MF2072
Research Methodology in Machine Design (6 credits)

Course PM

September 2022 – January 2023

Version 2022-08-11

Canvas activity: *MF2072 HT22-1 Research Methodology in Machine Design*

Department of Machine Design
School of industrial engineering and management
Royal Institute of Technology
SE-100 44 STOCKHOLM

Background

The course gives an overview over present-day scientific and industrial development trends in the area of machine design. Scientific research methods and tools, and ethical aspects are treated, both at a general and a concrete level, in the context of research and development (R&D) of mechanical products, high-performance machine elements and understanding of physical phenomena.

Objectives

Intended learning outcomes

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

- Apply common concepts and language within the topic.
- Evaluate, discuss and reason around ethical research aspects.
- Carry out a scientific study.
- Give constructive criticism on a scientific article.

Main content

The course is given in the form of classes and lectures by internal and external researchers and/or individuals active within industrial research and development.

8 lectures

1 seminar

5 supervision activities

4 group assignments

1 feedback activity

Examination and grading

INL1, 4.5 credits, grading scale P/F:

1. Review of scientific articles
2. Review of an ethic case study
3. Statistical analysis and measurement uncertainty
4. Writing a scientific article.
5. Review of an article written by another student group.
6. Presenting at seminar.

TEN1, Written examination, 1.5 credits, grading scale A, B, C, D, E, FX, F

The results from the written examination defines the final grade

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.

Pre requisit

MF2024 Robust and probabilistic design or equivalent knowledge

Course literature

1 – Ö Andersson, Experiment – planning, Implementing and Interpreting, Wiley 2012.

2 – D B Resnik, the ethics of science Chapter 5 Routledge 1998

3 - D B Resnik, Philosophical foundations of scientific ethics 1994

4 – S Bell , A beginners gudie to uncertainty of measurements, NPL, Issue 2.

5 - Handouts

Course responsible

Ulf Olofsson (course coordinator)
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Preliminary Course schedule, 2022

Week	Day	Time	Location	Content
W35	Tuesday 30 Aug	8-10	U1	L1: Introduction to research methodology, what is science, science childhood (ÖA ch 2 and ch3) UO
	Wednesday 31 Aug	13-15	W25	L2: Science inclined to experiment, Scientist, engineers and other poets (ÖA ch 4 and ch 5) UO
	Friday 02 Sep	8-12	digital	H1: Supervison own research project (research question) UO
	Friday 02 Sep	11-12	digital	
W36	Tuesday 06 Sep	8-10	U1	L3: Research ethics UO
	Wednesday 07 Sep	14-16	W37	L4: Experiment!, Phase I: Planning (ÖA ch 6, ch 10) UO
	Wednesday 07 Sep	23.55		Hand in Assignment 1: power point presentation litterature review + selected article
	Friday 09 Sep	8-11	Digital	H2: Supervison own research project (literature review) UO
	Friday 09 Sep	11-12	digital	MF206X/MF213X/MF223X Master´s Thesis in Machine Design - Procedure and process
W37	Tuesday 13 Sep	8-10	U1	L5: Statistics for experimenters (ÖA ch 7 and 8) UO
	Wednesday 14 Sep	13-15	W25	L6: Statistics for experimenters + measurement uncertainty(ÖA ch 7 and 8) UO
	Wednesday 14 Sep	23.55		Hand in Assignment 2: power point presentation research ethics
	Friday 16 Sep	8-12	digital	H3: supervision own research project (research etics) UO
W38	Tuesday 20 Sep	8-10	U1	L7: presentation of data, Phase II: Data collection. Phase III: Analysis and synthesis (ÖA ch 11 and ch 12) UO
	Wednesday 21 Sep	13-15	W37	L8: Lecture if needed
	Wednesday 21 Sep	23.55		Hand in Assignment 3: technical report
	Friday 23 Sep	8-12	Digital	H4: supervision own research project (research question and methodology)
W39	Friday 30 Sep	8-12	digital	H5: supervision own research project
W40	Monday 03 Oct	07.00		Hand in assignment 4: Extended abstract and power point presentation
	Tuesday 04 Oct	8-12	V1	S1: Seminar in research methodology presentation of own research with opposition, mandatory to be present the whole seminar, UO
	Thursday 06 Oct	23.55		Hand-in assignment 4: Final version of Extended abstract and opposition report
W41	Friday 14 Oct	8-12	digital	S2: Feedback seminar UO

UO = Ulf Olofsson

Lecture (L); Seminar (S); Supervision (H)

Preliminary Supervision and seminar schedule, 2022

Week	Day	Time	Location	Content
W35	Friday 02 Sep	8-12	digital	H1: Group 1: 8.15-8.35; Group 2: 8.40-9.00; Group 3: 9.05-9.25; Group 4: 9.30-9.50; Group 5: 09.55-10.15;
W36	Friday 09 Sep	8-12	digital	H2: Group 1: 8.15-8.35; Group 2: 8.40-9.00; Group 3: 9.05-9.25; Group 4: 9.30-9.50; Group 5: 09.55-10.15; All groups 11.15-12.00 - Master´s Thesis in Machine Design - Procedure and process
W37	Friday 16 Sep	8-12	digital	H3: Group 1: 8.15-8.35; Group 2: 8.40-9.00; Group 3: 9.05-9.25; Group 4: 9.30-9.50; Group 5: 09.55-10.15;
W38	Friday 23 Sep	8-12	digital	H4: Group 1: 8.15-8.35; Group 2: 8.40-9.00; Group 3: 9.05-9.25; Group 4: 9.30-9.50; Group 5: 09.55-10.15;.
W39	Friday 30 Dec	8-12	digital	H5: Gr 1: Group 1: 8.15-8.35; Group 2: 8.40-9.00; Group 3: 9.05-9.25; Group 4: 9.30-9.50; Group 5: 09.55-10.15;.
W40	Tuesday 04 Oct	8-12	V1	S1: Presentation of own research + opposition , **mandatory to be present the whole seminar**, random order of presentations
W41	Friday 14 Oct	8-12	digital	S2: Feedback seminar Group 1: 8.15-8.35; Group 2: 8.40-9.00; Group 3: 9.05-9.25; Group 4: 9.30-9.50; Group 5: 09.55-10.15;