

**Centre for International Trade and Development  
School of International Studies  
Jawaharlal Nehru University, New Delhi**

Course: MA in Economics (with specialisation in World Economy)

Course No. & Title: **IE 521 – Economics of Technology and Development**

Course Type: Optional

Course Teacher: Professor Amit S Ray

Credits: 4

Contact Hours: 4 per week

**Course Objectives**

Technology has long been recognized to be crucially important for economic growth and prosperity of societies. The role of technology in driving the world economy has magnified manifolds over the last few decades, with the emergence of a new economic, institutional, and technological architecture steering us towards a truly knowledge driven economy and society. The concept of technology has attracted the scholarly attention of economists for over a century, mainly exploring what constitutes technological change, and its consequences for economic development. The objective of this course is to introduce students to this extensive scholarly (and technical) literature on the economics of technology especially from the perspective of developing countries.

**Learning Outcomes**

- A sound theoretical understanding of the nature and drivers of technological change and its consequences for economic development.
- Gain an analytical perspective on the role of institutions and policy in the facilitating innovation
- Prepare students for research in this area by nurturing their ability to think conceptually and creatively to formulate research puzzles and to address these puzzles
- Hone their writing and presentation skills

**Evaluation Methods**

Evaluation will have two components – (1) End Semester examination and (2) one term paper

**Course Content**

- I. Background and preliminaries:
  - a. Technology through the lens of economics
    - i. Technology as knowledge
    - ii. Definitions and concepts
    - iii. Locating technology in a discourse on development
  - b. Perspectives on Technology by Economic Thinkers
- II. Economics of Technology Generation
  - a. Market Failure and the problem of appropriability
  - b. Market Structure and Innovation
    - i. The Schumpeterian Hypothesis
    - ii. Arrow's results and further insights
    - iii. Empirical validation of the Schumpeterian hypothesis

- III. Economics of Patents
  - a. Definition, history, nuts and bolts
  - b. Justification/ arguments for patents
  - c. Optimum patent strength
  - d. Pitfalls of the patent system
- IV. Economics of technological diffusion
  - a. Standalone technologies
  - b. Strategic adoption
  - c. Risks and uncertainty
  - d. Multiple technologies and network externalities
- V. Technology and Development
  - a. Technological learning
  - b. Technological Capability (TC): Definition, Stages, Consequences
  - c. The role of IPR in creating TC
  - d. Appropriate Technology
- VI. Public Funded Research and Knowledge Transfer
  - a. Economics of science research
  - b. The role of public funded research
  - c. University-industry knowledge transfer
- VII. India's technological trajectory and its emergence in the world economy
  - a. Broad contours of India's technology policy
  - b. India's technological learning and technological capability creation
  - c. India's emergence in the world economy: the role of knowledge inputs

### **Readings (listed alphabetically)**

#### Key text book:

Ray, AS (2025), *Demystifying the Economics of Technology: Perspectives on Development and Reflections from India*, New Delhi: Social Science Press and Orient Blackswan (South Asia Edition)

#### Books (selected chapters)

- Gonsen, R. (1998), *Technological Capabilities in Developing Countries*, Chapter 2, London: MacMillan.
- Greenhalgh, C. and M. Rogers (2010), *Innovation, IP and Growth*, Chapter 2, 6, Princeton University Press: Princeton.
- Hall, B and N. Rosenberg (eds.) (2010), *Handbook of the Economics of Innovation*, Vol I Chapters 5 and 6, Elsevier: Amsterdam
- Katz, J. (ed.) (1987), *Technology Generation in Latin American Industries*, MacMillan: London, Chapters 1-4
- Lall, S (1987), *Learning to Industrialise*, Chapters 1,2,8,9, London: MacMillan.
- Machlup, F. (1958), "An Economic review of the patent system", *US Senate Committee Report*, Washington DC: US Govt.
- Schumpeter, J. (1943), *Capitalism, Socialism and Democracy*, Chapters 7 and 8, Unwin: London.
- Stewart, F. (1977), *Technology and Underdevelopment*, Chapters 1-5, MacMillan: London.
- Stoneman, P. (2002), *The Economics of Technological Diffusion*, Chapters 1 – 5, Blackwell: Oxford.

- Stoneman, Paul (1983), *The Economic Analysis of Technological Change*, Chapter 1, Oxford University Press: Oxford.
- Stoneman, Paul (ed.) (1995), *Handbook of Economics of Innovation and Technological Change*, Chapters 1, 4, Blackwell: Oxford.
- Tirole, J (1988), *The Theory of Industrial Organisation*, Chapter 10, MIT Press: Cambridge, MA.

#### Journal articles

- Bhaduri, S. and A. S. Ray (2004), “Exporting through Technological Capability: Econometric Evidence from Indian Pharmaceutical and Electronics/Electrical Firms”, *Oxford Development Studies*, Vol 32 No.1
- Cohen W.M. and D Levinthal (1989), “Innovation and Learning: The two faces of R&D,” *The Economic Journal*, Vol 99, 1989.
- Dasgupta, P. and J. Stiglitz (1980), “Industrial Structure and Nature of Innovative Activity,” *Economic Journal*, Vol 90 No 358.
- Fischer, F.M. and P. Temin (1973), “Returns to Scale in Research and Development: What does Schumpeterian Hypothesis Imply?” *Journal of Political Economy*, Vol 81 No.1.
- Kamien, M. and N. Schwartz (1975), “Market Structure and Innovation: A Survey”, *Journal of Economic Literature*, Vol 13 No 1.
- Katz, J. (1984), “Domestic Technological Innovations and Dynamic Comparative Advantage, *Journal of Development Economics*, 16, pp 13-37.
- Ray, A.S. and S. Bhaduri (2001), “R&D and Technological Learning in Indian Industry: Econometric Estimation of the Research Production Function”, *Oxford Development Studies*, Vol 29 (2).
- Scherer, F.M. (1972), “Nordhaus’ Theory of Optimal Patent Life’, *American Economic Review* 62 (3), pp 422-427.
- Sengupta, A. and A.S. Ray (2017), "University Research and Knowledge Transfer: A Dynamic View of Ambidexterity in British Universities", *Research Policy*, 46 (5)
- Teitel, S. (1984), Technology Creation in Semi-Industrialised Economies, *Journal of Development Economics*, 16, pp 39-61.

#### Chapters in Edited Volumes

- Stiglitz, Joseph (1987), “On the Microeconomics of Technological Progress”, Chapter 2 in J. Katz (ed), *Technology Generation in Latin American Industries*, MacMillan: London.