

Course Code	Course Title Techno-Economics of Mobile Networks and the Internet	Credits (ECTS) 3
Department	Semester	Prerequisites N/A
Type of Course	Field	Language of Instruction English
Level of Course Postgraduate	Year of Study N/A	Lecturers Listed below

Lecturers (alphabetically):

Erik Bohlin, Chalmers University of Technology, Sweden
Morten Falch, Aalborg University, Denmark
Lauri Frank, University of Jyväskylä, Finland
Heikki Hämmäinen, Aalto University, Finland
Antonis M. Hadjiantonis, University of Cyprus, Cyprus
Dimitris Katsianis, University of Athens, Greece
Burkhard Stiller, University of Zurich, Switzerland
ITST Representative, National IT and Telecom Agency, Denmark

Objectives of the Course:

The main objective of this course is to familiarise participants with the Techno-Economic aspects of Mobile Networks and the Internet, emphasising on realistic examples and business case studies from Europe. In addition, participants will have the opportunity to present their own work to an expert audience and receive feedback through group discussions.

Learning Outcomes:

- Familiarisation with Innovation Diffusion Theory (IDT) and its relation to the ICT field
- Understanding of the Information Society and its development within the European Union
- Familiarisation to charging & accounting technologies for the Internet
- Understanding of foresight methodologies with concrete examples in policy advisory studies
- Understanding about theory and design processes of value networks in Internet
- Familiarisation with international roaming and competition policy in telecom
- Familiarisation with Autonomic Management and its applicability to mobile networks
- Familiarisation with techno-economic evaluation of business prospects of telecom networks

Course Contents:

Lectures – Day 1

- **Adoption and Diffusion of Innovations** by Lauri Frank
 - Introduction to the lectures. Participants will learn the basic concepts and theories related to the Innovation Diffusion Theory (IDT) and be able to relate these to the ICT field

- **Diffusion of ICT Innovations in the Information Society - case broadband in Finland** by Lauri Frank
 - Participants will familiarise themselves with the basic concepts related to Information Society and be informed on the development of Information Society within the European Union. Participants will be informed on the case of broadband diffusion in Finland

- **Charging & accounting technologies for the Internet** by Burkhard Stiller
 - The charging of Internet services requires, depending on the layer and technology, a set of suitable technological and protocol hooks, which can deliver via technical accounting approaches those type of data and information that are needed for the charging itself. Thus, on one hand, this lecture will outline major charging models for the Internet and will derive major technical accounting needs. On the other hand, the set of available tools and protocols for the technical accounting will be discussed to determine, which aspects of charging schemes cannot be supported as of today or which accounting needs still require technical developments to progress.

Lectures – Day 2

- **Foresight methods and business model planning** by Erik Bohlin
 - This lecture will review foresight methodologies, such as trend analysis and scenario planning, and business modelling. The lecture will also provide concrete examples of how these methodologies have been used in policy advisory studies.

- **Value network design for Internet** by Heikki Hämmäinen
 - The objective of this lecture is to improve understanding about theory and design processes of value networks in Internet. The basis of lecture is the STOF model but also other methods such as scenario planning and system dynamics will be introduced. Design examples include different domains such as application level services and Internet access services. The relationship between technical and industry architectures will also be elaborated.

- **International Roaming, Competition Policy In Telecom** by Morten Falch
 - One of the most important issues in the debate on interconnect regulation has been use of forward looking costs for setting of interconnection charges. This debate has been ongoing within the EU as well as in US. This lecture discusses the European experiences and in particular the Danish experiences with use of cost based interconnection charges, and their impact on competition in the telecom market.

Lectures – Day 3

- **Autonomic Management of Mobile Networks** by Antonis Hadjiantonis
 - The concept of Autonomic Management is receiving intense interest from both academia and industry since it emerges as an appealing solution to the increasing complexity of managing IT and Telco systems. In this lecture we focus on the applicability and potential of AM to Mobile Networks. The policy-based management (PBM) paradigm is often linked to autonomic management and will be also examined. The specification of high level objectives and their automated deployment and lifecycle management within complex mobile networks make PBM approaches and technologies important candidates for Autonomic Management realisation.

- **Techno-Economic Modelling In Telecommunications** by Dimitris Katsianis
 - In this lecture, a techno-economic evaluation of the business prospects of selected large scale telecommunications networks is carried out. The evaluation is based on a Techno-Economic (TE) tool which, taking into account network topology, area characteristics, service demand and price evolution forecasting as well as risk analysis, estimates key economic figure-of-merits. In the first part the techno-economic methodology will be presented and analysed. In the second part selected business cases will be presented and discussed for European Market concerning technical, business and economic aspects.

All lectures have duration of 90'

Teaching Methods:

- Lectures
- Group work sessions

Assessment Methods:

- ESR presentations and oral discussion

Required Textbooks:

N/A

Recommended Textbooks/Reading:

- **Adoption and Diffusion of Innovations and Diffusion of ICT Innovations in the Information Society - case broadband in Finland**
- Eskelinen, H., Frank, L., Hirvonen, T. (2008): Does Strategy Matter? A Comparison of Broadband Rollout Policies in Finland and Sweden. Telecommunications Policy, vol 32, no 6, 412-421.
- Frank, L., Inkinen, T. & Hirvonen, T. (2006): A Territorial Perspective on the Finnish Information Society. In Eskelinen, H. & Hirvonen, T. (Eds.) Positioning Finland in a European Space. Ministry of the Environment & Ministry of Interior. Edita, Helsinki.

- **Charging & accounting technologies for the Internet** by Burkhard Stiller (90')
- Aiko Pras, Bert-Jan van Beijnum, Ron Sprenkels, and Robert Parhonyi: Internet Accounting, IEEE Communications Magazine, May 2001, pp 108-113
- James W. Roberts: InternetTraffic, QoS, and Pricing, PROCEEDINGS OF THE IEEE, VOL. 92, NO. 9, SEPTEMBER 2004, pp 1389-1400
- David Hausheer, Burkhard Stiller: PeerMint: Decentralized and Secure Accounting for Peer-to-Peer Applications, IFIP Networking Conference, Waterloo, Ontario, Canada, May 2005.

- **Foresight methods and business model planning**
- E. Bohlin, S. Forge, C. Blackman, Assessing the Long-Term Future Demand for Infrastructure in the Telecom/Broadband Sector.
- E. Bohlin, Business models and financial impacts of future mobile broadband networks, Telematics and Informatics 24 (2007) 217–237
- I. Niiniluoto, Futures studies: science or art?, Futures 33 (2001) 371–377
- J. R. Meredith, S. J. Mantel, Technological Forecasting, John Wiley & Sons, Inc., 1995

- **Value network design for Internet**
- Smura T and Sorri A (2009) Future Scenarios for Local Area Access: Industry Structure and Access Fragmentation
- Diesen R et al (2008) Business Model Case Analysis: Floobs, TKK
Additional Reading
- Bouwman H et al, Mobile Service Innovation and Business Models, 2008, XIII, 327 p. 41 illus., Hardcover, ISBN: 978-3-540-79237-6
- Casey T (2009) Analysis of Radio Spectrum Market Evolution Possibilities, C&S
- Abebe B (2009) Mobile Service Usage and Business Models in Wireless Local Area Networks, TKK
- Hanbo Z (2008) Emerging Business Models of the Mobile Internet Market, TKK

- **International Roaming, Competition Policy In Telecom and ITST Keynote Speech**
- Falch, Morten, Telric - the Way Towards Competition? - a European Point of View. Review of Network Economics Journal, Vol. 1, No. 2
- M Falch, A Henten, R Tadayoni: International roaming: is there a need for EU-regulation beyond 2010? - Info (Bingley), 2009
- Sutherland, E. (2008), "The regulation of international mobile roaming", Info, Vol. 10No.1, pp. 13-24.

- **Autonomic Management of Mobile Networks**
- J.O.Kephart, D.M.Chess, "The vision of autonomic computing", IEEE Computer, Vol.36, Iss.1, pp.41 - 50, Jan. 2003.
- G. Pavlou, A. Hadjiantonis (Eds), "D9.2: Next Generation Management Technologies and Approaches to Support Autonomic Management", EMANICS Network of Excellence, Deliverable.[online].Available: www.emanics.org
Additional Reading
- Eurescom Project P1855 "Autonomic Computing & Networking – The operators' vision on technologies, opportunities, risks and adoption roadmap"
 - <http://www.eurescom.eu/Public/Projects/P1800-series/P1855/>

- **Technoeconomic Modelling In Telecommunications**
- N. K.Elnegaard, K. Stordahl, "Analysing the impact of forecast uncertainties in broadband access rollouts by the use of risk analysis, Telektronikk(100) no 4, 2004, pp 157-167
- Olsen et al, "Technoeconomic evaluation of the major telecommunication investment options for European players", IEEE Network July 2006
- T. Monath et al, "Economics of Fixed Broadband Access Network Strategies", IEEE Communications Magazine, September 2003