Centre for Studies in Science Policy
School of Social Sciences

Course Title	:	**Science and Technology in Social Context**
Course No	:	**SP 602 (M.Phil./Ph.D.) Compulsory**
Credits	:	**4**
Faculty in charge	:	**V.V. Krishna, Madhav Govind & Rohan D'Souza**
Mode of Evaluation	:	**Term Paper (40%)**
		Class Seminars Presentation(30%)
		Book Review (30%)
Instruction Method	:	**Lecture-cum-Seminar**

This course is designed to impart an inter-disciplinary perspective on relationships between science, technology and society. The course explores both theoretical aspects and empirical details for science and technology studies. The major themes are outlined in three parts.

The first focuses on the main perspectives in <u>Sociology of Science</u>, covering leading contributions in the field from the 1940s to the contemporary phase of globalisation. The course will relate these perspectives to understand and engage with developments in contemporary society.

The second part covers the theme on <u>Technology and Society</u>. Here the focus is laid on three main perspectives, namely, social shaping of technology, large technological systems and networks.

The third part deals with <u>Social History of Science and Technology</u> in the Indian context. Main themes, which will be covered in this part, are colonial and post-colonial social history of science & technology, emergence of Indian science community and post-independence developments covering the role of scientific and political elite.

a) Perspectives in Sociology of Science

Introduction to sociology of science and technology including some basic concepts and perspectives; institutional/interactionist, structural and social history perspectives in the analyses of science.

- Development of science as social institution; changing relationship between science and society; institutionalization and professionalisation of science; social and cognitive concerns; scientific community at different

levels; types of science, scientific communication; social control in science; and science and autonomy questions.

- *Robert K .Merton*: Mertonian sociology of science covering functionalist perspective in sociology of science; ethos and norms of science; reward system and stratification in science; other insights from the Mertonian perspective of science as a social system and the production of systematic knowledge drawing on from other influential authors such as Norman Storer, Bernard Barber, Derrick Solla Price among others.

- *Thomas Kuhn*: Kuhnian and post-Kuhnian sociology of science covering scientific revolutions and 'paradigms' in the development of science; influence of Kuhn on cognitive sociological writings and empirical studies related to science controversies, consensus, negotiation; and closure debates.

- *Bruno Latour* and *Karin D. Knorr-Cetina* and others: Social constructivist approach with a focus on laboratory studies; social processes of laboratory research; critically exploring relativism in science; and scientists in laboratories with empirical studies in the Indian context.

- J.D.Bernal and Social Relations of Science perspective

- Changing structure of science as a social institution in the contemporary period; Impact of globalistion; Michael Gibbons et.al, John Ziman and others on 'new modes' of knowledge production.

Essential Reading List

Bernal, J.D. (1939) *The Social Function of Science,* Cambridge MA:MIT Press.

Kuhn, Thomas (1970) *The Structure of Scientific Revolutions.* 2nd. Ed. Chicago: University of Chicago Press.

Latour, Bruno and Steve Woolgar (1979) *Laboratory Life: The Social Construction of Scientific Facts,* Beverly Hills, CA : Sage

Merton, Robert K (1973) *The Sociology of Science: Theoretical and Empirical Investigations.* Chicago: Chicago University Press.

Mulkay, M.J. (1977). 'Sociology of the Scientific Research Community', in Ina Spiegel-Rosing and Derek de Solla Price (eds), *Science, Technology & Society – A Cross Disciplinary Perspective,* London and Beverly Hills: Sage Publicatons.

Stehr, Nico (1978), 'The Ethos of Science Revisited: Social and Cognitive Norms", *Sociological Inquiry,* volume 18, pp.172-197.

Ziman, J.M. (1984). *An Introduction to Science Studies*, Cambridge: Cambridge University Press.

Supplementary Reading List:

Ben-David, J (1978), 'Emergence of National Traditions in the Sociology of Science: The United States and Great Britain', *Sociological Inquiry,* volume 18, pp. 197-219.

Burch, David (1998), 'Science, Technology and the Less-developed Countries', in Martin Bridgestock et.al (eds), *Science, Technology and Society: An Introduction*, Melbourne: Cambridge University Press.

Gaillard, J, V.V.Krishna and R.Waast (1997), *Scientific Communities in the Developing World*, New Delhi: Sage Publications. (Chapters on Introduction and on India)

Gibbons M., C.Limoges, H.Nowotny, S.Schwartzman, P.Scott and M.Trow (1994), *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies,* Sage: London.

J.J.Salomon et.al (eds) *The Uncertain Quest: Science, Technology and Development,* Japan: United Nations University, pp.201-236. (See also chapter on science communities by Gaillard, Jacques).

Krishna, V.V., R.Waast and J.Gaillard (1997), 'Globalisation and Scientific Communities in the Developing Countries', *World Science Report* (Unesco), Paris and London: Unesco and Elsevier.

Nowotny, H., Peter Scott and Michael Gibbons (2001*), Re-Thinking Science: Knowledge and the Public in an Age of Uncertainty,* Oxford: Polity Press and Blackwell Publishers.

Schott, T (1991), 'The World Scientific Community: Globality and Globalisation', *Minerva,* 29, pp.440-462.

Ziman, J.M. (1994) *Prometheus Bound: Science in a Dynamic Steady State,* Cambridge: Cambridge University Press.

Rose, Hilary and Stephen Rose (1970), *Science and Society*, Great Britain: Penguin Books.

b) **Technology and Society**

- Basic issues, conceptions and definitions of technology; changing relation between science - technology; functional and dysfunctional aspects of technological society.

- Technological determinism vs. social shaping of technology

- Technology and gender: Feminist technology studies
- Large technological systems and society: Managing large technological systems such as transportation, energy, chemical industries, ICT and telecommunications; debating risk and hazards.
- Technological systems as networks: Techno-economic networks and social networks in technology clusters and understanding innovation from the perspective of networks.

Essential reading list

Basalla, G. 1988. *The Evolution of Technology*. Cambridge: Cambridge University Press.

Beck, Ulrich. 1992. *Risk Society: Towards a New Modernity*. London: Sage

Ellul, J. 1965 .*The Technological Society* London: Jonathan Cape.

Harding, Sandra (1991) *Whose Science? Whose Knowledge? Thinking from Women's Lives.* Ithca: Carnell University Press.

Mackenzie Donald and Judy Wajcman (eds) (1999), *The social shaping of technology, UK: Open University Press. (Second edition)*

Rosenberg, Nathan 1976. *Perspectives on Technology* .Cambridge: Cambridge University Press.

Wajcman, J.1991. *Feminism Confronts Technology*. Cambridge: Polity.

Supplementary Reading:

Alagh, Yoginder K. (19950 'Technology & Development in South Asia: Some perspective' *South Asian Survey*. Vol. 2(1) : 1-24

Bhattacharya, S. and Pietro Redondi (1990), *Techniques to Technology*, New Delhi: Orient Longman (particularly see the Chapter on 'What is Technology: The Issue of its Origins and Definitions', by J.J.Salomon; and 'Technical Progress and Society: Historical Perspective' by Bertrand Gille).

Borgmann, Albert(1984) 'Technology and the Character of Contemporary life: A Philosophical inquiry'. Chicago: Chicago University Press.

Callon, Michael (1991). 'Techno-economic networks and irreversibility', in J.Law (ed), A *Sociology of Monsters: Essays on power, technology and domination* (Sociological Review Monograph), London: Routledge & Kegan Paul, pp.132-164.

Cloyton, N.(2002). SCOT: Does it Answer? *Technology and Culture*. Vol. 43, No. 2 PP.351-360.

Gender &Technology –special issue of *Technology &Culture* vol. 38(January) 1997: Vol 43 (October) 2002

Haraway, Donna (1991) "A Cyborg Manifesto Science Technology and Socialist – Feminism in the Late Twentieth Centaury ." in *Simians , Cyborgs and Women : The Reinvention of Nature* New York: Routledge .. pp. 149-181.

Hughes, Thomas (1983). *Networks of Power: Electrification in Western Society 1880-1930*, Baltimore: Johns Hopkins University Press.

Hughes, Thomas (1989). 'The Evolution of Large Technological Systems', in Wiebe E. Bijker, Thomas Hughes and Trevor Pinch (eds), *The Social Construction of Technological Systems,* Cambridge: MIT Press.

Law, J. (1988). 'Anatomy of a socio technical struggle: the design of the TSR2 'in Elliot, B. (ed.) *Technology and social Process* .Edinburgh: Edinburgh University Press. PP 83-106.

Lie, M and Sorensen, K. H. (eds) (1997). *Making Technology our own? Domesticating technology into every day life.* Stockholm: Scandinavian University Press.

Mackenzie, D. (1996). *Knowing Machines: Essays on Technical Change.* Cambridge: MIT Press.

Pathak, Avijit (2003) 'Columbia as Metaphor: Reflection on Life in the Age of Science' *MAINSTREAM*. Vol.41 (10):25-26

Shibasaki, Fumikazu (2005) 'Technology & Ethics' *Philosophy &Social Criticism*. vol.31 (4) 2005: 487-98.

Westrum, R. (1991.) *Technologies and society: The shaping of People and Things.* Belmont California: Wadsworth.

Ziman, John (ed.) (2000). *Technological Innovation as Evolutionary Process.* Cambridge: Cambridge University Press.

c) Social History of Science and Technology

- The expansion of 'modern' science in non-European cultures and context; debating 'internal' vs 'external' perspectives in science;
- Concept of 'colonial science' and colonial science enterprises and institutions; science and its organization in the colonial context; centre-periphery relations and the development of science in the 19th and 20th Centuries.

- National science and emergence of the Indian scientific community; understanding the contributions of P.C.Ray, M.N.Saha, M.Sircar, J.C.Bose,

C.V.Raman, M. Visvesvaraya and others; formation of Indian Science Congress Association and science societies, journals and professionalisation of science between 1870s –1940s.
- Industrial Research and Challenges of Technological Development: CSIR
- Post-war and post-colonial developments in science organization and institutional building of science in India; role of scientific and political elite; Nehru vs Gandhian perspectives on science and development.

Essential Reading List:

Babar, Zaheer(1998) *The Science of Empire: Scientific Knowledge, Civilization and the Colonial Rule in India*. New Delhi: OUP.

Bernal, J. D. (1969) .*Science in History*. Harmondsworth: Penguin Books Ltd. Vol. 1

Ian Inskter, (1995) 'Colonial and Neo-Colonial Transfer of Technology: Perspectives on India before 1914' in Deepak Kumar and Roy Macleod (ed.), *Western Technology and Technical Transfers to India, 1700-1947*, New Delhi, London: Sage Publications. pp.11-25.
Krishna, V. V.(2001)."Changing Policy Cultures, Phases and Trends in Science and Technology in India", *Science and Public Policy* (UK), 28(3), pp.179-194

Krishna, V.V. (1992). 'The Colonial 'Model' and the Emergence of National Science in India 1876-1920', in P.Petitjean et.al (eds) *Science and Empires*, The Netherlands: Kluwer Academic Press.

Kumar, Deepak & Macleod, Roy (1997) *Technology & the Raj: Western Technology and Technical Transfer to India 1700-1947*. Delhi: Sage

Kumar, Deepak (1995) *Science and the Raj, 1857-1905*. Delhi: OUP.

Needham, Joseph (1979) *Grand Titration Science and Society in East and West*. London: Allen & Unwin.

Raina, Dhruv (2001)'Visvesvaraya as Engineer-Sociologist and the Evolution of His techno-Economic Vision,' NIAS Lecture-L1, National Institute of Advanced Studies, Bangalore
Supplementary Readings List:
Adas, Michael(1990) *Machines as the Measure of Men: Science, Technology and Ideologies of western Dominance*. New Delhi: OUP
Alvares ,Claude, (1988) "Science, Colonialism and Violence: A Luddite View", in Ashis Nandy (ed.), *Science, Hegemony and Violence: A Requiem for Modernity*, Bombay : Oxford University Press, pp.68-112.
Arnold,David(2000) *Science, Technology and Medicine in Colonial India*, Cambridge: Cambridge University Press, pp.169-210.
Bernal, J. D. (1969) .*Science in History*. Harmondsworth: Penguin Books Ltd.Vol. 2&3.

D'Souza , Rohan,(2003) "Damming the Mahanadi River: The Emergence of multi-purpose river valley development in India (1943-46)" *Indian Economic and Social History Review* .40(1), pp.81-105**.**

Grove,Richard H (1995)"The beginnings of global environmentalism: Professional Science, Oceanic islands, and the East India Company, 1768-1838", in Idem, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism 1600-1860,* UK: Cambridge University Press. pp. 309-379.

Krishna, V. V. (1993)(ed.) *S. S. Bhatnagar on Science , Technology and Development 1938-54.* New Delhi: Wiley Eastern Limited.

MacLeod, Roy. M.(1975),'Scientific Advice for British India: Imperial Perceptions and Administrative Goals,1898-1923', *Modern Asian Studies*, 9, pp.343-384.

Merritt Roe Smith and Leo Marx (ed.) (1994) *Does Technology Drive History? : The Dilemma of Technological Determinism*, Cambridge: MIT Press .

Prakash ,Gyan (2000) *Another Reason: Science and the Imagination of Modern India,, New Delhi :OUP* pp. 159-200.

Raina ,Dhruv and Irfan Habib, (2004) "Big Science and the University in India", in idem (ed), *Domesticating Modern Science*, New Delhi :Tulika.

Raina ,Dhruv and S. Irfan Habib, 'The Missing Picture: The Non-emergence of a Needhamian History of Science of India' in idem (ed.), *Situating the History of Science: Dialogues with Joseph Needham,* Oxford University Press, New Delhi, 1999, pp. 279-302.

Raj,Kapil(2003) 'Circulation and the Emergence of Modern Mapping: Great Britain and Early Colonial India, 1764-1820.' In Claude Markovits, Jacques Puchepadass, Sanjay Subrahmanyam (ed*.), Society and Circulation: Mobile People and Itinerant Culture in South Asia, 1750-1950*, Delhi: Permanent Black. pp.23-54.

Visvanathan ,Shiv (1985) *Organizing For Science: The Making of an Industrial Research Laboratory.,* Oxford University Press, Bombay, pp.8-96.