galileo and observations using telescope, Kepler and laws of planetary motion (qualitative treatment)

Renaissance in Europe- Brief accounts of the work of Leonardo da Vinci;  
The age of enlightenment- Definition, significant developments in the age of enlightenment; Descartes and his contributions: Cartesian dualism, Reductionism, Mechanistic view of nature  
The industrial revolution- Definition, Contributions to technology and mass production

Modern science: A brief discussion on modern scientific method: Hypothesis, experimentation- Repeatability of measurements, Models and Theory, Nature of scientific inquiry.

Science in non-western cultures (with focus on Indian subcontinent): Mathematics in India- Contributions of Aryabhata, Bhaskara, Nilakanta (Kerala school of mathematics), Hindu-Arabic numerals, Panini and Vyakarana, Metallurgical practices- Examples of iron pillar at Qutub Minar, Damascus steel; Contributions in medicine and surgery with examples from Sushruta and Caraka

### **B. Interdependence of Science and Technology with examples:**

Germ theory of disease, Louis Pasteur and pasteurization, Viruses and disease, Vaccination

Example of laser as a tool that has made possible new scientific discoveries and new technologies (one or two examples)

Microscope-Leeuwenhoek, modern microscopes and their applications in life sciences, medicine

### **C. Science and the public:**

Role of Science and technology in economic progress, Investment on S&T of different nations (percentage of GDP); Knowledge Society and role of S&T; Science communication in media

## **Unit II**

- Darwin’s theory of Natural selection: Basic theory, Darwin’s work and impact on British society of the times

- Antibiotics: Discovery of penicillin and its consequences,; how do antibiotics work? Drug resistance and abuse of antibiotics
- Some important chemicals and the science behind them: Soaps, cleaning detergents, plastics and their uses, problems of excessive use of plastics
- Atomic energy- Atomic and nuclear structure (qualitative overview),Basics of fission and fusion reactions, atomic power plants; Fission devices; Chernobyl reactor meltdown and the issues of nuclear safety
- Space sciences: Brief history of Russian sputnik and American space programme, Modern satellites and their role in communications, weather analysis. Remote sensing satellites, Indian space programme- GSLV and PSLV, Chandrayaan and Mangalyaan
- Genetics: Introduction to gene and heredity, DNA- double helix structure, basis of heredity, Some diseases linked to genetics (one or two examples- Down syndrome, Hemophilia)
- Nanoscience and technology: Nano length and size scales, Basic introduction. Examples of nanotechnology – Nanomedicine, Nano electronics, Smart materials- definition

### **Unit III**

- Introduction to Green and White Revolutions in India, Change in agricultural and dairy practices that led to enhanced agricultural and dairy productivity; Example of Amul; GM crops- definition, issues of concern regarding GM crops
- Information Technology and Information Revolution- Computer and automation of processes, Internet and web-based technologies; India's role in IT sector- examples
- Digital technology and its impact on emotional, social and cognitive facets on humans – discussions on excessive radiofrequency radiation, reliance on interaction between people through web
- Introduction to renewable and non renewable energy; Impact of exploitation of natural resources; alternative energy- solar, wind, biofuels
- Climate change- Definition. Consequences- green house gases, melting of polar ice caps, rise in sea levels, impact on global scale on populations;

Relation between development and issues of climate change and environmental degradation

*All topics in Unit III can be taught leaving some time for discussions and questions from the students ( Suggested time of 15 minutes in a hour's lecture)*