

STUDIEPLAN

DOKTORGRADSPROGRAM I MOBILE KOMMUNIKASJONS- SYSTEMER: NETTVERK, SIKKERHET OG FORMELLE METODER

Doktorgradsprogram - 180 studiepoeng - 3 år - Grimstad

Mål for studiet

Doktorgradsutdanningen i mobile kommunikasjonssystemer har som mål at kandidatene skal oppnå høy vitenskapelig kompetanse innen ett av områdene nettverk, sikkerhet eller formelle metoder. Dette målet skal nås ved at kandidaten gjennomfører et selvstendig forskningsarbeid som leder til en vitenskapelig avhandling på godt internasjonalt faglig nivå. I tillegg skal doktorgradskandidaten få en avansert opplæring i teori og metode som gir faglig dybde og bredde i eget fag. Kandidatene tildeles etter fullført studium graden philosophiae doctor (ph.d.).

Yrkesmuligheter og videre utdanning

Doktorgradsutdanningen er landets høyeste utdanning og kvalifiserer for tilsetning som førsteamanuensis ved universiteter og høyskoler. Andre aktuelle yrkesmuligheter er å finne i forskningsinstitutter eller innen forskning i industri og næringsliv.

Opptakskrav/målgruppe

For å kunne bli opptatt til ph.d.-programmet må søkeren tilfredsstille ett av følgende krav til kompetanse i informasjons- og kommunikasjonsteknologi:

- Ha oppnådd sivilingeniør-, cand.scient- eller mastergrad ved et norsk universitet eller ha utdanning godkjent som tilsvarende,
- ha annen utdanning og kompetanse på masternivå som etter individuell vurdering godkjennes som grunnlag for opptak, *eller*
- ha utenlandsk utdanning (avsluttet grad) som tilsvarende minst 4 år i det norske universitetssystemet og som etter individuell vurdering aksepteres som opptaksgrunnlag (slike søkere må fremlegge en vurdering av utdanningen, gjort av et norsk universitet eller høyskole med masterprogram i vedkommendes fagområde).

Som hovedregel skal følgende gjelde:

- Gjennomsnittskaracteren på bachelorgraden skal ikke være dårligere enn C,
- for emner på hovedfags- og masternivå skal gjennomsnittskaracteren ikke være dårligere enn B, *og*
- den avsluttende masteroppgaven (eller tilsvarende) skal ha karakteren B eller bedre.

I enkelttilfeller hvor karaktergrunnlaget til søkeren er svakere, kan søknaden vurderes dersom det legges frem dokumentasjon som sannsynliggjør at søkeren vil være egnet til å gjennomføre en ph.d.-utdanning.

For øvrig henvises det til *Utfyllende regler for ph.d.-graden i Mobile kommunikasjonssystemer: nettverk, sikkerhet og formelle metoder ved Høgskolen i Agder*,

http://www.uia.no/no/portaler/forskning/ph_d_utdanning/dokumenter_documents

Anbefalte forkunnskaper

Studiet bygger på forkunnskaper i enten nettverk, sikkerhet eller formelle metoder på mastergradsnivå. Søkere som mangler slike kunnskaper, kan skaffe seg dem ved å følge annen undervisning ved Fakultet for teknologi. I så fall må søkeren regne med lengre studietid enn 3 år. Søkere med liten eller ingen trening i forskningsarbeid fra tidligere utdanning eller arbeid må også regne med å bruke lengre tid på forskningsoppgaven enn de normerte 2,5 år.

Innhold

Doktorgradsprogrammet er lagt opp med tre spesialiseringsretninger: nettverk, sikkerhet og formelle metoder. Innenfor hver spesialiseringsretning tilbys et grunnleggende emne på 5 studiepoeng og minst ett fordypningsemne på 5 studiepoeng. Følgende tabell gir en oversikt over grunnleggende emner og fordypningsemner:

Spesialiseringsretning	Grunnleggende emner	Fordypningsemner
Nettverk	IKT610 Introduction to Mobile Fading Channels and Wireless Networks	IKT703 Mobile Fading Channels IKT700 Advanced Mobile Network and Service Architectures
Sikkerhet	IKT619 Information Security: Main Results and Research Topics	IKT701 Dynamics of Computer Security Incident Response Teams IKT702 Selected Topics in Security for Mobile Systems
Formelle metoder	IKT617 Formal Descriptions and Related Tools	IKT706 Using Semantics to Generate Code

Opplæringsdelen skal være på minst 30 studiepoeng. I tillegg kommer vitenskapsteori og etikk på minst 5 studiepoeng. Hver enkelt doktorgradsstudent må i opplæringsdelen ha minst ett emne fra hver spesialiseringsretning: minst ett fordypningsemne fra den retningen som vedkommende har valgt for forskningsarbeidet, og det grunnleggende emnet fra hver av de to andre retningene. Dermed vil 15 studiepoeng av opplæringsdelen bli hentet fra emnene i tabellen ovenfor. De resterende 15 studiepoeng bygges opp med avanserte spesialemer som ligger tett opp til forskningsoppgaven.

Det vil etter behov bli tilbudt følgende spesialemer:

Spesialiseringsretning	Spesialemer
Nettverk	Selected Topics in Mobile Communications – Propagation Modelling, Diversity Reception, and Performance Analysis (2 studiepoeng) Avanserte protokoller for mobilkommunikasjon (4 studiepoeng)
Sikkerhet	Quantum Communication and Cryptography (2 studiepoeng) Elliptic Curves and Cryptography (4 studiepoeng) Modelling and Analysis of Security Protocols (4 studiepoeng)
Formelle metoder	Abstractions for Mobile Computation (2 studiepoeng) Learning Automata in Security and Communications (4 studiepoeng) Modal and Multicontext Systems of Logic (4 studiepoeng) Research Directions in Context-Aware Computing (4 studiepoeng)

Høgskolen i Agder har en samarbeidsavtale om forskerutdanning med Aalborg Universitet. Dette universitetet tilbyr en rekke doktorgradsemner som kan være aktuelle å benytte som spesialemer i opplæringsdelen.

For øvrig kan ulike typer kurs, konferanser, seminarer o.l. av kortere varighet inngå i opplæringsdelen med inntil 10 studiepoeng. For poengberegning av aktiviteter som ikke har poengangivelse, benyttes som norm at en normal arbeidsuke inklusiv eksamen tilsvarer 1,5

studiepoeng. Slike aktiviteter må ha en vurdering med bestått/ikke bestått for å kunne brukes i opplæringsdelen. Følgende aktiviteter kan inngå:

a. *Forskerkurs*

Slike kurs kan omfatte en rekke ulike typer temaer med bestemte kravspesifikasjoner for å oppnå studiepoeng. De kjennetegnes med et intensivt opplegg uten godkjent vurderingsform slik det er krav om for grunnleggende emner, fordypningsemner og spesialemer med egen emnebeskrivelse. Sommerskole, nasjonale eller internasjonale forskerkurs kan inngå. En ukes intensivt kurs inklusiv eksamen tilsvarer 1,5 studiepoeng. Fakultetet kan godkjenne at en ukes intensivt kurs med etterfølgende individuell rapport gir 2 studiepoeng.

b. *Opphold ved eksterne institusjoner, normalt utenlandske*

Slike opphold kan gi studiepoeng hvis formålet er opplæring i bestemte metoder o.l. Oppholdet må dokumenteres med en skriftlig rapport. Det kan gis maksimalt 4 studiepoeng for slike opphold.

c. *Deltakelse i internasjonale konferanser*

Deltakelsen må innebære muntlig presentasjon av resultater fra egen forskning og følges opp av en rapport om konferansens innhold. Det kan gis 2 studiepoeng per konferanse, maksimalt 4 studiepoeng.

d. *Forelesning over oppgitt emne på seminar*

Emnet skal være oppgitt i god tid før forelesningen holdes, og det skal utarbeides forelesningsmanuskript. Det kan gis inntil 2 studiepoeng for slike forelesninger, maksimalt 4 studiepoeng.

Organisering. Undervisnings- og vurderingsformer

Doktorgradsprogrammet er normert til 3 år, men normal åremålsperiode for doktorgradsstipendiater er 4 år med 25 % pliktarbeid for fakultetet. Programmet er en forskerutdanning som består av en opplæringsdel på minimum 35 studiepoeng og en forskningsoppgave, doktoravhandlingen, som arbeidsmessig regnes til ca. 150 studiepoeng (2,5 års arbeid). Avhandlingen utarbeides under veiledning av to toppkvalifiserte fagpersoner. Undervisnings- og vurderingsformene framgår av de vedlagte emnebeskrivelsene. Nærmere omtale av doktorgradsprogrammet finnes også i *Utfyllende regler for ph.d.-graden i Mobile kommunikasjonssystemer: nettverk, sikkerhet og formelle metoder ved Høgskolen i Agder*, http://www.uia.no/no/portaler/forskning/ph_d_utdanning/dokumenter_documents

Undervisningsspråket vil til vanlig være engelsk.

Utenlandsopphold

Alle ph.d.-kandidater bør ha et utenlandsopphold ved et utenlandsk universitet med et anerkjent forskningsmiljø innen mobile kommunikasjonssystemer. Oppholdet kan være av ½-1 års varighet og skal fortrinnsvis gå til steder som er anbefalt av veilederne.

Forskning vil være det primære formålet med utenlandsoppholdet, men deler av opplæringsdelen kan også tas ved en utenlandsk institusjon. Bestått eksamen i emner kan gi fritak for tilsvarende obligatoriske emner i studieplanen og dermed inngå i opplæringsdelen. Bestått eksamen i spesialemer ved annen institusjon kan også inngå i opplæringsdelen. For øvrig kan det gis studiepoeng for forskerkurs m.m. som beskrevet ovenfor.

EMNEBESKRIVELSER

IKT610 Introduction to Mobile Fading Channels and Wireless Networks

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

Mobile Radio Communications (IKT500)

Random Variables and Stochastic Processes for Communication Engineering (IKT401)

Formål og innhold (Aim and contents)

Aim: To give candidates that have not specialised in wireless networks an overview and background information of main results, research questions and research methods.

The candidates shall be able to discuss wireless network issues and how these issues relate to their own specialization. After taking the course, the candidates should be able to apply their work within wireless contexts and to work together with specialists in wireless networks.

Structure: The course consists of two modules covering two important facets of the area.

Module A: This module gives an introduction to the modelling, analysis, and simulation of mobile fading channels. It provides a fundamental understanding of basic concepts used in the area of mobile fading channel modelling. The most important single-input single-output (SISO), and multiple-input multiple-output (MIMO) fading channels are treated. Besides knowledge of statistics, also basic knowledge of mobile communications and systems theory is assumed.

Contents:

- Introduction to mobile fading channels
- Review of random variables and stochastic processes
- Path loss models
- Frequency-nonselective fading channels (Rayleigh channels, Rice channels, Nakagami channels)
- Introduction to the theory of sum-of-sinusoids models
- Methods for the computation of the model parameters
- Frequency-selective fading channels (WSSUS models, DGUS models, COST 207 models)
- Modelling and simulation of MIMO channels
- Modelling and simulation of mobile-to-mobile channels

Module B (Wireless Network Simulation): The aim of the module is to generate and enhance deeper practical knowledge for mobile, wireless communications and their simulation.

Contents:

- understand common simulation techniques
- learn how to plan, set up, and run simulation
- interpret simulation results properly

Module B studies the impact of wireless communications systems on the performance of end-to-end applications. Examples of challenges are constantly changing wireless link quality, effects of local link layer error handling on end-to-end TCP/IP protocols, handling of user and device mobility, and adjusting to restricted resources on the terminal side.

Simulation techniques are introduced as one of three approaches to the performance analysis of a technical system. All three approaches, i.e., mathematical analysis, measurements in real systems and simulation, are introduced and their advantages and disadvantages are discussed. It is shown that in the area of communication networks, simulation provides a good trade-off between the advantages of mathematical analysis and measurements and is therefore employed quite often in practice.

Undervisning (Teaching)

Lectures:

Simulation of Wireless Communications, Lectures and Exercises (1 week)

Simulation projects on selected topics (1 week)

Litteratur (Literature)

- [1] M. Pätzold, *Mobile Fading Channels*. Chichester: John Wiley & Sons, February 2002.
- [2] M. Pätzold, *Mobile Fading Channels*. Agder University College, lecture notes, 200 pages, 2006.
- [3] R. Jain, *The Art of Computer Systems Performance Analysis*. Chichester: John Wiley & Sons, 1991, ISBN: 0471503363.
- [4] A. M. Law and W. D. Kelton, *Simulation Modeling and Analysis*. New York: McGraw-Hill, 2000, 3rd Edition, ISBN: 0070592926.
- [5] S. M. Ross, *Introduction to Probability and Statistics for Engineers and Scientists*. Elsevier Academic Press, 2004, 3rd Edition, ISBN: 0125980574.
- [6] The Network Simulator - ns-2, <http://www.isi.edu/nsnam/ns/>.

Eksamen (Examination)

Project, essay and oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig fakultet (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of Engineering and Science

IKT703 Mobile Fading Channels

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

Mobile Radio Communications (IKT500)

Random Variables and Stochastic Processes for Communication Engineering (IKT401)

Formål og innhold (Aim and contents)

Aim:

A precise knowledge of mobile radio channels is indispensable for the development, evaluation, and test of present and future mobile radio communication systems. After all, from digital modulation techniques over channel coding to network aspects, nearly all relevant components of mobile radio systems are determined by the propagation characteristics of the channel. This lecture deals with the modelling, analysis, and simulation of mobile fading channels. It provides a fundamental understanding of many issues that are currently being investigated in the area of mobile fading channel modelling. Several classes of single-input single-output (SISO), and multiple-input multiple-output (MIMO) fading channels are treated in detail. Furthermore, the description of efficient methods for the simulation of mobile radio channels is in the centre of attention. Besides knowledge of statistics, also basic knowledge of mobile communications and systems theory is assumed.

After taking the course, the candidates shall be able to model, analyse and simulate channels of various kinds. Furthermore, the candidates will understand the theory behind channel modeling and simulation.

Contents:

- Review of random variables and stochastic processes
- Fundamentals of stochastic and deterministic channel models
- Frequency-nonselctive fading channels (Rayleigh channels, Rice channels, generalized Rice channels, Nakagami channels, various types of Suzuki channels, classical and modified Loo model)
- Frequency-selective fading channels (WSSUS models, DGUS models, COST 207 models)
- MIMO fading channels
- Methods for the computation of the model parameters
- Design of fast channel simulators
- Test and performance analysis of channel simulators
- Modelling and simulation of mobile-to-mobile channels
- Modelling and simulation of shadowing
- Design of bit and block error models.

Undervisning (Teaching)

Lecture

Litteratur (Literature)

[1] M. Pätzold, [*Mobile Fading Channels*](#). Chichester: John Wiley & Sons, February 2002.

[2] M. Pätzold, *Mobile Fading Channels*. Agder University College, lecture notes, 640 pages, 2006.

Eksamen (Examination)

Oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig fakultet (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of Engineering and Science

IKT700 Advanced Mobile Network and Service Architectures

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

IKT610 or similar background

Formål og innhold (Aim and content)

The mobile industry is moving from a highly optimized infrastructure with few services such as voice, SMS, and MMS to a more sophisticated, service driven, and flexible architecture.

The course starts with a high level, operator centric business model as a basis for the requirements driving the functional architecture within the operator domain, as well as requirements arising from interconnection with other domains (e.g., user/user terminal, peer operators, access service providers, application & content providers).

Students will be introduced to a range of relevant mobile services architectures, standards and solutions, e.g., from 3GPP, OMA, OASIS, Liberty Alliance, IETF and W3C.

To complete the overall end-to-end view, we look into the technology of today's and tomorrow's mobile devices. Know-how about important upcoming technology trends and limitations is important to create powerful applications.

After taking the course, the candidates shall be able to understand the driving forces behind the changes in the current mobile communications world. Furthermore, the candidates will know relevant mobile services architectures and technologies.

Undervisning (Teaching)

Mobile End-to-End Service Layer Architectures (1 week)

Mobile Device Technology (1 week)

Project Study (1 week)

Litteratur (Literature)

Ericsson Review Magazine, <http://www.ericsson.com/about/publications/review/index.shtml>

“3rd Generation Partnership Project” (3GPP), <http://www.3gpp.org/Default.htm>

“Open Mobile Alliance”, <http://www.openmobilealliance.org/index.html>

“Organization for the Advancement of Structured Information Standards” (OASIS), <http://www.oasis-open.org>

“Liberty Alliance”, <http://www.projectliberty.org/>

“OMA Device Management Working Group”,

http://www.openmobilealliance.org/tech/wg_committees/dm.html

IETF, <http://www.ietf.org/>

Eksamen (Examination)

Project, essay and oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig fakultet (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of Engineering and Science

IKT619 Information Security: Main Results and Research Topics

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

MA408, IKT402, IKT409, IKT501 or similar background

Formål og innhold (Aim and contents)

Aim:

To give candidates that have not specialised in security an overview and background information of main results, research questions and research methods within security in mobile communication systems.

The candidates shall be able to discuss security issues and how these issues relate to their own specialization. After taking the course, the candidates should be able to work with security-related problems of mobile communication and computing related to their own specialization.

Content:

The course will cover selected topics among the following:

- Cryptography: classic cryptosystems, symmetric key cryptography, public key cryptography, hash functions, random numbers, information hiding, and cryptanalysis
- Access control: authentication and authorization, password based security, ACLs and capabilities, multilevel and multilateral security, Bell-LaPadula and Biba's models, RBAC
- Protocols: simple authentication protocols, session keys, perfect forward secrecy, timestamps, SSL, IPSec, Kerberos, and GSM
- Software: flaws and malware, buffer overflows, viruses and worms
- Secure mobile commerce
- Generic archetypes in mobile security
- Some other selected areas of security will be also considered (vary from year to year)

The actual content will vary from year to year.

Undervisning (Teaching)

Lectures, guided self-study, paper/article writing tasks and project work

Litteratur (Literature)

Information Security. Mark Stamp, Publisher: Wiley Interscience, 2005, 390 pages.

Chris J. Mitchell (ed.) Security for Mobility. Publisher: Institution of Electrical Engineers; 2003, 464 pages

Some journal and conference publications (will vary from year to year)

Eksamen (Examination)

Essay and oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig fakultet (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of Engineering and Science

IKT701 Dynamics of Computer Security Incident Response Teams

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

IKT619 or similar background

Formål og innhold (Aim and content)

Aim: The course provides insight into current research topics in CSIRTs.

The candidates shall be able to do research work related to incident response handling, CSIRTs and IDS (Intrusion Detection Systems)

Content: In-depth review of current implementations of Computer Security Incident Response Teams (CSIRTs). Model-based analysis of selected CSIRTs based on cases from literature and/or organizations (if available). The role of CSIRTs as emergent Cyber Security Reporting Systems.

Undervisning (Teaching)

Lectures, seminars, guided self-study, system dynamics modelling, writing assignments

Litteratur (Literature)

Georgia Killcrece, Klaus-Peter Kossakowski, Robin Ruefle, and Mark Zajicek. 2003.

Organizational Models for Computer Security Incident Response Teams (CSIRTs). Carnegie Mellon University, Software Engineering Institute

<http://www.sei.cmu.edu/pub/documents/03.reports/pdf/03hb001.pdf>.

Georgia Killcrece, Klaus-Peter Kossakowski, Robin Ruefle, and Mark Zajicek. 2003. *State of the practice of Computer Security Incident Response Teams (CSIRTs)*. Carnegie Mellon University, Software Engineering Institute

<http://www.cert.org/archive/pdf/03tr001.pdf>.

Sawicka, Agata, Jose J. Gonzalez, and Ying Qian. 2005. *Managing a CSIRT*. The 23rd International Conference of the System Dynamics Society, Boston, USA

Wiik, Johannes, Jose J Gonzalez, and Klaus-Peter Kossakowski. 2005. *Limits to effectiveness of Computer Security Incident Response Teams (CSIRTs)*. The 23rd International Conference of the System Dynamics Society, Boston, MA.

Eksamen (Examination)

Approved exercises and oral presentation. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig fakultet (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of engineering and science

IKT702 Selected Topics in Security for Mobile Systems

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

IKT619 or similar background

Formål og innhold (Aim and content)

Aim:

The course provides understanding of the main technologies, mechanisms and architectural approaches to security for both current and future mobile systems. After taking the course, the candidate should be able to work with security-related problems of mobile communication and computing.

Content:

The course will cover selected topics among the following:

- PKI in mobile systems. The smartcard as a mobile device. Secure mobile tokens
- Architectural approaches and mechanisms providing access security in mobile networks
- Security in personal area networks
- Software security issues arising in future mobile communication systems

The actual content will vary from year to year.

Undervisning (Teaching)

Lectures, self study and project work

Litteratur (Literature)

Chris J. Mitchell (ed.) Security for Mobility. Publisher: Institution of Electrical Engineers; 2003, 464 pages.

V. Niemi and K. Nyberg, UMTS Security, John Wiley & Sons, 2003, 288 pages.

Some journal and conference publications (will vary from year to year)

Eksamen (Examination)

Oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig fakultet (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of engineering and science

IKT617 Formal Descriptions and Related Tools

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Formål og innhold (Aim and content)

Aim:

To give candidates that have not specialised in formal methods and software engineering an overview of research questions and research methods in formal methods and software engineering as they are applied to mobile communication systems.

The candidates shall be able to discuss research issues from this field and how these issues relate to their own specialization.

Content:

- 1) Modelling and meta-modelling for describing a domain precisely: approach, tools, state of the art
- 2) Notations, architectures and models for describing and analysing distributed communicating distributed systems, e.g. process algebras, mobile calculi, event-based vs. state-based formalisms
- 3) Notations, architectures and models for describing and analysing languages, e.g. abstract state machines, object constraint language, MOF, grammars. This is embedded in the use of a meta-modelling environment
- 4) Notations, architectures and models for extracting and formalising content, e.g. web mining, pattern recognition, statistical techniques, machine learning

Undervisning (Teaching)

The course is given as 2 hour lectures per week and 10 hours own work of the students.

Litteratur (Literature)

Tony Clark, Andy Evans, Paul Sammut, James Willans: Applied Metamodeling: A Foundation for Language-Driven Development, Xactium, 2004

Egon Börger, Robert Stärk: Abstract State Machines, Springer, 2003

Several white papers on www.omg.org

Kleppe, A. and Warmer, J.: MDA Explained, Addison Wesley 2003

Mellor, S.: Executable UML, Addison Wesley 2003

Eksamen (Examination)

Project, essay and oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig avdeling (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of Engineering and Science

IKT706 Using Semantics to Generate Code

5 ECTS

Grimstad

Studium (Study)

PhD programme in Mobile Communication Systems

Anbefalte forkunnskaper (Recommended previous knowledge)

IKT404, IKT407, IKT408, IKT502, IKT504, IKT617 or similar background

Formål og innhold (Aim and content)

Aim:

The course gives an overview of the use of formal notations to define semantics for languages. After taking the course, the candidates shall be able to specify and implement transformations between several languages and notations.

Content:

The course provides an overview of modern ways to define semantics of modelling languages and language constructs and how to use this for generating modelling tools.

It will cover all aspects of modelling languages, i.e. structure in terms of abstract grammars and MOF-metamodels, static constraints using logic in the sense of PC1 or OCL, representation in terms of graphics and textual grammars, and dynamic behaviour described using denotational and operational techniques.

Undervisning (Teaching)

The course is given as 2 hour lectures per week and 10 hours own work of the students.

Litteratur (Literature)

Jack Greenfield, Keith Short, Steve Cook, Stuart Kent, John Crupi: Software Factories: Assembling Applications with Patterns, Models, Frameworks, and Tools

Prinz, Andreas: Formal Semantics for SDL, Habilitation thesis, Humboldt-University, Berlin, 2001

Martin Große-Rohde: Semantic Integration of Heterogeneous Software Specifications, Springer 2004

Ileana Ober, Harmonizing Design Languages with Object-Oriented Extensions and an Executable Semantics. PhD thesis, Institut National Polytechnique de Toulouse, April 2001

Material from www.pats.no

Eksamen (Examination)

Project, essay and oral examination. Approved/not approved

Åpent for privatister (Open for external candidates)

Yes

Ansvarlig avdeling (Responsible faculty)

Fakultet for teknologi og realfag – Faculty of Engineering and Science