Science, Technology and Innovation Policy

1. Introductory note

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General Description of the Program:

The course is delivered to master students. It is a part of general scientific curricula unit, and it is delivered in modules. The course length is ***216*** academic hours in total of which ***70*** hours are class room hours and ***146*** are devoted to self study.
Academic control forms are one written exam and one essay.

Course Objective

The course spans 1 academic module. Students are assessed with a written exam. The teaching is based on selected writings and experiences of faculty members. In addition selected reputed scholars and experts are invited bringing together views from different perspectives on the meaning of intellectual property for science, technology and innovation to provide in-depth learning opportunities for all students.

Lectures are designed to deliver theoretical frameworks and international experiences. The course is accompanied by a seminar, and some sessions will feature additional foreign experts.
Accompanying seminars introduce and develop new approaches to understand and further develop different facets of innovation thinking and to provide participants with ready to use state of the art knowledge as well as academic training.

Course Language: English.

Abstract

Science, Technology and Innovation (STI) Policy is a key pillar of government strategy to promote sustainable socio-economic development. An area in which decisions today have an important and long lasting impact on the future competitiveness and prosperity of nations. After a brief introduction on the past, current and prospective place of STI policy within the overall economic development policy agenda, the course starts with the definition of the basic concepts, including that of a national innovation system as an integrative analytical framework. It then reviews in detail how STI policy main objectives are defined and specific STI measures to achieve them are designed and implemented in different national contexts and through international co-operation. Then, it reviews the general approaches and specific methodologies that are used to evaluate the efficiency and impact of individual policy measures, as well as of the overall STI policy.

Training Objectives

- How innovation is generated and impact on socio-economic performance
- What main influences have public policies on STI dynamics

- How governments can best boost national innovation performance
- How to derive useful lessons from an international comparison of STI policies

Target audience

- Master students

2. Thematic Plan

a) Lectures

Module	Topic	Course hours, Total
Introduction	Subject overview and definition of basic concepts and their interrelations	2
	total	*2*
STI strategies and governance	Knowledge Triangle – the concept	2
	Knowledge Triangle – environment	2
	STI policy governance systems I	2
	STI policy governance systems II	2
	STI policy responses to global challenges	2
	total	*10*
STI policy mix	Framework conditions for STI development: linkages with other public policies I	2
	Framework conditions for STI development: linkages with other public policies II	2
	STI policy making process	2
	STI policy mix	2
	Government and public research	2
	Research in Higher Education Institutions	2
	Business Enterprise Research	2
	total	*14*
Evaluation of STI policy	STI policy effectiveness and efficiency	2
	Principles of STI policy evaluation I	2
	Principles of STI policy evaluation II	2
	total	*6*
STI policy in special environments	STI policy in OECD countries	2
	STI policy in transition countries	2
	Looking forward: the future of STI policies	2
	total	*6*
	total	**38**

b) seminars

The seminar consists of an introductory session which highlights the phenomena in discussion, introduces the theoretical background and practical applicability. Supervision of students will be offered using a mid term interim presentation of additional information and facts by the supervisor and individual consultations during the seminar. Following these introductory session students will develop a practical applicable concept for a given problem which is based on sound scientific grounds. The session ends with the introduction of core themes for which the students are asked to prepare a presentation. Finally these concepts are introduced in a concluding session which is

devoted to presentations of concepts developed by students and a concluding discussion of these concepts from both a scientific and a practical view. Students will develop concepts in teams and be supervised during development of their concepts

Topic	**Total academic hours**
Introductory presentation	8
Interim presentation / individual consultations	12
Presentations	12
Total	**32**

3. Basic literature

Books:

- Organisation for Economic Co-operation and Development: OSLO MANUAL - THE MEASUREMENT OF SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES: PROPOSED GUIDELINES FOR COLLECTING AND INTERPRETING TECHNOLOGICAL INNOVATION DATA

- Edquist, C. 1997 (edt.), Systems of Innovation: Technologies, Institutions and Organizations, London 1997

- Freeman, C.: Technology and Economic Performance: Lessons from Japan, Pinter, London.1987

- Lundvall, B. A. (edt.): National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning. London, NewYork: Pinter 1995

- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999

- Nelson, R. N. 1993: National Systems of Innovation: A Comparative Analysis. NewYork: Oxford: Oxford University Press 1993

- Schibany, A.; Jörg, l.; Polt, W.: Towards realisitc expectations: The science system as contributor to industrial innovation. Seibersdorf: Österreichisches Institut für Wirtschaftsforschung 1999

Articles

- Atkinson, R. D.: Innovation policy making in a federalist system: Lessons from the states for U.S. federal innovation policy making. Research Policy 20, 1991, S. 559-577

- Bartholomew, S.: National systems of biotechnology innovation: complex interdependence in the global system. Journal of International Business Studies, 1197, 2nd quarter, Vol. 28, issue 2, S. 241-267

- Conceicao, P.; Heitor, M. V.; Gibson, D.; Shariq, S. S.: The emerging importance of knowledge for development: Implications for technology policy and innovation. Technological Forecasting and Social Change, Vol. 58, 1998, S. 181-202

- Debackere, K.; Rappa, M. A.: Technological communities and the diffusion of knowledge: an application and validation. R&D Management 24, 4, 1994, S. 355-371

- Etzkowitz, H.; Leydesdorff, L.: The dynamics of innovation: From national Systems and "Mode 2" to a Triple Helix of university-industry-government relations. Research Policy 29 (2000), S. 109-123

- Gregersen, B.; Johnson, B.; Kristensen,A.: Comparing National Systems of Innovation: The Case of Finland, Denmark and Sweden. in: Vuori, S.; Vuorinen, P. (Hrsg.): Explaining Technical Change in a Small Country: The Finnish National Innovation System. Heidelberg 1994, S. 116 ff.

- Hahn, Y.-H.; Yu, P.-I.: Towardas a new technology policy: the integration of generation and diffusion. Technovation, 19, 1999, S. 177-186

- Lundvall, B.: National Business Systems and National Systems of Innovation. International Studies of Management and Organization, Summer 99, Vol. 29, Issue 2, S. 60-78

- Myers, M. B.; Rosenbloom, R. S.: Rethinking the role of research – leadership in innovation requires mastering ‚radical incrementalism‘. Research, Technology, Management, May / June 1996, S. 14-18

4. Education control forms

Final control (F): written exam (90 minutes exam)
Seminar: Essay (E) and Defence (D) at the end of the seminar.

The overall course grade (10-point scale) is calculated as a sum of
$G = 0{,}5\ F + 0{,}5\ (0{,}5E + 0{,}5\ D)$
The overall course grade *G* (10-point scale) includes results achieved by students in their exam *F,* seminar *(S)*; it is rounded up to an integer number of points.

Summary Table: grading scale

Ten-point scale [10]
1 – unsatisfactory 2 – very bad 3 – bad
4 – satisfactory 5 – quite satisfactory
6 – good 7 – very good
8 – nearly excellent 9 – excellent 10 – brilliant

6 Programme Contents

Module 1 - Introduction

Topic 1 subject overview and definition of basic concepts and their interrelations

Topic outline:

- science; technology; innovation; knowledge;
- research and development
- national, regional and global innovation systems

Main references/books/reading:

- OECD Oslo Manual
- Kline S. J., Rosenberg N. (1986). An overview of innovation. In: Landau R., Rosenberg N. (Eds). The Positive Sum Strategy // Washington, D.C.: National Academy Press, pp. 275–305
- Kotsemir, Maxim; Abroskin, Alexander; Meissner, Dirk (2013): Innovation concepts and typology – an evolutionary discussion, Series: Science, Technology and Innovation, WP BRP 05/STI/2013, http://ssrn.com/abstract=2221299
- Jensen, Morten Berg; Johnson, Björn; Lorenz, Edward; Lundvall, Bengt Åke (2004): Absorptive Capacity, Forms of Knowledge and Economic Development. Groupe de Recherche en Economie, Droit et Gestion, Centre National de la Recherche Scientifique, Universite de Nice – Sophia Antipolis, Décembre 2004, Document de travail n° 2004 – 2

Module 2 - STI Strategies and governance

Topic 1 Knowledge Triangle - concept

Topic outline:

- Elements of Knowledge Triangle – Research, Education, Commercialisation
- Instruments to connect elements

Main references/books/reading:

- Maassen P.; Stensaker B. (2011): The knowledge triangle, European higher education policy logics and policy implications. High Educ (2011) 61:757–769, DOI 10.1007/s10734-010-9360-4

- Adomssent M (2011): In search of the knowledge triangle for regional sustainable development: the role of universities. In Barton A.; Dlouhá J. (editors): Multi-Actor Learning for Sustainable Regional Development in Europe: A Handbook of Best Practice. Grosvenor House Publishing, Guildford, Surrey, 2011

Topic 2 Knowledge Triangle - environment

Topic outline:

- Interaction of elements
- Interfaces between elements
- Instruments to connect elements

Main references/books/reading:

- Maassen P.; Stensaker B. (2011): The knowledge triangle, European higher education policy logics and policy implications. High Educ (2011) 61:757–769, DOI 10.1007/s10734-010-9360-4

- Adomssent M (2011): In search of the knowledge triangle for regional sustainable development: the role of universities. In Barton A.; Dlouhá J. (editors): Multi-Actor Learning for Sustainable Regional Development in Europe: A Handbook of Best Practice. Grosvenor House Publishing, Guildford, Surrey, 2011

Topic 3 STI policy governance I/II

Topic outline:

- overall governance models
- prioritisation and other major decision making processes
- institutional frameworks for monitoring and evaluation

Main references/books/reading:

- Edquist, C. 1997 (edt.), Systems of Innovation: Technologies, Institutions and Organizations, London 1997
- Nelson, R. N. 1993: National Systems of Innovation: A Comparative Analysis. NewYork: Oxford: Oxford University Press 1993
- Lundvall B.-Å.; Borras S. (2005), 'Science, Technology, Innovation and Knowledge Policy', in Fagerberg, J., D. Mowery and R.R. Nelson (eds.), The Oxford Handbook of Innovation, Norfolk, Oxford University Press
- Amin A. and Thrift N., 1995: Institutional issues for the European regions: from market and plans to socioeconomics and powers of association. Economy and Society, 24 (1): 41–66
- Park, Sam Ock (2001): Regional innovation strategies in the knowledge-based economy. GeoJournal 53: 29–38, 2001
- Storper M., 1996: Institution of the knowledge-based economy. In OECD: 1996: Employment and Growth in the Knowledge-based Economy, Paris, pp. 255–283

Topic 3 STI policy responses to global challenges

Topic outline:

- meeting the requirements of new emerging technologies
- impact of globalization of STI markets and networks on national STI policy

Main references/books/reading:

- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999

- Carlsson, B; Jacobsson, S.; Holmén, M.; Rickne, A. (2002): Innovation systems: analytical and methodological issues. Research Policy 31 (2002) 233–245
- Carlsson, Bo(2006):Internationalization of innovation systems: A survey of the literature. Research Policy 35 (2006) 56–67

Module 3 - STI policy mix

Topic 1 Framework conditions for STI development: linkages with other public policies I/II

Topic outline:

- Public policies – tax, labor, IP, migration, economic development
- Interfaces between policy fields
- Coordination of policies

Main references/books/reading:

- Chaminade, C.; Lundvall, B-A.; Vang, J; Joseph, K.J.; (2009): Designing innovation policies for development: towards a systemic experiment based approach. in: Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (edt): Handbook of Innovation Systems and Developing Countries – Building Domestic Capabilities in a Global Setting. Edward Elgar, Cheltenham 2009, pp. 380-385

Topic 2 STI policy making process

Topic outline:

- science, technology and innovation strategy – definitions and scope
- elements of STI strategy
- Communication of national STI strategies
- Implementation rules and guidelines for implementing actors

Main references/books/reading:

- Chaminade, C.; Lundvall, B-A.; Vang, J; Joseph, K.J.; (2009): Designing innovation policies for development: towards a systemic experiment based approach. in: Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (edt): Handbook of Innovation Systems and Developing Countries – Building Domestic Capabilities in a Global Setting. Edward Elgar, Cheltenham 2009, pp. 380-385
- Cooke, Philip (2001): Strategies for Regional Innovation Systems: Learning Transfer and Applications. Report prepared for UNIDO World Industrial Development Report (WIDR) 2001
- Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (2009): Epilogue: Which way now? in: Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (edt): Handbook of Innovation Systems and Developing Countries – Building Domestic Capabilities in a Global Setting. Edward Elgar, Cheltenham 2009, pp. 380-385

- Lundvall, Bengt-Åke; Johnson, Björn; Andersen, Esben Sloth; Dalum, Bent (2002): National systems of production, innovation and competence building. Research Policy 31 (2002) 213–231
- Meissner Dirk; Roud Vitaly; Cervantes Mario (2013): Innovation Policy or Policy for Innovation? – In Search of the Optimal Solution for Policy Approach and Organisation. In: Meissner D., Gokhberg L., Sokolov A. (eds.) (2013) Science, Technology and Innovation Policy for the Future - Potentials and Limits of Foresight Studies. Springer, Heidelberg/ New York/ Dordrecht/ London, Pages 247-255
- Morgan, Kevin (1997): The Learning Region: Institutions, Innovation and Regional Renewal. Regional Studies, Vol. 31.5, pp. 491± 503

Topic 3 STI policy mix

Topic outline:

- Science, technology and innovation policies and STI strategy
- Objectives and goals of STI policies
- Interdependence and interrelation of STI policies

Main references/books/reading:

- Lundvall B.-Å.; Borras S. (2005), 'Science, Technology, Innovation and Knowledge Policy', in Fagerberg, J., D. Mowery and R.R. Nelson (eds.), The Oxford Handbook of Innovation, Norfolk, Oxford University Press
- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999

Topic 4 Government and Public Research

Topic outline:

- Missions and visions for public research
- Organization and forms of public research
- Public research infrastructures

Main references/books/reading:

- Lundvall B.-Å.; Borras S. (2005), 'Science, Technology, Innovation and Knowledge Policy', in Fagerberg, J., D. Mowery and R.R. Nelson (eds.), The Oxford Handbook of Innovation, Norfolk, Oxford University Press
- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999

Topic 5 Research in Universities and Higher Education Institutes

Topic outline:

- Missions and visions for public research
- Organization and forms of public research
- Public research infrastructures

Main references/books/reading:

- Lundvall B.-Å.; Borras S. (2005), 'Science, Technology, Innovation and Knowledge Policy', in Fagerberg, J., D. Mowery and R.R. Nelson (eds.), The Oxford Handbook of Innovation, Norfolk, Oxford University Press
- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999

Topic 5 Business Enterprise Research

Topic outline:

- Role of business enterprise research

Main references/books/reading:

- Lundvall B.-Å.; Borras S. (2005), 'Science, Technology, Innovation and Knowledge Policy', in Fagerberg, J., D. Mowery and R.R. Nelson (eds.), The Oxford Handbook of Innovation, Norfolk, Oxford University Press
- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999

Module 4 - Evaluation of STI policy

Topic 1 STI policy effectiveness and efficiency evaluation

Topic outline:

- Introductions of effectiveness and efficiency concept
- Effectiveness and efficiency of policies

Main references/books/reading:

- Wang E.C., Huang W. (Relative efficiency of R&D activities: A cross-country study accounting for environmental factors in the DEA approach. Research Policy, Volume 36, Issue 2, March 2007, Pages 260–273
- Teirlinck P.; Delanghe H.; Padilla P. ; Verbeeck A. (2013): Closing the policy cycle: Increasing the utilization of evaluation findings in research, technological development and innovation policy design Science and Public Policy June 1, 2013 40: 366-377
- Koch T. (2011): Implementing the National Dementia Strategy in England: Evaluating innovative practices using a case study methodology Dementia November 1, 2011 10: 487-498
- Hansen M.B.; Vedung E. (2010): Theory-Based Stakeholder Evaluation American Journal of Evaluation September 1, 2010 31: 295-313
- Trochim W.M.; Marcus S.E.; Mâsse L.C.; Moser R. P.; Weld P.C. (2010): The Evaluation of Large Research Initiatives: A Participatory Integrative Mixed-Methods Approach American Journal of Evaluation March 1, 2008 29: 8-28

Topic 2 Principles of evaluation I

Topic outline:

- Evaluation methods and instruments
- Defining scope and objective of evaluation
- Comparability of evaluations

Main references/books/reading:

- Glasgow, Russell E.; Linnan, Laura A. (2008): Evaluation of Theory-Based Interventions. In: Glanz, K.; Rimer, B.K.; Viswanath, K. (Editors): Health Behaviour and Health Education - Theory, Research, and Practice, 4TH EDITION, Wiley 2008, pp487-508
- Georghiou L Impact and additionality of innovation policy pp57-66 in: Boekholt P. (edt. 2002): Innovation policy and sustainable development: can public innovation incentives make a difference? Institute for the Promotion of Innovation by Science and Technology in Flanders, IWT Studies 40, available at http://www.6cp.net/downloads/02brussels_review.pdf#page=57

Topic 3 Principles of evaluation I

Topic outline:

- ex-ante, on-going and ex-post evaluation
- different levels of evaluation
- evaluation methodologies
- evaluation metrics
- Types of impact by STI policy measures
- Causality and plausibility of impact attribution to STI policy measures
- Methodologies for impact measurement

Main references/books/reading:

- Schibany, A.; Jörg, l.; Polt, W.: Towards realisitc expectations: The science system as contributor to industrial innovation. Seibersdorf: Österreichisches Institut für Wirtschaftsforschung 1999
- Koch T. (2011): Implementing the National Dementia Strategy in England: Evaluating innovative practices using a case study methodology Dementia November 1, 2011 10: 487-498
- Hansen M.B.; Vedung E. (2010): Theory-Based Stakeholder Evaluation American Journal of Evaluation September 1, 2010 31: 295-313
- Trochim W.M.; Marcus S.E.; Mâsse L.C.; Moser R. P.; Weld P.C. (2010): The Evaluation of Large Research Initiatives: A Participatory Integrative Mixed-Methods Approach American Journal of Evaluation March 1, 2008 29: 8-28

Module 5 - STI policy in special environments

Topic 1 STI policy in OECD countries

Topic outline:

- Designing and developing national STI strategies considering the specific framework conditions of transition countries
- Implementation of national STI policies in transition economies
- Governance of national innovation systems in transition countries

Main references/books/reading:

- Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (2009): Innovatin systems research ande developing countries. in: Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (edt): Handbook of Innovation Systems and Developing Countries – Building Domestic Capabilities in a Global Setting. Edward Elgar, Cheltenham 2009, pp. 1-33

Topic 2 STI policy in transition countries

Topic outline:

- Designing and developing national STI strategies considering the specific framework conditions of transition countries
- Implementation of national STI policies in transition economies
- Governance of national innovation systems in transition countries

Main references/books/reading:

- Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (2009): Innovatin systems research ande developing countries. in: Lundvall, B-A.; Joseph, K.J.; Chaminade, C.; Vang, J (edt): Handbook of Innovation Systems and Developing Countries – Building Domestic Capabilities in a Global Setting. Edward Elgar, Cheltenham 2009, pp. 1-33

Topic 3 Looking forward: the future of STI policies

Topic outline:

- public private partnerships to promote science-industry linkages
- measures for human resource development, incentives and regulations (e.g. IP) to promote business R&D and innovation
- increase public awareness and public procurement to stimulate demand for innovations
- development of infrastructures to foster innovative networks and clusters, etc

Main references/books/reading:

- OECD: Managing National Innovation Systems. Organisation for Economic Co-Operation and Development, Paris 1999
- Lundvall, B. (2007): National Innovation Systems—Analytical Concept and Development Tool, Industry and Innovation, 14:1, 95-119