

STUDY GUIDE (FTVFM38)

Version 2023-09-05 (version 3)

Theory of science and research methodology, 4 hec

Vetenskapsteori och forskningsmetodik, 4 högskolepoäng

Introduction

This course aims at providing a foundation in theory of science and research methodology for all doctoral students admitted to third-cycle programmes at School of Engineering, Jönköping University. Traditional scientific traditions relevant to the field industrial product realisation are presented, together with a number of research methods. The course also includes fundamentals in research quality and discussions on possibilities and limitations of science.

The course includes a brief common part concerning theory of science and research methods, and a possibility for each student to deepen their studies into the most relevant method/s for their own research project.

Learning outcome

On completion of the course the student should:

Knowledge and understanding

- demonstrate basic understanding of various scientific traditions relevant to the field industrial product realisation
- demonstrate deeper knowledge of scientific methods in general and of methods in the specific field of research in particular

Skills and abilities

- demonstrate an ability to identify and formulate issues and to plan with appropriate methods a limited research task

Judgement and approach

- demonstrate insight into quality in research
- demonstrate insight into the possibilities and limitations of science

Content

The course includes:

- Basics within theory of science
- Different research designs
- Case study, design science/design research, experiment, action/interactive research, modelling/simulation, etc. based on the needs in the group
- Techniques for data collection (of empirical material)
- Data management
- Quality in research

Type of instruction

Lecture and seminars. Teaching is conducted in English or Swedish dependent on the requirements among the participants.

Prerequisites

Admitted to third-cycle programme or equivalent.

Examination and grades

The course is graded Fail or Pass. Examination includes oral and written parts within two assignments, of which one is individual and one is a group assignment.

Name of the test	Value	Grading
Assignments	4 hec	U/G

Assignment 1: Specialisation on selected research method

The students are responsible for a seminar where a selected research method is addressed in depth. The preparation is carried out in small groups, formed based on research interest/research questions. A detailed description of what to include in the seminar is handed out separately. The result is presented at a seminar.

Assignment 2: Method section for licentiate thesis

Throughout the course, the students shall individually work on a draft method section for the licentiate thesis. In addition, a data management plan should be prepared. A detailed description of what to be included is handed out separately. The result is presented in a written report and in a concluding seminar.

Course literature

As a joint common ground (basic reading)

Säfsten, K. Gustavsson, M. (2020). *Research methodology for engineers and other problem solvers*. Lund: Studentlitteratur.

(also available in Swedish: Säfsten, K. Gustavsson, M. (2019). *Forskningsmetodik för ingenjörer och andra problemlösare*. Lund: Studentlitteratur.)

Literature related to the lectures in Theory of science (in Teams).

Readings related to data management:

<https://guides.library.ju.se/c.php?g=689091> (SWE)

<https://guides.library.ju.se/c.php?g=689096> (ENG)

Recommended additional readings

Aagaard Nielsen, K. & Svensson, L. (2006). *Action research and interactive research: Beyond practice and theory*. Maastricht: Shaker Publishing BV.

Blessing, L. T. & Chakrabarti, A. (2009). *DRM, a Design Research Methodology*. London: Springer-Verlag.

Blom, G., Enger, J., Englund, G., Grandell, J. & Holst, L. (2017). *Sannolikhets teori och statistik teori med tillämpningar*. 7th edition. Lund: Studentlitteratur.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532–550.

Hansson, S. O. (1995). *Vetenskap och icke-vetenskap*. Stockholm: Institutionen för filosofi och teknikhistoria, KTH.

Hansson, S. O. (2007a). *Konsten att vara vetenskaplig*. Stockholm: Institutionen för filosofi och teknikhistoria, KTH.

Herr, K. & Anderson, G. (2015). *The action research dissertation: A guide for students and faculty*. 2nd edition. London: SAGE Publications.

- Johansson, L-G. (2016) *Philosophy of Science for Scientists. Springer Undergraduate Texts in Philosophy*, Cham: Springer.
- Karlsson, C. (2016) (editor). *Research Methods for Operations Management*. New York: Routledge.
- Leedy, P. D. & Ormrod, J. E. (2015). *Practical research: planning and design* (11. uppl.). New Jersey: Pearson Education.
- Miles, M. B., Huberman, A. M. & Saldaña, J. (2019). *Qualitative data analysis: an expanded sourcebook*. 4th edition. Thousand Oaks: SAGE Publications.
- Montgomery, D. C. (2019). *Design and Analysis of Experiments*. 10th edition. Hoboken: John Wiley & Sons.
- Montgomery, D. C. & Runger, G. C. (2019) *Applied Statistics and Probability for Engineers*. 7th edition. Hoboken: John Wiley & Sons Inc.
- Nyquist, H. (2017). *Statistikens grunder. Vetenskap, empiriska undersökningar och statistisk analys*. Lund: Studentlitteratur.
- Williamson, K. (2002). *Research Methods for Students, Academics and Professionals : Information Management and Systems, Elsevier Science & Technology*. ProQuest Ebook Central, <https://ebookcentral.proquest.com/lib/jonhh-ebooks/detail.action?docID=1640195>.
- Yin, R. K. (2018). *Case study research and applications: Design and methods*. 6th edition. Los Angeles: SAGE Publications.

Schedule fall 2023

Week	Date	Time	Place	Topic	Teacher
36	5/9	10.15-11.45	Teams	Course introduction, presentations and forming groups	Kristina Säfsten
37	12/9	10.15-12.15	E3231	Exercise: The Box	Kristina Säfsten
39	29/9	9.15–12	JTH Towers 01	Book examination seminar (course book)	Kristina Säfsten
41	12/10	13.15–17	E3105b (Leonardo)	Lecture 1: Theory of science	Sverker Johansson
	13/10	9.15–12	E3105b (Leonardo)	Lecture 2: Science or non-science	Sverker Johansson
44	30/10	9.15–12	E3105b (Leonardo)	Assignment 1: Seminar a	Guest/doctoral students
		13.15–16		Assignment 1: Seminar b	Guest/doctoral students
	31/10	9.15–12		Assignment 1: Seminar c	Guest/doctoral students
		13–16		Assignment 1: Seminar d	Guest/doctoral students
46	14/11	9.15–15	E3105b (Leonardo)	Lecture 3: Data collection – theory and practice	Kristina Säfsten/Guest
47	20/11	10.15-12.00	E3105b (Leonardo)	Lecture 4: Data management	Daniel Gunnarsson Oskar Westergren
49	7/12	TBD	A4222b (Galileo)	Assignment 2: Seminar a	Kristina Säfsten/ doctoral students
	8/12	TBD	A4222b (Galileo)	Assignment 2: Seminar b	Kristina Säfsten/ doctoral students
50	18/12	TBD	A4222b (Galileo)	Assignment 2: Seminar c	Kristina Säfsten/ doctoral students

Teachers

Course responsible and examiner is Professor Kristina Säfsten, kristina.safsten@ju.se, School of Engineering, Jönköping University.

Associate Professor Sverker Johansson, Dalarna University.

Daniel Gunnarsson, Research Support, University Library, Jönköping University.

Oskar Westergren, Records Manager, University Services, Jönköping University.