Europa-Universität Flensburg
International Institute of Management and Economic Education
Department of Pluralist Economics

Theoretical and Empirical Research Methodology

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Overall goal of the course

Students will learn scientific methods and tools that are essential for advanced seminars at the university and relevant for advanced management activities. In addition to core methodological skills, students learn to use modern AI tools and the R programming language to perform applied research tasks in both academic and business contexts.

Learning goals

At the end of the course, students will have acquired the following competences:

- Develop a command of basic logic, including the ability to identify arguments and deconstruct their logical structure and components, both in the writing of others and in one's own ideas.
- Cultivate the ability to grasp the main arguments and positions in a debate, and to neutrally describe and reflect on the arguments exchanged.
- Gain a broad overview of common research methods in the social sciences and business, including their strengths and weaknesses.
- Develop the ability to evaluate methodological approaches to specific research questions and select appropriate combinations of methods.
- Gain project and knowledge management skills using modern tools such as Zotero for bibliographic management and Obsidian for note-taking.
- Learn to effectively structure research projects and implement methodological approaches in the correct chronological order.
- Master implementation of covered research tools using the R programming language
- Develop skills to produce professional, attractive, and reproducible research reports using Quarto

Structure and basic philosophy

The course consists of two parts: a lecture and an implementation lab. The lecture takes place every Wednesday and introduces the basics of various basic topics and tools. The implementation lab consists of face-to-face meetings and instructional videos. Here, students learn hands-on how to implement key tools using the programming language R. Therefore, it is essential that students bring their laptop to each lab session.

Tentative outline and logistics

Please note that this schedule will be subject to change as the course progresses. **Announcements will be made via Moodle.** The latest version of the syllabus will also be made available on Moodle. All on-site events take place in MAD 099 on Mondays and in MAD 225 on Fridays. Material will be made available via Moodle and a course homepage for the implementation lab:

Moodle room: 16256 Password: ResearchMethods25
Implementation lab homepage: https://researchmethodology-fall25.netlify.app

#	Week	Date Monday	Topic	Type & Instructor	Date Friday	Topic	Type & Instructor
1	38	15.09.	General introduction	Lecture: AKK & CGR	19.09.	General introduction and installation	On-site lab: CGR
2	39	22.09.	AI tools in practice	Lecture: CGR	26.09.	Introducing the basics of R and R Studio	Video lab
3	40	29.09.	Basics of logic	Lecture: AKK	03.10.	Object types	Video lab
4	41	06.10.	Logic and argumentation	Lecture: AKK	10.10.	Project Management and recap	On-site lab: CGR
5	42	13.10.	Scientific arguments, models & explanation	Lecture: AKK	17.10.	Data visualization	Video lab
Take-Home Exam I							
6	43	20.10.	Importing data	Video lab	24.10.	Data preparation	Video lab
7	44	27.10.	Quantitative & qualitative research	Lecture: AKK	31.10.	Introducing Quarto and R Markdown	Video lab
8	45	03.11.	Interviews	Lecture: AKK	07.11.	Recap and practice	On-site lab: CGR

9	46	10.11.	Literature reviews	Lecture: CGG	14.11.	Using AI for Coding	On-site lab: CGR
Take-Home Exam II							
10	47	17.11.	Statistics recap	Lecture: CGR	21.11.	Case studies	Lecture: AKK
Take-Home Exam III							
11	48	24.11.	Sampling theory	Lecture: CGR	28.11.	Regression analysis	Lecture: CGR
12	49	01.12.	Experiments	Lecture: CGR	05.12.	Linear models and experimental data in R	Video lab
13	50	08.12.	Open slot	Lecture: AKK & CGR	12.12.	Open slot	On-site lab: CGR
15.12., 14:00 – 16:00			First Exam				
25.02., 14:00 – 16:00			Second Exam				

Timing overview

This course is worth 5 CP. Here is how the expected workload is distributed among the various course activities:

Activity	**Time requirement**
On-site lectures	$14 \cdot 1{,}5 = 21$ hours
On-site labs	$7 \cdot 1{,}5 = 10{,}5$ hours
Instructional videos	10 hours
Expected self-study (including take-homes)	108,5 hours
Total workload	150 hours

Note that we strongly recommend that you spread your study time fairly evenly throughout the semester. It will save you time and effort if you study and practice constantly, not just right before the exams.

Evaluation

The exam will be the final exam at the end of the semester. In order to be admitted to the final exam, you must pass two of the three take-home exams assigned during the semester. These take-home exams are graded on a pass/fail basis only, are available through Moodle, and must be completed at home on your own. For each take-home exam, you will have until the Sunday following the date of the lecture. The exam, along with an affidavit (*Eidesstattliche Erklärung*), must be uploaded via Moodle. Late submissions will automatically be graded as fail.

The final exam is a 120-minute open-book exam that you will take at the university on your own laptop. You are free to bring any materials you wish and to use all the tools you have

learned about during the semester. However, it is essential that you document any use of AI tools as explained during the course. Failure to do so will be considered cheating.

The content of the exam will be as follows:

- $^1/_3$: Multiple choice questions (via Moodle)
- $^1/_3$: Open questions and technical applications (via Moodle)
- $^1/_3$: R tasks (on your own computer, to be uploaded to Moodle)

Required prior knowledge in Mathematics and Statistics

This course does not require completion of any other course in the IMS Master's program. We also do not require prior knowledge of programming languages or any of the methods covered in this course (although it may be helpful). However, we do assume knowledge of some basic mathematical and statistical areas. These are described below. If you do not have this knowledge, please make sure that you acquire it as soon as possible. This knowledge will be assumed in the take-home exam on statistics. We strongly recommend that you review these concepts early in the semester and ask questions using the Moodle forum. While we will do our best to help you with this content, we are not responsible (and unable) to teach these topics in the course itself.

- Fundamentals of probability theory (random variables, probability distributions, expected values)
- Fundamentals of calculus (derivatives, partial derivatives, basic optimization)
- Linear algebra essentials (vectors, matrices, matrix operations, determinants)
- Familiarity with statistical notation and terminology (indices, kind of variables, scales of measurement)
- Familiarity with concepts of variance, covariance, and correlation matrices
- Descriptive statistics (measures of central tendency, dispersion, and correlation)
- Basic inferential statistics (confidence intervals, hypothesis testing, p-values)
- Simple linear regression analysis (model assumptions, interpretation of coefficients)
- Understanding of statistical significance and effect sizes
- Basic understanding of sampling methods and their implications
- Ability to interpret common statistical output from software packages
- Understanding of model evaluation metrics (R^2, adjusted R^2, residual analysis)

Detailed course outline for the lectures

Information about readings and exercises for the Implementation Lab can be found on the lab homepage. We strongly encourage you to complete any required readings after the lecture. For some lectures, it is required to read the material before the lecture. This will be explicitly noted down below. Note that we often provide exercises that we suggest you do to help you remember the material. These are different from the take-home exams. The latter are part of the overall course examination and must be passed in order to be admitted to the final exam of the course.

15.09.: General introduction

Content & Goals:

- We get to know each other and can clarify our goals and interests in the topics of the course
- You will be given a general overview over the course, the kind of examination, the role of take-home exams and the rules for using AI
- We introduce a set of general software tools that we recommend to use (e.g. for literature management or note taking)

Required readings: *None*

Further readings:

For note taking with Obsidian:

Miller, T. (2023, March 23). Getting Started with Obsidian Notes: A Beginner's Guide. *Obsidian Rocks*. https://obsidian.rocks/getting-started-with-obsidian-a-beginners-guide/

For writing text with Markdown:

Cone, M. (2025). *The Markdown Guide*. https://www.markdownguide.org

The CommonMark Tutorial: https://commonmark.org/help/tutorial/

For bibliographic management with Zotero:

Quick Start Guide. *The Zotero Documentation*. https://www.zotero.org/support/quick_start_guide

On using LLMs such as Claude:

Kuka, V. (2024, October 22). Prompt Engineering. *Learn Prompting*. https://learnprompting.org/docs/basics/prompt_engineering

Take-home exercises:

- Familiarize yourself with Moodle, the course webpage, and the previous knowledge in mathematics and statistics

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22.09.: AI tools in practice

Content & Goals:

- You understand use cases for different kinds of AI models
- You know common AI tools for different tasks
- You know the basics on how to write good prompts
- You are aware of the main caveats and ethical issues of using AI
- You can disclose and document the use of AI

- You understand the business models of AI companies

Required readings: *none*

Further readings: *TBD*

Take-home exercises etc.:

- Try the different tools introduced and decide which one you want to use
- Familiarize yourself with the practice of prompting

29.09.: Basics of logic

Content & Goals:

- You understand the relevance of logic to management studies and decision making in a management context
- You understand how an argument is constructed and the most important (technical) terms in logic
- You understand basic propositional logic operators and know how to formalize a text into the form of the logical operators

Required readings: *TBD*

Further readings: *TBD*

Take-home exercises etc.: *None*

06.10.: Logic and argumentation

Content & Goals:

- You know different types of arguments, most importantly deductive and inductive arguments and the most common argumentative fallacies
- You can evaluate an argument and know the difference between the concepts of validity and truth
- You can analyze arguments through reconstruction

Required readings: *None*

Further readings:

Lutz, B., Pröllochs, N., & Neumann, D. (2022). Are longer reviews always more helpful? Disentangling the interplay between review length and line of argumentation. *Journal of Business Research*, *144*, 888–901. https://doi.org/10.1016/j.jbusres.2022.02.010

Hundleby, Catherine E. (2023). Feminist Perspectives on Argumentation. In *The Stanford Encyclopedia of Philosophy*. https://plato.stanford.edu/archives/fall2023/entries/feminism-argumentation/.

Take-home exercises etc.: Take Home Exercise on Logic & Argumentation (on Moodle)

13.10.: Scientific arguments, models, and explanation

Content & Goals:

- You understand the concepts of a theory, a model, and an explanation, as well as the deductive-nomological model
- You know about the structure of scientific progress and scientific paradigms
- You understand the concepts of ontology, epistemology, and methodology

Required readings:

Shrader-Frechette, Kristin. 2014. Tainted. How Philosophy of Science Can Expose Bad Science. New York, NY: Oxford University Press. Pai 17 - 28.

Further readings:

Reiss, J. (2013). Philosophy of Economics: A Contemporary Introduction. Routledge. Pages: 15 – 26.

Popper, K. R. (2007). Conjectures and refutations: The growth of scientific knowledge (Repr). Routledge.

Hansson, Sven O. (2021). Science and Pseudo-Science. In The Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/archives/fall2021/entries/pseudo-science.

Take-home exercises.: *None*

27.10.: Quantitative and qualitative research

Content & Goals:

- You understand how to differentiate and gain an overview over qualitative and quantitative methods
- You can connect qualitative and quantitative methods to research designs and critically discussing the strengths and weaknesses using qualitative or quantitative methods
- You know the concept of (methodological) pluralism

Required readings: *TBD*

Further readings:

Mahoney, J., & Goertz, G. (2006). A Tale of Two Cultures: Contrasting Quantitative and Qualitative Research. *Political Analysis*, *14*(3), 227–249. https://doi.org/10.1093/pan/mpj017

Nowell, B., & Albrecht, K. (2019). A Reviewer's Guide to Qualitative Rigor. *Journal of Public Administration Research and Theory*, *29*(2), 348–363. https://doi.org/10.1093/jopart/muy052

Take-home exercises etc.: *None*

03.11.: Interviews

Content & Goals:

- You can describe different kinds of interviews and can explain when (for what kind of research question) to use which type of interview
- You understand the mains strength and weaknesses of each interview type
- You know how to conduct an interview, including: how to select the interviewees, how to build a theory-driven interview guide and what question techniques work best, are to avoid respectively
- You know the major sources/handbooks for further research

Required readings: *TBD*

Further readings: *TBD*

Take-home exercises: *none*

10.11.: Literature reviews

Content & Goals:

- You can describe the different kinds of literature review and can decide which type is adequate for what purpose
- You know about the PRISMA guidelines for systematic literature reviews and understand central concepts, such as 'search strategy', 'keywords', or 'citation networks'
- You can use Web of Science to conduct a systematic literature review
- You know how to document a systematic literature review
- You know about various assistance tools of literature reviews; in particular, you understand the difference between citation-based and syntax-based tools and can decide which one is better suited for a given task

Required readings:

Page, M. J., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Reviews*, *10*(1), 89. https://doi.org/10.1186/s13643-021-01626-4

Page, M. J., … McKenzie, J. E. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ*, n160. https://doi.org/10.1136/bmj.n160

It is also insightful to have a look at the materials at the PRISMA website: https://www.prisma-statement.org

Supplementary material specific for the context of this course is distributed via Moodle.

Further readings:

As concrete examples for systematic reviews:

Aistleitner, M., Gräbner, C., & Hornykewycz, A. (2021). Theory and Empirics of Capability Accumulation: Implications for Macroeconomic Modelling. *Research Policy*, *50*(6), 104258. https://doi.org/10.1016/j.respol.2021.104258

Gräbner-Radkowitsch, C., & Strunk, B. (2023). Degrowth and the Global South: The twin problem of global dependencies. *Ecological Economics*, *213*, 107946. https://doi.org/10.1016/j.ecolecon.2023.107946

Take-home examination:

- Conduct a small systematic literature review as described in the lecture slides and on Moodle.

17.11.: Statistics recap

Content & Goals:

- Clarify your questions regarding the concepts described under "Required prior knowledge in Mathematics and Statistics" in the course description.
- Please ask questions already in advance via Moodle; this lecture is just to recap and illustrate certain concepts.

Required readings: *TBD*

Further readings: *TBD*

Take-home examination:

- The take-home examination will test your ability to apply the mathematical and statistical concepts covered in the lecture and described in the course description as required prior knowledge.
- You must pass this take-home examination to be accepted for the final exam of this course.

21.11.: Case studies

Content & Goals:

- You understand what a case study design is, when to best chose a case-oriented approach and the central elements of the research design
- You know what a case is and can explain the main strategies of case selection
- You understand the comparative method and its different types
- You can critically discuss the method in comparison to other research methods

Required readings: *None*

Further readings:

Beach, D., & Pedersen, R. B. (2016). *Causal case study methods: Foundations and guidelines for comparing, matching, and tracing*. University of Michigan Press.

Yin, R. K. (2018). *Case study research and applications: Design and methods* (Sixth edition). SAGE.

Take-home exercises.: *TBD*

24.11.: Sampling theory

Content & Goals:

- You understand the following concepts: population, population parameter, census, (random) sample, sample statistic, sampling distribution, standard error, bias, representativeness of samples, generalisation, estimate, estimator
- You know what a Monte Carlo Simulation is and what it can be used for
- You understand the Central Limit Theorem and its importance for inference
- You can explain how we can use sampling to make general claims based on smaller samples

Required readings:

Ismay, C., Kim, A. Y., & Valdivia, A. (2025). *Statistical Inference via Data Science: A ModernDive into R and the Tidyverse* (2nd ed.). CRC Press. https://moderndive.com/v2/index.html: chapter 7

Further readings:

Gräbner-Radkowitsch, C. (2023): *Monte Carlo Simulations in R*, https://datascience-euf-spring24.netlify.app/2024spring/tutorials/mcs/

Take-home exercises etc.: *TBD*

28.11.: Regression analysis

Content & Goals:

- You understand the logic behind multiple linear regression and how to interpret it

- You understand the logic behind different models for interaction effects
- You can choose the right functional form based on the visual analysis of the data
- You know the steps of a regression analysis

Required readings:

Ismay, C., Kim, A. Y., & Valdivia, A. (2025). *Statistical Inference via Data Science: A ModernDive into R and the Tidyverse* (2nd ed.). CRC Press. https://moderndive.com/v2/index.html: chapters 5 & 6

Further readings:

James, G., Witten, D., Hastie, T., & Tibshirani, R. (2021). An introduction to statistical learning: With applications in R (Second edition). Springer. https://www.statlearning.com: chapter 3

Take-home exercise: Conduct a regression analysis for the example data provided and present the results in a Quarto report

01.12.: Experiments

Content & Goals:

- You understand the differences between distinct types of experiments
- You can explain under which circumstances conducting experiments is helpful and when it can be problematic
- You can critically discuss the internal and external validity of an experiment.
- You know how to describe an experimental design
- You know which kinds of statistics are used during the analysis of experimental data

Required readings: *TBD*

Further readings: *TBD*

Take-home exercise: Write a short report about the analysis of experimental data distributed via Moodle

08.12.: Open slot

Content & Goals:

- You understand the advantages and disadvantages of experiments as a method
- You can describe the different types of experiments and understand their respective use cases
- You know about common quality criteria for experimental research
- You can describe and choose among typical statistical methods to analyze experimental data

Required readings: *TBD*

Further readings: *TBD*

Take-home exercises etc.: None