Blekinge Institute of Technology
Department of Mechanical Engineering

Revision: 2
Reg.no: BTH-4.1.14-285-2020

COURSE SYLLABUS

Knowledge Enabled Engineering

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7.5 credits (7,5 högskolepoäng)

Course code: MT2570
Main field of study: Mechanical Engineering
Disciplinary domain: Technology
Education level: Second cycle
Specialization: A1N - Second cycle, has only first cycle course/s as entry requirements

Subject area: Mechanical Engineering
Language of instruction: English
Applies from: 2020-08-31
Approved: 2020-03-01

1. Decision

This course is established by Dean 2020-02-28. The course syllabus is approved by Head of Department of Mechanical Engineering 2020-03-01 and applies from 2020-08-31.

2. Entry requirements

Admission to the course requires 150 completed credits, of which 60 credits must come from an MSc Engineering program, including completed course of minimum 6 credits in Computer Aided Design (Computer Aided Engineering). Additionally it requires taken courses of minimum 6 credits in Product Development Methodology (Innovative and Sustainable Product Development) and Mathematical Statistics (6 credits).

3. Objective and content

3.1 Objective

The aim of the course is to raise participants' understanding of the importance of information and knowledge sharing in modern product and service development activities. Knowledge Enabled Engineering (KEE) is an umbrella term that describes practices, methods and technologies for engineering knowledge management, and their relevance to ensure timeliness and quality of the engineering work. KEE specifically studies how engineering knowledge support shall be used to take better decisions along the different steps of the design process.

3.2 Content

Nowadays, the development of complex product-service combinations pushes engineers to work more concurrently: design activities overlaps and bilateral interactions across disciplines (e.g., to share information about how a product is used, maintained, dismissed or recycled) become increasingly more common and frequent. Knowledge management systems must then be introduced to exploit information and knowledge not readily available in a traditional product development context, so to improve quality, as well as reduce lead time and cost of the development process.
The course covers planning, development and realization of enablers for managing knowledge in engineering teams and organization, featuring a strong coupling with research. It addresses topics such as:

- Knowledge management theory.
- Design automation and Knowledge Based Engineering.
- Methods and tools for design rationale capturing.
- Enterprise modelling and techniques.
- Methods and tools for the simulation of industrial processes.

4. Learning outcomes

The following learning outcomes are examined in the course:

4.1 Knowledge and understanding

On completion of the course, the student will be able to:

- describe and reflect on the different types of engineering knowledge support and their relevance for design decision making;
- justify the use of methods and tools for engineering knowledge support in the innovation process;
- set requirements for an engineering knowledge management system.

4.2 Competence and skills

On completion of the course, the student will be able to:

- analyse the need for knowledge of engineering teams in different design situations;
- describe phenomena and models for engineering knowledge management in the organization;
- apply methods and tools to capture knowledge about products and technologies (e.g., Knowledge Based Engineering);
- apply methods and tools for capturing design rationale and argumentations (e.g., IBIS and Design Rationale Editor);
- apply methods and tools to capture knowledge about processes (e.g., IDEF and Business Process Modelling Notation);
- apply simulation methods and tools in relevant design episodes;
- plan and perform a team-based design project;
- verbally and in writing present and discuss their findings and conclusions, in dialogue with other students.

4.3 Judgement and approach

On completion of the course, the student will be able to:

- assess and discuss how chosen methods and approaches for engineering knowledge support relate to industrial state-of-practice and academic state-of-the-art;
- evaluate, assess, and demonstrate the project outcome benefits, with respect to the success criteria of a KEE project.

5. Learning activities

Lectures and tutorials will provide depth in the subject: here the students will learn about concepts and theories relevant to the acquisition, development and dissemination of knowledge in engineering teams. Beside them, individual and group exercises are held, where students are given the opportunity to actively perform, analyse and present their work under lectured supervision.

The course project (Project Assignment) features small teams and stretches over the entire period of study. This is conducted in collaboration with selected company partners and gives students the opportunity to apply their theoretical knowledge and skills in 'real-life' development projects. Experience from the project work are shared during presentation events in the classroom, while peer evaluation and group coaching (feed forward) are used to stimulate critical reflection on process and the results. The latter are gathered in a written report, which constitutes the basis for grading.

Individual written assignments aim at further stimulating students in learning about methods and tools for engineering knowledge management, through solving problems found in trigger material.

6. Assessment and grading

Modes of examinations of the course

Code	Module	Credits	Grade
2010	Writtten Assignment	5 credits	AF
2020	Project assignment	2.5 credits	AF

The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Fail, supplementation required, F Fail.

The course-PM for each course revision should include the assessment criteria and make explicit in which modes of examination that the learning outcomes are assessed.

An examiner can, after consulting the Disability Advisor at BTH, decide on a customized examination form for a student with a long-term disability to be provided with an examination equivalent to one given to a student who is not disabled.

7. Course evaluation

The course evaluation should be carried out in line with BTH:s course evaluation template and process.

8. Restrictions regarding degree

The course can form part of a degree but not together with another course the content of which completely or partly corresponds with the contents of this course.

9. Course literature and other materials of instruction

The course is based on theoretical and working materials (scientific articles and industrial case studies) that is referred to as a 'workbook', which is distributed to students during the course.

Reference literature:

- Prasad, B. (1996). Concurrent Engineering Fundamentals, Vol.1, Prentice Hall, Upper Suddle River, NJ, 478p.
- Davenport, T.H. and Prusak, L. (1998). Working Knowledge: How Organisations Manage What They Know, Harvard Business Press, Boston.
- Nonaka, I. and H. Takeuchi.1995. The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University, New York.
- Noble, D., & Rittel, H. W. (1988). Issue-based information systems for design. Computing in Design Education (ACADIA

Conference Proceedings) Ann Arbor (Michigan / USA) 28-30 October 1988, pp. 275-286
• Bracewell, R., Wallace, K., Moss, M., & Knott, D. (2009). Capturing design rationale. Computer-Aided Design, 41(3), 173-186.
• National Institute of Standards and Technology (1993) Integration Definition for Function Modeling (IDEF0). Available at: https://www.idef.com/wp-content/uploads/2016/02/idef0.pdf
• Pedgen, C.D., Sturrock, D.T. (2014) Rapid Modeling Solutions: Introduction to Simulation and Simio. ISBN-10: 1492967130. Available on request at: https://www.simio.com/about-simio/introduction-to-simio.phpe

10. Additional information

This course replaces the course MT2557