The northernmost University of Technology in Scandinavia
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COURSE MEMO

FPD002 Knowledge Enabled Engineering (7,5 Hp/ECTS)

TEACHING TEAM

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COURSE OVERVIEW

Effective product development depends on well-managed knowledge throughout the whole life-cycle of the product. This course gives an introduction to methods and tools for how knowledge can be shared effectively within and between organisations and how it can be used to automate product development activities e.g. business process flows and engineering design. The course covers a range of knowledge engineering processes and practices, targeting both capture, formalization and implementation of (mainly) explicit knowledge and lightweight technologies and methods to support socio-technical knowledge sharing processes dealing with (mainly) tacit knowledge. Methods for assessing the maturity of knowledge in product development decision-making are also included. The course assignment is to conduct a company survey and either write a paper or a short report including the creation of a computer application.

Course aim

After the course the participants will grow a basic understanding of how knowledge enabled engineering methods and technologies can be used to support effective sharing of both formal/structured and informal/unstructured knowledge throughout the product development process.

Course goals

The goal with this course is that the student should be able to:

- Understand and describe the fundamentals of engineering knowledge management
- Understand and describe the advantages and disadvantages of a bottom-up approach to knowledge sharing, supported by lightweight, social computing technologies
- Understand and describe the advantages and disadvantages of a top-down approach to knowledge sharing, including the ability to create basic engineering design automation applications
- Justify the adoption of knowledge sharing methods and tools to support given collaborative design tasks, suggesting suitable approaches to deal with knowledge sharing effectively in different product development situations.

PRACTICAL DETAILS

Examination

The course includes one individual preparatory assignment, one team/individual assignment as well as active participation during the two course meetings. Read the separate sections on assignments below. Grading is Pass (G) or Fail (U).

Attendance

Your attendance is expected at both course meetings. We believe that your ability to do well in the course depends largely on your participation in lectures and exercises.

Deadlines

When a deadline is missed extra homework may be needed. If you believe that you have particularly strong reasons for not meeting a deadline, talk to the course coordinator before the deadline to negotiate a new deadline and possible homework assignments.

Language

The course language is English. If all participants speak and understand Swedish, the lecturers might choose to hold their lectures in Swedish. All lecture material will be in English.

Plagiarism

All assignments will be checked with the Ephorus plagiarism controller software. All cases of academic misconduct will be reported.

Recommended literature

Material provided in Luleå consisting of training material and scientific papers of interest for the course. Material is free of charge.

Referencing

To avoid plagiarism, make sure that you reference the source of the ideas and information that you have used to complete the assignments.

Location

The meetings take place at Luleå University of Technology at Campus Porsön in Luleå. If you need suggestions of suitable hotels please contact the course coordinator.

Questions

You are very welcome to contact any member of the teaching team if you have any questions throughout the duration of this course. Since the door to our office space is locked, please schedule a time with us via e-mail. In case of more urgent matters, please call the course coordinator.

PREPARATORY ASSIGNMENT

Each participant shall read one PhD thesis within the course subject and write a one page analysis stating sweet spots and weak spots. Send the analysis to the course coordinator on **April 19** at the latest. Select a thesis from the following:

- Bertoni, M. (2008) A Target Cascading Methodology for Engineering Knowledge Management systems, PhD thesis, Politecnico di Milano,
- Boart, P., (2007), The enabling of product information in the conceptual phase, PhD thesis, Luleå University of Technology
- Cederfeldt, M., (2007), Planning design automation: A structured method and supporting tools, PhD thesis, Chalmers.
- Elgh, F., (2007), Computer-Supported Design for Producibility: Principles and Models for System Realisation and Utilisation, PhD thesis, Chalmers.
- Holst, M (2007) Enabling boundary-crossing collaboration for innovation: issues for collaborative working environments, PhD thesis, Luleå University of Technology
- Johansson, C., (2009), Knowledge maturity as decision support in stage-gate product development, PhD thesis, Luleå University of Technology.
- Larsson, A., (2005), Engineering Know-Who: Why Social Connectedness Matters to Global Design Teams, PhD thesis, Luleå University of Technology.
- Malvius, D (2009) Integrated information management in complex product development, PhD thesis, Royal Institute of Technology.
- Nergård, H., (2009), Knowledge engineering models as experience carriers, PhD thesis, Luleå University of Technology.
- Pulli M., (2004), Engineering knowledge management system evolution, PhD thesis, University of Parma *(Contact the University of Parma to get a copy)*
- Rundquist (2009). Outsourcing and knowledge integration in new product development, PhD Thesis, Luleå University of Technology.
- Sandberg, M., (2007), Design for manufacturing - methods and applications using knowledge engineering, PhD thesis, Luleå University of Technology.
- Stolt, R., (2008), CAD-model parsing for automated design and design evaluation, PhD thesis, Chalmers.
- Wikberg, P. (2007) Eliciting knowledge from experts in modeling of complex systems managing variation and interactions, PhD thesis, Linköping University.

All theses (except Pulli's) can be downloaded from: http://staff.www.ltu.se/~marsan/
Right click FPD002_thesis.zip and save to your hard drive. Extract using e.g. WinRAR or 7zip

It is also possible to contact the coordinator and make an own suggestion.

MAIN ASSIGNMENT

All participants will make a survey, or similar, at their partner companies (one or more) to find out how knowledge currently is managed in terms of processes, tools and methods used. Example questions:

- Which process does the company follow for engineering knowledge management?
- How does the company perform engineering design automation?
- How does the company assess knowledge maturity at stage gates?
- Which supporting technologies are currently available to assist engineers in managing explicit and tacit knowledge?
- How does the company ensure that lessons learned are captured and reused?
- How does the company ensure that design rationale can be traced?

Based on these findings the participants discuss how the company could change for the better. If there are other ideas coupled to knowledge enabled engineering, especially the ones that would greater benefit the participant's research project, please discuss them with the teaching team. The assignment can be made individually or in teams of maximum three people. The assignments will be orally presented at the second meeting. The papers and reports will be reviewed both by the teaching team and by the other course participants. There are two assignment options:

Option 1: Write paper (8-12 pages)

Option 1 implies conducting the survey, analysing the results, proposing a change and discussing pros and cons of the proposal. Arguments should be supported through extensive referencing of relevant literature. The paper should be structured according to the guidelines provided by an international, peer-reviewed journal or conference of your own choice.

Option 2: Write report (4-5 pages) and create computer application

Option 2 implies conducting the survey, analysing the results, proposing a change and creating a computer application that will enable a change for the company. The short report contains a description of the survey, results analysis and change proposal including computer application.

MAIN ASSIGNMENT DATES

As the deadline schedule is tight it is recommended to start the assignment before the first meeting.

- Draft paper/report submission — May 17, 2010
- Review due — May 24, 2010
- Final paper/report submission — June 7, 2010
- Presentation of paper, reports and applications — June 9, 2010

MEETINGS

FIRST

The first meeting contains both theoretical introductions and practical exercises regarding engineering knowledge management, Engineering 2.0 and design automation. The course assignment is also introduced and an industrial guest speaker will participate.

Starts: April 27, 2010, at 08.30 in E206 at Luleå University of Technology, Campus Porsön, Luleå
Ends: April 29, 2010, at 15.00

SECOND

The second meeting features the concept of knowledge maturity and other theoretical perspectives on knowledge enabled engineering, followed by a practical exercise that will connect to all theories and approaches introduced during the course. The main course assignment will also be presented orally.

Starts: June 8, 2010, at 10.00 in E206 at Luleå University of Technology, Campus Porsön, Luleå
Ends: June 9, 2010, at 15.00