

# Course Syllabus for Economics of Innovation (9 ECTS)

Approved by  
Academic Council  
of the Master's Programme  
Minutes AC2

Developer	Vitaliy Roud Dr. rer. Oec., Associate Professor, Deputy Head, Laboratory for Economics of Innovation, ISSEK
No. of credits	9
Contact hours	96
Independent study (hours)	246
Year of study, degree programme	Master's programme 'Governance of Science, Technology and Innovation' 1 <sup>st</sup> year, 1-2 modules, compulsory
Study format	No use of on-line courses

## 1. Course Description

### Abstract

The course introduces the basic theories and concepts underlying the state-of-the-art economics of science, technology, and innovation (STI). The course will discuss different perspectives on the STI, including the core concept formation and genesis, microeconomic, or firm-level aspects of innovation, macroeconomic perspectives, and rationales for policymaking. The lectures cover multi-actor context, discussing the roles of firms, institutions of higher education, research institutes, households, and individuals, as well as inter-actor linkages and institutional mechanics. Particular attention is given to a systemic perspective, known as the National innovation systems framework. The interplay between innovations, economic transformation, and economic growth is studied with an emphasis on the relationship between the STI discourse and the general agenda of development studies, considering the link between innovation and productivity, technological upgrading, and catch-up.

The course is delivered to master students of The National Research University – Higher School of Economics/HSE. The course length is 342 academic hours in total of which 100 hours are class room hours and 242 hours are devoted to self-study. Academic control forms are in-class quizzes and presentations, a written project (structured literature review), and a written exam.

### Pre-requisites

No pre-requisites

## 2. Learning Objectives

- Obtaining up to date knowledge on Science, Technology and Innovation Studies academic discourse
- Understanding the agenda of Economics of Innovation, as well as contemporary views on the interrelations between technological change and economic development
- Using quality academic texts to develop and support argumentation

## 3. Learning outcomes (competencies)

- Agenda, key concepts, theoretical frameworks and models in Science, Technology and Innovation studies
- Skills to analyze innovation processes as multi-faceted interactions within innovation systems
- Understanding the underpinnings of the contemporary STI policy
- Working with academic literature: search, selection and review strategies

## 4. Course Plan

The course spans two academic modules. The teaching is based on the selection of classical academic works and is complemented with the experiences of faculty members. The course is delivered in the form of interactive lectures with in-class activities (quizzes, group discussions, presentations by the students).

### Reading List

Literature recommended for reading is assigned to the course topics presented in the Course Contents below.

**Table 1 – Thematic Plan and Assessment Formats**

Section	Topic	Total	Lectures	Self-study	Expected learning outcomes (ELO) to be assessed	Assessment formats
1. Perspectives on innovation	Introduction: Science, technology and innovation in the economic analysis	10	4	6	Knowledge of the contemporary multi-actor perspective on innovation	In-class quizzes  Final exam
	Nature of innovation	12	4	8		
	Genesis of innovation concept	12	4	8		
	Agents and process of innovation	13	4	9		
2. Microeconomics of innovation	Innovation, firm and market characteristics	13	4	9	Knowledge of the key insights of the microeconomics of innovation	In-class quizzes  Final exam
	Linkages, collaborative networks and open innovation	13	4	9		
	Sectoral patterns of innovation and heterogeneity of economic activities	13	4	9		
	Non-technological innovation and innovation in services	12	4	8		
	Knowledge-intensive business services in the innovation processes	12	4	8		
	Dissemination of innovations	13	4	9		

	Systems of innovation	13	4	9		
3. Macroeconomics of innovation	Innovation, economic growth, economic convergence	13	4	9	Knowledge of the core macroeconomic dimensions of innovation and its link with economic development	
	Technology upgrading and economic catch-up / Middle income trap	13	4	9		
	International innovation	13	4	9		
	Innovation and the agenda of development studies	12	4	8		
4. Institutes and mechanisms	Innovation and Intellectual property rights	13	4	9	Knowledge of the contribution of broader set of actors and institutes into the innovation processes`	
	R&D organisations and universities in the innovation process	13	4	9		
	The role of individuals and households	13	4	9		
	The role of state and public-private partnerships for STI	13	4	9		
5. Effects of innovation	Measuring economic effects of R&D and innovation	12	4	8	Knowledge of the contemporary approaches to measure innovation outcomes	
	Social returns to R&D and innovation	12	4	8		
6. Policymaking in the area of STI	OECD Innovation Imperative agenda	13	4	9	Knowledge of the theoretical underpinning of innovation policymaking	
	Policymaking in the area of STI	13	4	9		
7. Future trends	Digitalization and innovation	13	4	9	A perspective on future trends in innovation studies	
Presentation of an academic paper		10	0	10	Skills to comprehend academic literature Skills to make academic presentations	Presentation and supplementary materials
Structured Literature Review (Essay)		30	0	30	Skills to collect and review existing academic literature on the chosen topic.	Written essay with supplementary appendixes
<b>total</b>		<b>342</b>	<b>96</b>	<b>246</b>		

### Course Contents

The course synthesizes the contents of the following classical handbooks:

- Handbook-1: Fagerberg, Jan, David C. Mowery and Richard R. Nelson (eds.) (2005) The Oxford Handbook of Innovation, Oxford University Press.  
<http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199286805.001.0001/oxfordhb-9780199286805>
- Handbook-2: Greenhalgh, Christine and Mark Rogers (eds) (2010) Innovation, Intellectual Property and Economic Growth, Princeton University Press.  
<https://epdf.tips/download/innovation-intellectual-property-and-economic-growth.html>
- Handbook-3: Hall, Bronwyn H. and Nathan Rosenberg (eds) (2010) Handbook of the Economics of Innovation, Elsevier.

- <https://www.sciencedirect.com/handbook/handbook-of-the-economics-of-innovation>
- Handbook-4: Freeman, Chris and Luc Soete (2000) *The Economics of Industrial Innovation*, 3rd ed., The MIT Press.  
<https://ebookcentral.proquest.com/lib/hselibrary-ebooks/reader.action?docID=3061321&query=chris+freeman>
  - Handbook-5: Henri Delanghe, Ugur Muldur, and Luc Soete (eds) (2009) *European Science and Technology Policy*, Edward Elgar.  
<https://www.elgaronline.com/view/9781848443303.xml>

The handbooks, the publications of the international organizations (e.g. OECD) and articles references within the course are available through the HSE subscription online or are in the open access.

Proposed reading for the topics:

### *Section I. Perspectives on innovation*

#### 1. Science, Technology and Innovation in the Economic Analysis

##### *Basic reading:*

Handbook-1. Chapter 1. Introduction  
Handbook-4. Chapter 1. Introduction

#### 2. Nature of innovation

##### *Basic reading:*

Handbook-2. Chapter 1. The Nature and Importance of Innovation  
Handbook-1. Chapter 2. The Innovative Firm  
Handbook-3. Chapter 2. The Contribution of Economic History to the Study of Innovation and Technical Change.

#### 3. Genesis of Innovation concept

##### *Basic reading:*

Handbook-1. Chapter 6. Smith K., Measuring Innovation.  
B. Godin (2008), *Innovation: the History of a Category*, Working Paper No. 1, Project on the Intellectual History of Innovation, Montreal: INRS.

##### *Additional reading:*

Frascati Manual 2015. Proposed Standard Practice for Surveys on Research and Experimental Development. OECD Publishing. Paris  
Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, 4th Edition. 2018. OECD Publishing. Paris.

#### 4. Agents and process of innovation

##### *Basic reading:*

Handbook-1. Chapter 4. Innovation Processes  
Handbook-3. Chapter 15. The Market for Technology

### *Section II. Microeconomics of innovation*

#### 5. Innovation, firm and market characteristics

##### *Basic reading:*

Handbook-4. Chapter 11. Innovation and Strategy of the Firm

Handbook-3. Chapter 4. Fifty Years of Empirical Studies of Innovative Activity and Performance  
 Handbook-2. Chapter 5. Innovative Firms and Markets

*Additional reading:*

Handbook-2. Chapter 8. Stylized Facts in the Geography of Innovation  
 Handbook-4. Chapter X. Scale and Scope in Research

6. Linkages, collaborative networks and open innovation

*Basic reading:*

Handbook-1. Chapter 3. Networks of innovators  
 Handbook-2. Chapter 13. Invention and Inventor Networks.  
 Handbook-3. Chapter 9. Open User Innovation.

7. Sectoral patterns of innovation and heterogeneity of sectors

*Basic reading:*

Handbook-1. Chapter 14. Sectoral Systems: How and Why Innovation Differs across Sectors.  
 Handbook-1. Chapter 15. Innovation in Low-Tech Industries

*Additional reading:*

Handbook-3. Chapter 3. Innovative Conduct in Computing and Internet Markets  
 Handbook-3. Chapter 12. Pharmaceutical Innovation  
 Handbook-3. Chapter 22. The Economics of Innovation and Technical Change in Agriculture

8. Non-technological innovation and innovation in services

*Basic reading:*

Handbook-1. Chapter 5. Organizational Innovation  
 Handbook-1. Chapter 16. Innovation in Services

9. Knowledge-intensive business services in the innovation processes

*Basic reading:*

Miles, I. (2005). Knowledge intensive business services: prospects and policies. *Foresight*, 7(6), 39-63.

10. Dissemination of innovations

*Basic reading:*

Handbook-3. Chapter 17. The Diffusion of New Technologies  
 Handbook-3. Chapter 18. General Purpose Technologies  
 Handbook-1. Chapter 17. Innovation and Diffusion  
 Handbook-2. Chapter 7. Diffusion and Social Returns

11. Systems of innovation

*Basic reading:*

Handbook-1. Chapter 7. Systems of Innovation: Perspectives and Challenges

*Section III. Macroeconomics of innovation*

12. Innovation, economic growth, economic convergence

*Basic reading:*

Handbook-1. Chapter 18. Innovation and Economic Growth

Handbook-2. Chapter 8. Models of Economic Growth

Handbook-2. Chapter 10. Technology, Wages and Jobs

Barro, Robert J. (2016) Economic Growth and Convergence, Applied Especially to China, NBER Working Paper 21872, National Bureau of Economic Research.

*Additional reading:*

Organization for Economic Cooperation and Development (2016) OECD Compendium of Productivity Indicators, Paris: OECD. Chapters 1-3.

13. Technology upgrading and economic catch-up / Middle income trap

*Basic reading:*

Lee, Keun and Franco Malerba (2017) Catch-Up Cycles and Changes in Industrial Leadership: Windows of Opportunity and Responses of Firms and Countries in the Evolution of Sectoral Systems, *Research Policy*, 46: 338-351.

14. International innovation

*Basic reading:*

OECD Compendium of Productivity Indicators, Paris: OECD. Chapter 4. Productivity, Trade and International Competitiveness

Handbook-1. Chapter 12. Narula, Rajnesh and Antonello Zanfei Globalization of Innovation: The Role of Multinational Enterprises

Handbook-2. Chapter 9. Innovation and Globalization

15. Innovation and the agenda of development studies

*Basic reading:*

UN. The Sustainable Development Goals Report 2019, New York: UN.

Handbook-3. Chapter 20. Innovation and Economic Development

*Section IV. Roles of institutional actors and mechanisms*

16. Innovation and Intellectual property rights

*Basic reading:*

Handbook-2. Chapter 2. The Nature and Role of Intellectual Property

17. R&D organisations and universities in the innovation process

*Basic reading:*

Handbook-2. Chapter 6. University Research and Public-Private Interaction.

Tether, B. S., & Tajar, A. (2008). Beyond industry–university links: Sourcing knowledge for innovation from consultants, private research organisations and the public science-base. *Research Policy*, 37(6-7), 1079-1095.

18. The role of individuals and households

*Basic reading:*

Stock, R. M., Oliveira, P., & von Hippel, E. (2015). Impacts of Hedonic and Utilitarian User Motives on the Innovativeness of User- Developed Solutions. *Journal of Product Innovation Management*, 32(3), 389-403.

Von Hippel, E. (1976). The dominant role of users in the scientific instrument innovation process. *Research policy*, 5(3), 212-239.

Von Hippel, E. (1986). Lead users: a source of novel product concepts. *Management science*, 32(7), 791-805.

## 19. The role of state and public-private partnerships for STI

### *Basic reading:*

- Audretsch, David B.; Link, Albert N.; Scott, John T. (2002a): Public/Private Technology Partnerships: Evaluating SBIR-supported Research. *Research Policy*, Vol. 31(1): 145-158
- Link, Albert N.; Scott, John N. (2005): Universities as Partners in U.S. Research Joint Ventures. *Research Policy*, Vol. 34(3): 385-393
- OECD (2005a): Public-Private Partnerships for Innovation: Synthesis Report. Paris
- The Business and Industry Advisory Committee to the OECD (2003): Promoting Better Public-Private Partnerships: Industry – University Relations. BIAC 2003

### *Section V. Effects of innovation*

## 20. Measuring economic effects of R&D and innovation

### *Basic reading:*

- Handbook-3. Chapter 23. Hulten, Charles R. Growth Accounting
- Handbook-3. Chapter 24. Hall, Bronwyn H., Jacques Mairesse and Pierre Mohnen Measuring the Returns to R&D
- Handbook-3. Chapter 26. Mairesse, Jacques and Pierre Mohnen Using Innovation Surveys for Econometric Analysis
- Handbook-1. Chapter 6. Smith, Keith Measuring Innovation

## 21. Social returns to R&D and innovation

### *Basic reading:*

- OECD (2017) Making Innovation benefit All: Policies for Inclusive Growth. OECD Publishing, Paris.

### *Section VI. Policymaking in the area of STI*

## 22. OECD Innovation Imperative agenda

### *Basic reading:*

- OECD (2015), The Innovation Imperative: contributing to productivity, growth and well-being. OECD Publishing, Paris.
- OECD (2015b), System Innovation: Synthesis Report. STI Policy Papers, OECD publishing.
- Coenen, L., Hansen, T. & van Rekers, J. (2015), Innovation Policy for Grand Challenges. An Economic Geography Perspective. *Geography Compass*, Vol 9, no. 9, 483–496.

## 23. Policymaking in the area of STI

### *Basic reading:*

- Fagerberg, Jan (2016) Innovation Policy: Rationales, Lessons, and Challenges, *Journal of Economic Surveys*, pp. 1-17.
- Handbook-2. Chapter 11. Microeconomic Policies to Promote Firm-Level Innovation
- Handbook-2. Chapter 12. Macroeconomic Issues and Policy

### *Section VII. Future trends*

## 24. Digitalization and innovation

### *Basic reading:*

- OECD (2019), Going Digital: Shaping Policies, Improving Lives, OECD Publishing, Paris

## 5. Grading system

The final grade G (10-point scale) of the course is calculated as a weighed sum of grades on in-class participation (quizzes and presentation), structured literature review (essay) and final exam:

$$G = 0.25 * C + 0.10 * P + 0.25 * W + 0.40 * E,$$

where:

C stands for in-class participation (quizzes), P is a presentation, W is a structured literature review (essay), and E is a Final exam. All forms of control except the Final exam are non-blocking.

The grade is rounded up to an integer number of points.

### **In-class participation (C)**

It refers to regular reading of the assigned material before a lecture and delivery of short in-class written assignments.

### **Presentation (P)**

Each of the students selects one academic paper from the provided list of highly impactful articles in the area of innovation studies. The students are to deliver a structured presentation that informs the audience about key messages and implications, research design and methodology and be ready to answer the questions on these issues.

### **An essay – a structured literature review (W)**

An essay is a structured text of no less than 5000 words, that provides an in-depth survey of the academic discussions at the topic. The students select the topic and confirm it with the professor. They are to find no less than 15 high-profile academic publications (papers from peer-reviewed journals, edited book chapters, indexed in SCOPUS/Web of Science databases) beyond the literature provided in this syllabus. The essay must synthesize the literature in a creative way, providing the reader with the structured description of the state-of-the art research on the topic. The language must follow academic style, be logical, structured and well-reasoned. References must follow the APA citation guidelines<sup>1</sup>.

Deadline for the choice of topics is November, 6, to be quickly discussed during class meeting November, 6. Please, provide a topic title and several highlights on the contents you plan to develop.

Deadline for final papers is 00:00 December, 11, to be submitted to the email [vroud@hse.ru](mailto:vroud@hse.ru) with the e-mail title “Economics of Innovation essay”. in Word format. Late submissions are subject to penalties. Beyond essay text, the students are to deliver two appendixes: a detailed bibliometric information on the list of chosen references including number of citations from SCOPUS/WoS; and the structured outline of the essay in the form of key statements and propositions.

## 6. Examination type

Final exam (E) consists of several open questions to be answered explicitly in the class room. Duration – 120 minutes, closed-book (no prepared materials or devices allowed). The evaluation will consider the argumentation, logics and use of frameworks and concepts discussed during the course.

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<sup>1</sup> <http://www.apastyle.org/>

## 7. Examples of Assessment Materials

Sample in-class assignment – a short quiz of 5 questions (Maximum score 5, each question weights equally):

1. *What are the statistical Manuals? What type of information is provided within them? What Manuals do you know?*
2. *Provide a definition of innovation*
3. *Provide a definition for R&D.*
4. *What is the difference between radical or incremental innovation? Which is more important for a firm?*
5. *What is the difference between innovations new to market or new to firm? Which is more impactful on the commercial success?*

Final Exam Example (Maximum score – 100; weights of particular questions are provided):

- 1 (15) *Provide the formal (e.g. Oslo Manual) definitions for the following concepts:*
  - a. (5) *business innovation*
  - b. (5) *product innovation*
  - c. (5) *business process innovation*
- 2 (25) *Let's consider the paper manufacturing industry, known for rather simple processes for transforming wood into paper products.*
  - a. (10) *Assume its' class according the classification of technological intensity (high-tech, medium high-tech, medium low-tech, low-tech). What indicators do you need to prove your assumption?*
  - b. (15) *What is the role of this industry in the processes of innovation diffusion, using the terminology of Pavitt's taxonomy?*
- 3 (30) *Let's look into the future. A council of the smartest scientists informally approaches you and says that in the next 5 years there will be a revolution in paper manufacturing industry. It will be possible to create a paper that is as hard as steel. It requires new equipment that is new, complex and expensive, but the results will be outstanding.*
  - a. (10) *What type of innovation is that? Use as many relevant innovation features as you remember.*
  - b. (10) *How the dissemination of this innovation will change the role of the paper industry in the national innovation system?*
  - c. (10) *What factors may hamper dissemination of this innovation?*
- 4 (30) *Suppose, you are the President. You want to establish a national programme SteelPaperTech to let the country benefit from this revolution. However, it could be done using the equipment from only two producers in the world, all abroad, the equipment is very expensive and complex. The national scientists have experiments in this area, but no mass production.*  
*Think about the possible implementation of this programme:*
  - a. (10) *What is the appropriate format of public intervention in this case?*
  - b. (10) *What types of organisations should be involved and why? How would you select them?*
  - c. (10) *Provide a definition of national competitiveness. How to make sure that this programme will contribute to increasing national competitiveness?*

## 7. Methods of instruction

The course delivers the contents through a participatory sessions that introduce and clarify major theoretical concepts, frameworks and models of the Innovation studies. The students are expected to be ready for discussions using the recommended readings and lecture materials.

## 8. Resources

The list of required and optional readings is presented in the Course Contents as distributed between the topics. Lecture materials and other information needed, as well as the list of records, will be available at the HSE Learning Management System (LMS). No specialized software or equipment is required. Students are recommended to use HSE e-Library to access the publications and recommended open-source databases and software from the list below.

*HSE Library e-resources:* <https://library.hse.ru/en/e-resources>

OECD iLibrary: <https://www.oecd-ilibrary.org/>

## **9. Special equipment**

- laptop
- multimedia projector
- screen

## **10. Organization of Studies for Persons with Limited Mobility and Disabilities**

If necessary, learners with limited mobility or a disability (as per his/her application), as well as per his/her individual rehabilitation programme, may be offered the following options for receiving learning information with due consideration of his/her individual psycho-physical needs (e.g., via eLearning studies or distance technologies):

- for persons with impaired vision: enhanced fonts in hard copy documents; e-documents; audio files (transfer of study materials to an audio-format); hard copy documents with the use of Braille; individual consultation with a facilitated communicator; individual assignments and mentoring;
- for persons with hearing impairments: in hard copy; e-documents; video materials with subtitles; individual consultation with a facilitated communicator; individual assignments and mentoring;
- for persons with a muscular-skeleton disorder: in hard copy; e-documents; audio-files, individual assignments and mentoring.