



KTH Electrical Engineering



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## **COURSE PM EI2600 Innovations and Entrepreneurship in Electric Power Engineering, 6 credits, academic year 2021/2022.**

Welcome to the course on Innovations and Entrepreneurship in Electric Power Engineering!

### **PREREQUIREMENTS and ELIGIBILITY**

You must be a student enrolled in the program Innovative Energy Technology and one of the tracks SENS (Smart Electrical Networks and Systems) or EFCS (Energy For Smart Cities).

### **COURSE RESPONSIBLE**

Lecturer and examiner: Professor Hans Edin, Teknikringen 31, 4<sup>th</sup> floor, room 1424,  
phone 08 - 790 7639, e-mail: [edin@kth.se](mailto:edin@kth.se)

### **OBJECTIVES**

This course in *innovation and entrepreneurship in electric power engineering* focus on the process from idea or invention to a product, process or service that is of such a value that it can reach the commercial market - that is an innovation.

The main focus in the course is to analyse different innovation processes from particular success and non-success development projects in the area of electric power engineering. Furthermore, the course focus on applying common techniques for analysis of the process that is required to bring a new idea or invention to a potential innovation that reach the market.

A further aim is to provide training on skills that will help in innovation work as well as in developing entrepreneurial skills.

### **LEARNING OUTCOMES**

After completion of the course the student should be able to:

- analyse the evolution of the existing power system and the processes behind the key inventions and their development into innovative products that now are well-established



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- analyse the impact of different stakeholders such as regulators, utilities, manufacturers, end customers etc. have on the market for products and services in the field of electric power engineering
- analyse the impact of the electricity price on investments.
- describe how improvements in material properties, computational models etc affects the innovation process.
- identify key technological inventions and development in other areas that leads to innovations in the electric power area.
- describe the necessary steps that needs to be undertaken in order to place a new or improved product on the market.
- develop a simple business plan
- describe the process of patenting an invention.

## **COURSE ORGANISATION AND EXAMINATION**

The course consists of ~12 lectures (2 x 45 min), including 3 scheduled supervision events and 3 mandatory seminars/poster session where the students in groups or individually present the results from their case studies or assignments.

The course grade is Pass or Fail.

### **Lectures**

The lectures will provide an introduction to certain topics and an introduction to the literature. It is a clear aim of the course to attempt to bridge the gap between classical engineering topics in the area of electric power engineering and the concepts, processes, strategies, etc. that cause an idea to become an innovation.

The 2h lectures will be split on pure talk from the lecturer (about 1h) and then active dialogues/group exercises around the topic scheduled for the day (about 1h).

Preparations by reading the proposed literature is strongly recommended.

Note that there may be other technical lectures in other courses that may be suitable to attend during the course.

The on-going Covid 19 pandemic situation will affect how the lectures can be executed. Normally lectures has to be in a physical room, but that may not work due to the restrictions we have. We will start with a hybrid variant and then we will see how we can proceed.



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## Examination

The examination consists of three assignments/ projects/case studies.

Assignment 1 and 2 are performed as projects in groups of two-three persons, Project 3 is an individual project. The analysis of the case should be documented in a report of 2500 (min) – 3500 (max) words. The results should also be presented in a poster presentation by the group in a mandatory seminar.

The following projects/assignment/cases will be treated:

1. Project 1 Case: Material related innovations in electric power area. **Deadline: Thursday 211007, 08:00. Presented in the seminar on: Thursday Oct. 7, 15:00-17:00+ in Sten Velande/Zoom.**
2. Project 2 Case: Innovations related to sustainability, efficiency, reduced emissions, renewable energy, optimisation. **Deadline: Thursday 211125, 08:00. Presented in the seminar on: Thursday 201125, 15:00-17:00 in Sten Velande.**
3. Project 3. (Individual) Business Case: A product/service/etc. of your own. Report + poster deadline: **Monday 211210, 08:00. Presented in a poster session: Some late afternoon/evening in mid December 2021. Suggestion is to have it on 211215 15-17. Best poster will be awarded. Peer-review comment should be given to report as well as to poster.**

## Formally the credits will register according to

INL1 - Assignment 1, 1.5, grade scale: P, F

INL2 - Assignment 2, 1.5, grade scale: P, F

INL3 - Assignment 3, 1.5, grade scale: P, F

SEM1 - Seminars, 1.5, grade scale: P, F

## LITERATURE

The course literature consists of:

The two books below overlap quite much and no need to buy both.

T&DI: John Bessant and Joe Tidd, Innovation and Entrepreneurship, 3<sup>rd</sup> ed., 2015, Wiley.

T&DII: Joe Tidd and John Bessant, “Managing Innovation,- Integrating Technological, Market and Organizational Change”, Wiley, 6<sup>th</sup> ed. 2018

T&DIII: The 5<sup>th</sup> ed is available on-line at KTH and is good enough



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[https://learning.oreilly.com/library/view/managing-innovation-integrating/9781118360637/?sso\\_link=yes&sso\\_link\\_from=kungliga-tekniska-hogskolan](https://learning.oreilly.com/library/view/managing-innovation-integrating/9781118360637/?sso_link=yes&sso_link_from=kungliga-tekniska-hogskolan)

A number of articles/supplementary reading will be distributed during the course.

Another useful book about the basics is

M. A. Schilling, “Strategic Management of Technological Innovation”, 3<sup>rd</sup> ed. McGraw-Hill

A good book on the relations between materials and innovations is:

Gessinger, G. H , Materials and innovative product developmen: using common sense / Gernot H. Gessinger ISBN 0-08-087820-2 Burlington, MA : Butterworth-Heinemann, 2009,

A simple book on business can be good to read, e.g.

Josh Kaufman, “The personal MBA – A world class business education in a single volume”

The books can be purchased on any internet bookstore, all other material will be put on “Canvas”.

## PARTICIPATING TEACHERS

Teacher	Abbr.	Phone 08-790####	Room *) number	Part
Hans Edin <a href="mailto:edin@kth.se">edin@kth.se</a> (Examiner)	HE	7639	Teknikringen 31, 4 <sup>th</sup> floor	Lectures, lessons, Projects 1-2
Patrik Hilber <a href="mailto:hilber@kth.se">hilber@kth.se</a>	PH	7772	Teknikringen 31, 4 <sup>th</sup> floor	Lectures on Business Creation Project 3

## HOMEPAGE

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## COURSE EVALUATION

After the course, an on-line questionnaire will be distributed.

A course evaluation meeting will be set-up directly after the course is completed.



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## **CODE OF HONOUR:**

Each student has to read and understand the Code of honour:

[https://www.kth.se/polopoly\\_fs/1.919802.1566304651!/Code%20of%20honour%20for%20students%20and%20teachers%20EECS.pdf](https://www.kth.se/polopoly_fs/1.919802.1566304651!/Code%20of%20honour%20for%20students%20and%20teachers%20EECS.pdf)

Stockholm 2021-08-27

Hans Edin



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## APPENDIX 1 - Course schedule Innovation and Entrepreneurship in Electric Power Engineering, EI2600, 2020/21

Type	Subject	Day	Hour	Place	Teacher
Lec. 1	Course introduction.  Group exercise: Innovations in Power Systems	Mon 30/8	15 - 17	Sten Velander/ zoom	HE
Lec. 2	Creativity, Sources of innovation  Literature: T&D:I, Chapter 1 and Chapter 6. (T&D:II and T&D:III: Chapter 5)	Mon 6/9	10 – 12	Sten Velander/ zoom	HE
Lec. 3	Searching for opportunities/strategies for innovation. Innovation networks and frameworks.  Literature:  T&D:I, Chapter 7,  T&D:II, Chapter 6 & 7, T&D:III , Chapter 6.	Mon 13/9	13 – 15	Sten Velander/ zoom	HE
Lec. 4	Developing an innovation strategy. Building an innovative organization. Leadership and Team buiding. Exploiting networks  Project 1 introduction.  Literature:  T&D:I,Chapter 8&9 T&D:II, III: Chapter 3&4	Wen 15/9	10-12	Sten Velander/ zoom	HE



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Lec. 5	<p>8-10 Social Innovation. Innovation, Globalization and Development. National Systems of Innovation.</p> <p>T&amp;DI : Chapter 2, 3</p> <p>T&amp;DII Chapter 14, T&amp;DIII N/A</p> <p>10-11 Guest lecture from KTH Innovation – Tom Magnergård</p> <p>11-12 Wrap up/spare time</p>	Mon 27/9	8-12	Sten Velander/ zoom	HE
Sup. 1	Supervision Project 1	Mon 4/10	11-12	Sten Velander/ zoom	HE
Sem. 1	Seminar Project 1 Group presentations	Thu 7/10	15-17+ (end time depends on number of student groups)	Sten Velander/ zoom	HE
Lec. 6	<p>Open innovation and collaborations.</p> <p>Literature: T&amp;DI Chapter 7</p> <p>T&amp;DII Chapter 11</p> <p>T&amp;DIII Chapter 10</p> <p>Project 2 introduction.</p>	Mon 11/10	10 - 12	Sten Velander/ zoom	HE
Lec 7	<p>Developing/creating new products and services (service innovation)</p> <p>Literature:</p> <p>T&amp;DI Chapter 11</p> <p>T&amp;DII, Chapter 10:</p> <p>T&amp;DIII, Chapter 9:</p>	Wen 13/10	10 – 12	Sten Velander/ zoom	HE
Lec. 8	Guest lecture: Neeraj Gupta, Formulate IP- Intellectual property rights.	Mon 1/11	15 - 17	Sten Velander/ zoom	HE



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Sup. 2	Supervision Project 2	Mon 8/11	14-15	Sten Velander/ zoom	HE
Lec. 9	Project 3 introduction. Your own product/service etc  Developing new ventures Pt. 1 – Creating a business plan.  Literature: T&BI: Chapter 12  T&BII: Chapter 12  T&BIII: Chapter 11	Mon 15/11	10 - 12	Sten Velander/ zoom	PH
Lec. 10	Developing new ventures Pt. 2 – Financing  Literature:  T&BI: Chapter 12-14, 16,17: Creating new ventures, etc  T&BII: Chapter 12,13  T&BIII: Chapter 11-13	Mon 22/11	10 - 12	Sten Velander/ zoom	PH
Sem. 2	Project Seminar	Thu 25/11	15-17+	Sten Velander/ zoom	HE
Lec. 11	Guest lecture: TBD	Mon 29/11	10 – 12	Sten Velander/ zoom	HE
Sup. 2	Supervision Project 3	Fri 3/12	14-15	Sten Velander/ zoom	PH
Lec. 12	Course summing up lecture	Mon 6/12	10 -12	Sten Velander/ zoom	HE
Sem. 3.	Poster session Project 3	TBD Tentatively Wen 15/2	15-17	Lunch hall TR31-33	HE/PH