



ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : Value Addition Course						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
I	Unique paper Code: 696700101 5 VAC	Science and Society	1		1	2
Teacher/Instructor(s)		Dr. Neha Bhardwaj				
Session		2022-2023				

Course Objectives and Learning Outcomes:

This paper is interdisciplinary in nature and would provide students with basic exposure to scientific methods, technologies and developments that have played a significant role in the evolution of human society from ancient to modern times. The primary objective of this course is to instill in students an appreciation for science and a scientific outlook and temper.

The course further aims to increase awareness about fundamental scientific concepts that play an important role in our daily life using various examples and case studies. Students would also be made aware of the scientific rationale of technological developments that would enable them to make informed decisions about their potential impact on society.

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Pedagogy:

- Pedagogy in this course should largely rely on learning by enquiry, observations, experimentation and group discussions using case studies/examples.
- Efforts should be made to instill an interest in students for science. Students should be encouraged to understand and appreciate scientific concepts and their applications rather than solely memorizing factual information.
- The faculty may refer to books/ articles/ reviews/ documentaries/ films etc. from academic institutions or other reliable sources. A few suggestive links are provided in the Suggested Reading/Resources Section below.
- In the spirit of exposition of popular science, Subject/Domain experts may also be invited for lectures and interactions with students.

Lesson Plan (Theory):

S. NO.	Learning Objective	Lecture No.	Topics to be covered
I	Science and Technology – from Ancient to Modern Times	1	(i) Philosophy of science, the scientific method, importance of observation, questions and experimental design, rational thinking, myths vs. facts
		2	(ii) Science, Technology and Traditional Practices: Suggestive areas include: <ul style="list-style-type: none"> ● Water harvesting structures and practices ● Construction, architecture and design – use of natural environment-friendly designs and materials ● Agriculture including domestication of plants and animals
		3	(iii) Science and Technology in Modern Times: Suggestive areas include: <ul style="list-style-type: none"> ● Public Health: Nutrition, Hygiene, Physical and Mental Health, Vaccines and Antibiotics, Anti-microbial resistance ● Food Security: Green Revolution, White Revolution
		4	<ul style="list-style-type: none"> ● IT Revolution, eGovernance ● Clean Energy, Renewable Energy ● Space Science and Exploration ● Evolution, Ecology and Environment
II	Scientific Principles and Concepts in Daily Life	5	Observing and documenting flora and fauna of College campus/city.
		6	Visits to National Science Centre, Pragati Maidan, Delhi
		7	Visits to biodiversity parks and nature walks.
		8	Visits to science laboratories in the College
III	Contemporary Developments	9	<ul style="list-style-type: none"> ● Climate change and global warming ● Threats to biodiversity and habitat degradation
		10	<ul style="list-style-type: none"> ● Genomics and modern medicine ● Genetically engineered crops
		11	<ul style="list-style-type: none"> ● Artificial intelligence and robotics ● Big Data Analytics
		12	<ul style="list-style-type: none"> ● Citizen science and science communication ● Science of natural disasters and their management
IV	Presentation	13	Presentation by Students on Various topics
		14	Presentation by Students on Various topics

Evaluation Scheme (Theory):

No.	Component	Duration	Marks
1.	Internal Assessment		10
	• Quiz		
	• Class Test		
	• Attendance		
	• Assignment		
2.	End Semester Examination	1 hr	30

Details of the Course		
Unit	Contents	Contact Hours
1 Basic Concepts of Organic Chemistry	<p>(i) Philosophy of science, the scientific method, importance of observation, questions and experimental design, rational thinking, myths vs. facts</p> <p>(ii) Science, Technology and Traditional Practices: Suggestive areas include:</p> <ul style="list-style-type: none"> • Water harvesting structures and practices • Construction, architecture and design – use of natural environment-friendly designs and materials • Agriculture including domestication of plants and animals <p>(iii) Science and Technology in Modern Times: Suggestive areas include:</p> <ul style="list-style-type: none"> • Public Health: Nutrition, Hygiene, Physical and Mental Health, Vaccines and Antibiotics, Anti-microbial resistance • Food Security: Green Revolution, White Revolution • IT Revolution, eGovernance • Clean Energy, Renewable Energy • Space Science and Exploration • Evolution, Ecology and Environment 	4
2 Stereochemistry	<p>This section aims to encourage appreciation of the scientific method through observation, experimentation, analysis and discussions. Students are required to participate in activities and experiments. A suggestive list is given below:</p> <p>Suggested Activities:</p> <ul style="list-style-type: none"> • Observing and documenting flora and fauna of College campus/city. • Visits to science laboratories in the College or neighbouring College/Institute. • Visits to science museums, planetarium. • Visits to biodiversity parks and nature walks. • Participation in a citizen science project/initiative. 	4

3	<ul style="list-style-type: none"> ● Climate change and global warming ● Threats to biodiversity and habitat degradation ● Genomics and modern medicine ● Genetically engineered crops ● Artificial intelligence and robotics ● Big Data Analytics ● Citizen science and science communication ● Science of natural disasters and their management 	4
4	Presentations	2
Total		14
Suggested Books:		
Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1	Basu and Khan. Marching Ahead with Science. National Book Trust	2001
2	Gopalakrishnan. Inventors who Revolutionised our Lives. National Book Trust	2006
3	Yash Pal and Rahul Pal (2013) Random Curiosity. National Book Trust	1994
4	Hakob Barseghyan, Nicholas Overgaard, and Gregory Rupik (****) Introduction to History and Philosophy of Science (licensed under a Creative Commons Attribution 4.0 International License)	
5	John Avery. Science and Society, 2 nd Edition,	2005
6	Dharampal. Indian Science and Technology in the Eighteenth Century,	2000
Mode of Evaluation:		Internal Assessment / End Semester Exam

LESSON PLAN (PRACTICAL)

Course Name : Value Addition Course						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
I	UPI: VAC	Science and Society	1		1	2
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PRACTICAL	Practical Title
1	Measuring the height of the college building using a stick. Measuring the curvature of earth, using distance and shadow

	length.
2	Isolation of DNA (DNA Spooling)
3	Observing transpiration and photosynthesis in plants
4	The blood typing game (online)
5	Are fruit juices, soap, carbonated drinks acidic or alkaline? (using pH strips or developing your own Litmus Test)
6	Do plants learn and remember?
7	Experiments on how migratory birds find their way. (Online)
8	How can a mosquito sit on a water surface or a blade float on water?
9	How does a submarine dip or rise in the ocean?
10	How and why does the path of the sun in the sky change with the seasons?
11	Identification of celestial objects with the naked eye
12	Types of clouds, Science of musical sounds
13	Lenses, mirrors and the human eye
14	Science of splitting of colours from white light: rainbow, CD-rom, prism, oil films.

Evaluation Scheme (Practical):

No.	Component	Duration	Marks
1.	Internal Assessment	2 hr	20
	• CA		
	• Viva		
2.	End term practical/ written exam	2 hr	20

Suggested Online Resources:

Section 1:

(i) Philosophy of science:

<https://blogs.scientificamerican.com/doing-good-science/what-is-philosophyof-science-and-should-scientists-care/>

http://abyss.uoregon.edu/~js/21st_century_science/lectures/lec01.html

https://wps.ablongman.com/wps/media/objects/1449/1483820/18_2.pdf

Myths vs. facts:

<https://www.sciencelearn.org.nz/resources/415-myths-of-the-nature-of-science>

History of technology:

<https://www.visualcapitalist.com/history-of-technology-earliest-tools-modernage/>

Water harvesting:

<https://worldwaterreserve.com/introduction-to-rainwater-harvesting/>

Public Health :

[https://www.ajpmonline.org/article/S0749-3797\(11\)00514-9/fulltext](https://www.ajpmonline.org/article/S0749-3797(11)00514-9/fulltext)

<https://study.com/academy/lesson/public-health-vs-medicine-differencessimilarities.html>

<https://www.deepc.org.in/video-tutorials/public-health-workshop>

Food Security:

<https://www.concern.net/news/what-food-security>

IT Revolution, eGovernance:**Energy:**

<https://www.nrdc.org/stories/renewable-energy-clean-facts>

Space Science:

<https://www.isro.gov.in/spacecraft/space-science-exploration>

<https://www.isro.gov.in/pslv-c11-chandrayaan-1>

<https://www.isro.gov.in/chandrayaan2-home-0>

<https://www.britannica.com/science/space-exploration>

Contribution of Indian Scientists & Women Scientists:

<https://www.tifr.res.in/~outreach/biographies/scientists.pdf>

<https://indiabioscience.org/media/articles/ISTI.pdf>

<https://www.thebetterindia.com/63119/ancient-india-science-technology/>

<https://ncsm.gov.in/indian-women-in-science-technology/>

Evolution:

<https://www.livescience.com/474-controversy-evolution-works.html>

<https://www.ibiology.org/evolution/origin-of-life/>

Section 2:**Measuring buildings, earth curvature:**

<https://www.youtube.com/watch?v=hrwL3u2Z4Kg>

<https://www.youtube.com/watch?v=khRMzxONpLg>

<https://www.youtube.com/watch?v=YaPa4esJJx4>

Isolation of DNA

<https://melscience.com/US-en/articles/home-dnaextraction/?irclickid=2hh2pqRY8xyLTbawUx0Mo3ENUKBwIX3pGQDJSc0>

https://melscience.com/US-en/articles/home-dnaextraction/?irclickid=2hh2pqRY8xyLTbawUx0Mo3ENUKBwIX3pGQDJSc0&utm_source=impact&irpid=2201352&irmpname=Science%20Journal%20for%20Kids&irgwc=1

Transpiration & Photosynthesis

<https://www.youtube.com/watch?v=JQvdXX7hGqI>

<https://www.youtube.com/watch?v=U4rzLhz4HHk>

<https://www.youtube.com/watch?v=pFaBpVoQD4E>

Online game on blood typing

<https://educationalgames.nobelprize.org/educational/medicine/bloodtypinggame/gamev3/1.html>

Determination of pH

https://www.youtube.com/watch?v=BEz6t_e6gpc

Plant behaviour

<https://youtu.be/KyoeCFTIXKk>

<https://youtu.be/gBGt5OeAQFk>

Migratory Birds

<https://www.scienceabc.com/nature/how-migrating-birds-geese-navigate-longdistance-earth-magnetic-field.html>

Section 3:

Climate change and global warming

<https://letstalkscience.ca/educational-resources/backgrounders/introduction-climatechange>

Biodiversity

<https://india.mongabay.com/2020/09/nature-in-peril-as-biodiversity-losses-mountalarmingly-states-the-living-planet-report/>

Genomics and Modern Medicine

<https://www.nationalgeographic.com/science/article/partner-content-genomics-healthcare>

<https://www.mja.com.au/journal/2014/201/1/impact-genomics-future-medicine-andhealth>

<https://www.nature.com/scitable/topicpage/pharmacogenomics-and-personalizedmedicine-643/>

Genetically modified crops

<https://www.nature.com/scitable/topicpage/genetically-modified-organisms-gmostransgenic-crops-and-732/>

<https://factly.in/explainer-what-is-the-status-of-gm-crops-in-india/>

<https://www.fda.gov/food/agricultural-biotechnology/how-gmo-crops-impact-ourworld>

Artificial Intelligence and Robotics

<https://www.ohio.edu/mechanical-faculty/williams/html/PDF/IntroRob.pdf>

<https://nptel.ac.in/content/storage2/courses/106105078/pdf/Lesson%2001.pdf>

Big Data Analytics

https://www.researchgate.net/publication/328783489_Big_Data_and_Big_Data_Analytics_Concepts_Types_and_Technologies

Citizen Science

<https://www.nationalgeographic.org/idea/citizen-science-projects/?page=1>

<https://blogs.scientificamerican.com/guest-blog/effective-communication-betterscience/>

<http://www.dialogue.ias.ac.in/article/30161/citizen-science-in-indiaintroduction-challenges-and-way-forward>

<https://www.societyforscience.org/research-at-home/citizen-science/>