UNIVERSITY OF BORÅS

Theory of Science and Research Methodology

Vetenskapsteori och forskningsmetodik

5 credits
5 högskolepoäng

Ladok Code: A531TA
Version: 2.0
Established by: Committee for Education in Technology 2022-06-30
Valid from: Autumn 2022

Education Cycle: Second cycle
Main Field of Study (Progressive Specialisation): Resource Recovery (A1E), Theory of Science (A1N)
Disciplinary Domain: Technology
Prerequisites: Degree of Bachelor of Science or Degree of Bachelor of Science in Engineering, 180 ECTS credits, specialising in physics or chemistry or equivalent. In addition, knowledge of English equivalent to English 6 is required.
Subject Area: Other Subjects within Technology
Grading Scale: Seven-degree grading scale (A-F)

Content

The course freshens up the students' knowledge and understanding of the foundation of science; philosophy of science, ontology and epistemology, understanding of the research process, how research problems are articulated, how research gaps are identified, how research questions and hypotheses are formulated, about research ethical principles, etc. The course provides orientation about qualitative methods and profound knowledge of and understanding of quantitative methods.

At advanced level, scientific communication is essential. Hence, the students are trained both in written and oral communication during the course where both peer and scholar review is exercised. The students will also practice their critical approach by scrutinizing scientific papers in their particular scientific domains where they judge how scientific methods has been put to use and pose alternative means, applications and execution.

The course interacts with parallel project oriented courses where their didactics is assessed while their pedagogic and rhetorical achievements are assessed in this course. Ultimately the course prepares the students for coming courses, their thesis project, and for post-graduate life.

Learning Outcomes

The examinee shall independently be able to:

Knowledge and understanding
1.1 describe the development of scientific ideas from both a historical and philosophical perspective,
1.2 account for the basis of science: philosophy of science, ontology and epistemology,
1.3 describe essential scientific theoretical concepts and outline their weaknesses and strengths,
1.4 account for different methods of software based data analysis, and
1.5 relate frameworks, methods and results to different research disciplines.

Skills and abilities
2.1 discuss choice and utility of quantitative scientific methods,
2.2 choose statistical methods to analyze sets of empirical data,
2.3 review and evaluate scientific literature with a critical approach from quantitative research domains, and
2.4 present self made studies, familiarize with and critical review peer's studies based on scientific communication principles.

Judgement and approach
3.1 provide constructive oral and written feedback in a respectful and forward manner, and
3.2 assess choice of methods in given contexts.

Forms of Teaching

Teaching comprises lectures, supervision and seminars.

The language of instruction is English.

Forms of Examination

The following examinations will form part of this course with respect to the stated learning objectives:

- Written exam:
  Higher education credits: 2.5
  Grade: A-F
  (Corresponding to Learning outcomes 1.1-1.5, 2.1-2.2)
- Project presentation; written
  Higher education credits: 0.5
  Grade: Pass/Fail
  (Corresponding to Learning outcomes 2.4, 3.1-3.2)
- Project presentation; oral and visual Higher education credits: 0.5
  Grade: Pass/Fail
  (Corresponding to Learning outcomes 2.4, 3.1-3.2)
- Opposition to peer project presentation
  Higher education credits: 0.5
  Grade: Pass/Fail
  (Corresponding to Learning outcomes 2.1, 2.3-2.4, 3.1-3.2)
- Seminars, active participation
  Higher education credits: 1.0
  Grade: Pass/Fail
  (Corresponding to Learning outcomes 1.5, 2.1, 2.3-2.4, 3.1-3.2)

  Students must pass all examinations in order to achieve a minimum final grade of E, which will be determined by the grade of the written exam.

  If the student has received a decision/recommendation regarding special pedagogical support from the University of Borås due to disability or special needs, the examiner has the right to make accommodations when it comes to examination. The examiner must, based on the objectives of the course syllabus, determine whether the examination can be adapted in accordance with the decision/recommendation.

Student rights and obligations at examination are in accordance with guidelines and rules for the University of Borås.

Literature and Other Teaching Materials

Hempel, Carl (1966). Philosophy of Natural Science, Princeton University, Prentice-Hall, New Jersey, USA
Montgomery DC (2009). Design and Analysis of Experiments. 7th Ed. Wiley
Säfsten, Kristina & Gustavsson, Maria (2020). Research methodology: for engineers and other problem-solvers. Studentlitteratur
A selection of articles and text book chapters will be included, maximum 400 pages.

Student Influence and Evaluation

The course is evaluated in accordance with current guidelines for course evaluations at the University of Borås in which students' views are to be gathered. The course evaluation report is published and returned to participating and prospective students in accordance with the above-mentioned guidelines, and will be taken into consideration in the future development of courses and education programmes. Course coordinators are responsible for ensuring that the evaluations are conducted as described above.

Miscellaneous

The course is first and foremost a programme course for the Master’s Programmes in Resource Recovery but may also be applicable for other master programmes in technology and exchange students at advanced level.
This syllabus is a translation from the Swedish original.