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UNIVERSITY OF APPLIED SCIENCES / AUSTRIA

Bachelor Exposé Preparation

Sarita Paudel

Course Outcome

Upon completion of this course, students are able to:

- Independently apply the principles of academic research
- Prepare an extended proposal and the subsequent bachelor paper

- The course builds on the content of Scientific Skills and Writing, with a focus on practical application.

https://www.fh-krems.ac.at/en/study/bachelor/full-time/informatics/#curriculum

Course Format

- No final exam.
- Grades are based on the quality of the Bachelor Exposé

Use your fifth semester to work on the Bachelor Thesis

22.02.2022 14:00 - 15:45	Introduction Session
08.03.2022 15:00 - 16:45	Presentation of ideas, discussion of research questions
29.03.2022 14:00 - 15:00	Preliminary literature review, supervisors feedback!
19.04.2022 15:00 - 17:45	Plans for practical part, and evaluation plan
14.06.2022 09:00 - 14:00	Presentations of Bachelor Exposé, including supervisors feedback!
16.06.2022 23:59 (Deadline of this course)	Submission of Bachelor Exposé, including supervisors feedback!.
xx January 2023 (Deadline: Academic Board)	Proposal for Bachelor Thesis submitted to Study Services! Adaptation to the Bachelor Exposé must be re-approved.

Why Bachelor Thesis?

Demonstrate that students can …

- Independently plan and execute a project in a topic in their field
- Work by adhering to the standards of academic research
- Relate their own work with the results of other researchers (connecting the dots)
- Critically reflect on and evaluate their own work
- Professionally present their work in writing for the scientific community
- …

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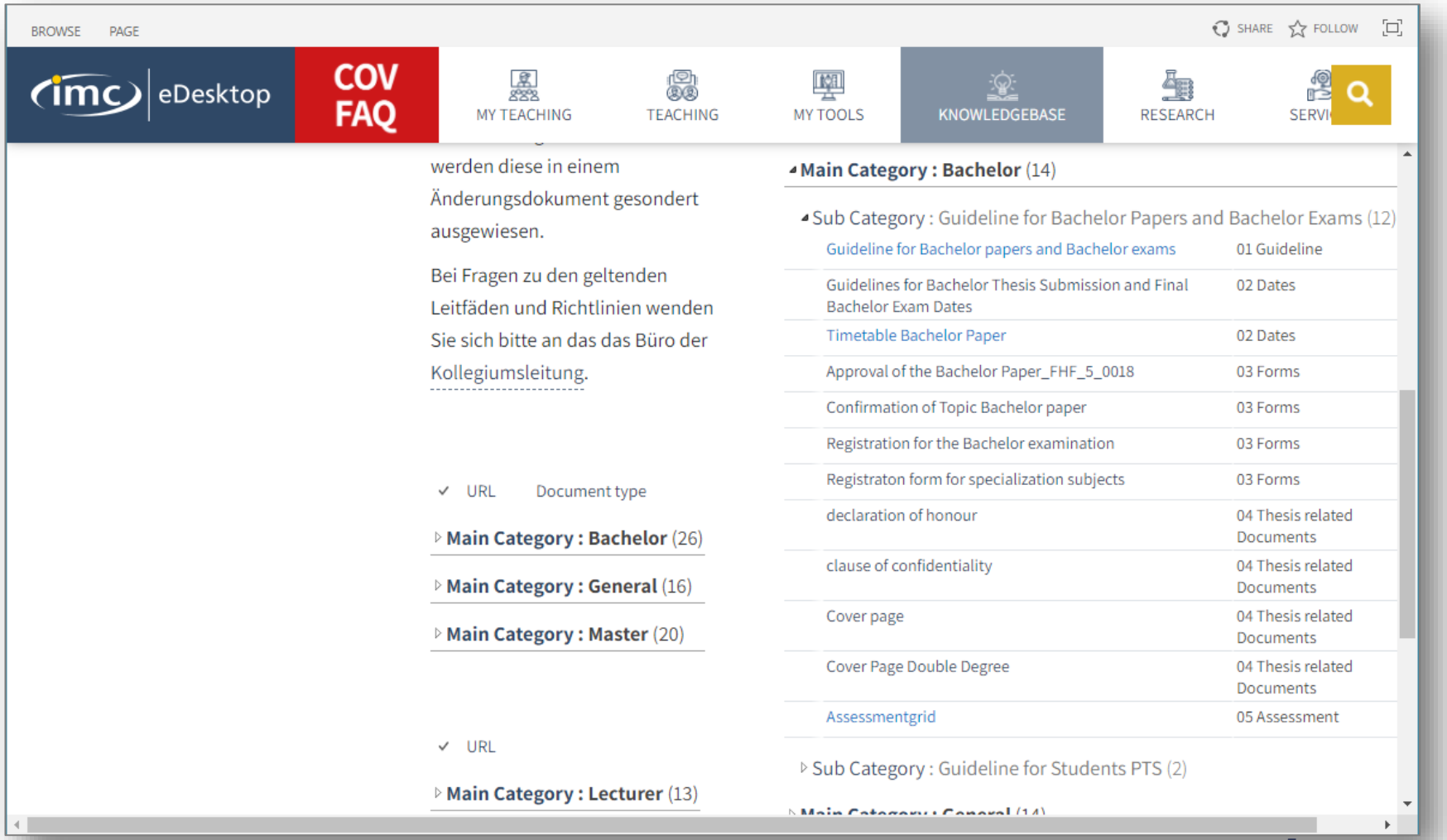
Guidelines in eDesktop



Contents of Bachelor Exposé

Plan + DO

- Title, Abstract (Executive summary)
- Description of research problem
- Description of objectives and research questions
- Description of the scientific method
  - Software development, data analysis, evaluation strategy
- Theoretical background
- Related work
- Summary
- Bibliography

Roughly 15 pages

Bachelor Thesis

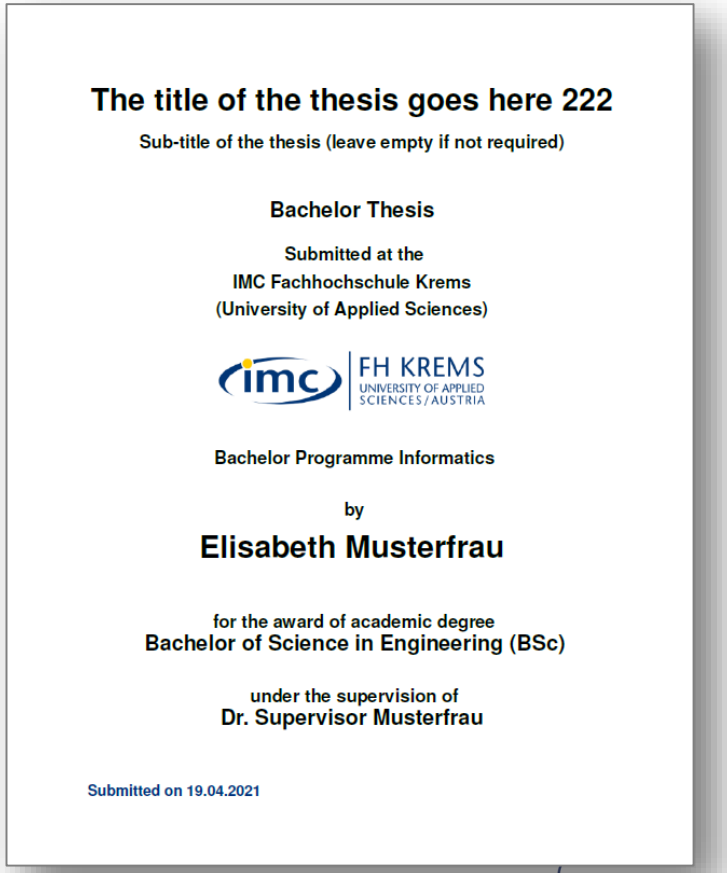
- Elaborate the sections
- Description of practical part
- Analysis of results
- Conclusions and Future Work

Roughly 45 pages

Template for your Bachelor Exposé/Thesis

https://github.com/IMC-UAS-Krems/latex-thesis-templates

- Use LaTeX for writing your Exposé/Thesis
  - We have used MiKTex (URL: https://miktex.org/) and TeXstudio (URL: https://www.texstudio.org/)
- Usually a good idea to use Git for version control
  - Your thesis will build upon the contents of the Exposé
- Citations using IEEE Reference Style
  - http://ieeeauthorcenter.ieee.org/wp-content/uploads/IEEE_Style_Manual.pdf
  - Template provides examples



The title of the thesis goes here 222

Sub-title of the thesis (leave empty if not required)

Bachelor Thesis

Submitted at the
IMC Fachhochschule Krems
(University of Applied Sciences)

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Bachelor Programme Informatics

by

Elisabeth Musterfrau

for the award of academic degree
Bachelor of Science in Engineering (BSc)

under the supervision of
Dr. Supervisor Musterfrau

Submitted on 19.04.2021

Track Exposé progress

- Create a Git repository and add me as a member
- I will track your progress
- Updates should be available before the deadlines

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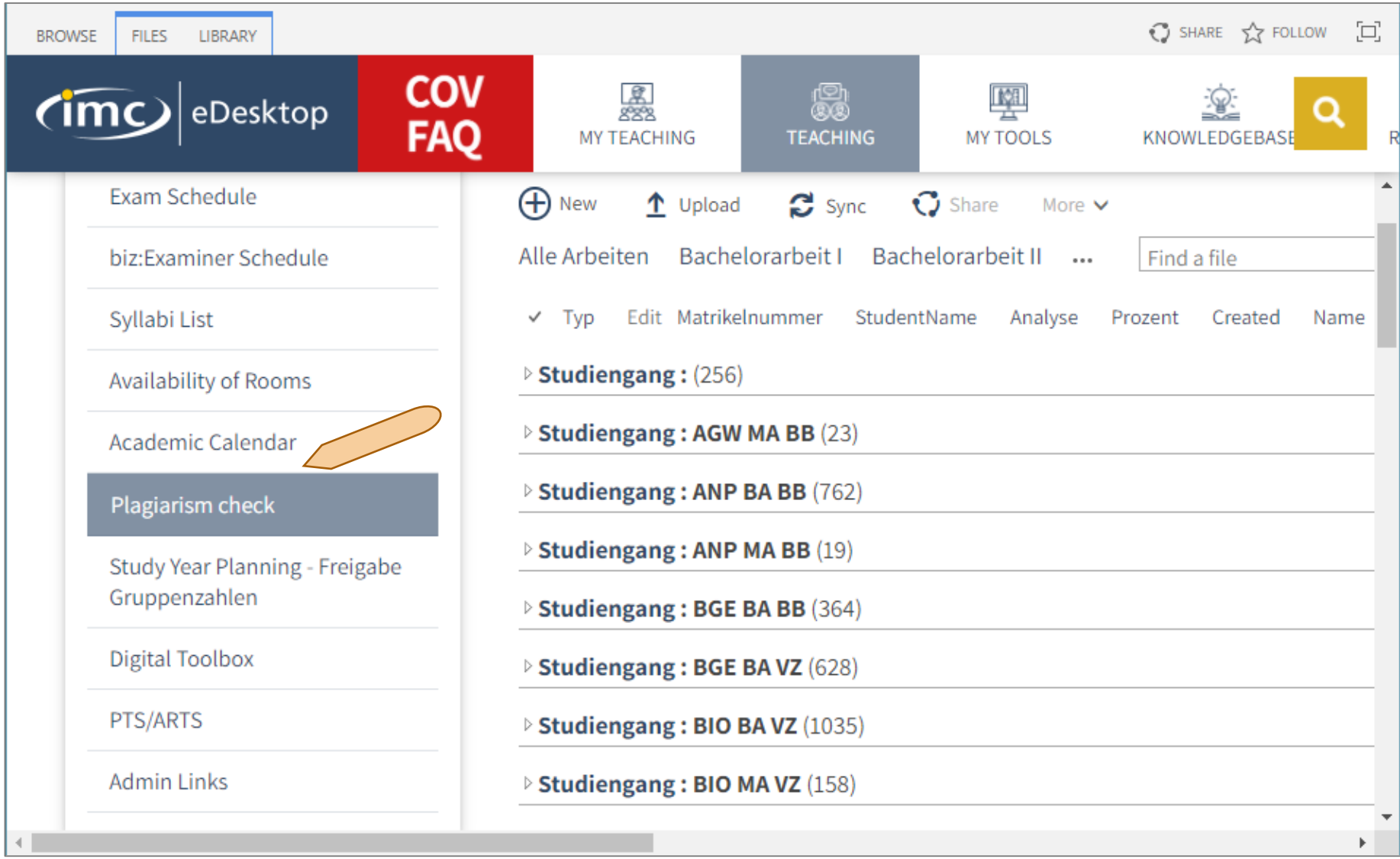
Plagiarism Check

- Zero tolerance
- If you get caught – it is too late!



Online Libraries

Example Sources

Free access to PAID Content for IMC Students
https://edesktop.fh-krems.ac.at/research/library/SitePages/Home.aspx

Association for Computing Machinery

Google Scholar

ScienceDirect

ELSEVIER

IEEE Advancing Technology for Humanity

ResearchGate

Springer

dblp computer science bibliography

Outline of Thesis Chapters

- Introduction and Motivation
- Research Method, Research Questions, Research Hypothesis
- Review of Literature, State of Art, State of Practice
- Implementation
- Research Results
- Validation, Evaluation of Results
- Summary, Conclusions and Future Work

Thesis Content

50% theory and 50% implementation

- Theory ➔ introduction to the topic, required backgroung knowledge, your approach and its components,….
- Implementation ➔ data science or software development

Data Science

- Provide source of data
- Data exploration and visualization
- Application (apply data to machine learning, prediction algorithms)
- Results presentation, interpretation and analysis

Software development

- Define the requirements
- Design
- Implementation/development
- Validation/testing

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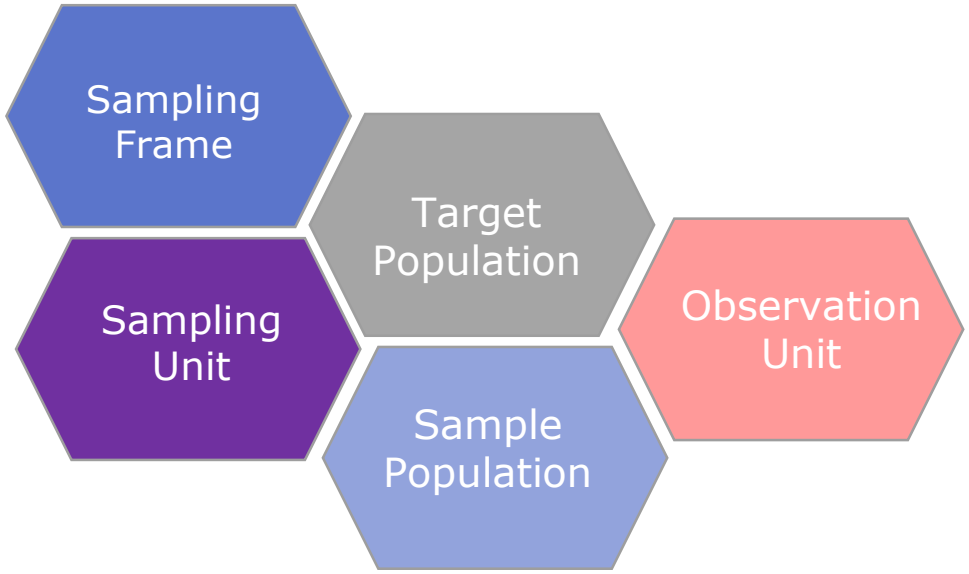
Research Methods in Practice

Information or Data Collection

- Target Population: major elements of a topic on which the topic is investigated
- Observation unit: unit on which the measurements (information) are taken
- Sample population: collection of all observable units
- Sample unit: a unit that can be selected for a sample
- Sampling frame: a list of all sampling units



Example

Intrusion Detection (ID) approaches for Cyber-Physical Systems (CPSs)

- Article: "A survey of Intrusion Detection techniques for Cyber-Physical Systems" [*Ref*]

- Target population – all ID systems
  - *Detection Techniques* : what misbehaviors are used for detection?
    - Knowledge and behavior based techniques
  - *Audit materials*: how to collect data for analysis?
    - Host and network based audit materials

Ref: Robert Mitchell and Ing-Ray Chen. 2014. A survey of intrusion detection techniques for cyber-physical systems. *ACM Comput. Surv.* 46, 4, Article 55 (March 2014), 29 pages.

Example (contd.)

- Sampling frame - list of ID systems
- Sample unit - detection technique, audit material
- Observation unit– detection technique, audit material designed for CPS (Supervisory Control and Data Acquisition (SCADA), Smart Utility, Automotive, Aerospace, Medical)
- Sampled population – all ID systems for CPS which are either techniques or audit materials.
  - techniques are either knowledge based or behavior based, and
  - audit materials are either host based or network based.

Summary

- Findings: research gaps and future research
  - Effectiveness of network-based auditing is limited by the visibility of nodes; addressing this weakness in an important gap
  - Detection latency need to be developed as a key intrusion detection metric

- Opinion: good survey paper
  - Classifies the ID systems in different categories
  - Study the literatures fall in the defined categories
  - Investigate on the techniques that fall in the one of the category
  - Quantitative method is followed while conducting the survey
  - Citation- 330

Example (define Topics)

- Findings: research gaps and future research (recall Summary)
  - Effectiveness of network-based auditing is limited by the visibility of nodes; addressing this weakness in an important gap
  - Detection latency need to be developed as a key intrusion detection metric

- Potential topics:
  - Development of detection latency to support intrusion detection in Cyber-Physical Systems
  - Investigating the relationship between intrusion detection and visiblity of nodes in communication network
  - Enhancing intrusion detection through improving the visibility of nodes in communication network

Potential Topics

Qualitative or Quantitative Research

- Analysis of *XXX* to determine *YYY*
- Comparision of *XXX* and *YYY* in regards to *ZZZ*
- Application of *XXX* in *YYY* to improve *ZZZ*
- Implementation of *XXX* to support *YYY*
- Supporting *XXX* through *YYY*
- Design and Implementation of a Method for *XXX* to enable *YYY*
- Investigating the relationship between *XXX* and *YYY*
- Building a model for *XXX* to support *YYY*
- *… and many more*

About Topics

- What is your research interest (what exactly do you want to research?)
- Why is the topic interesting?
- What comes to your mind related to the topic?
- What comes to this field (references)?
- What aspects of the topic do you want to cover (scope)?
- What aspects of the topic you do not want to cover (out of scope)?
- Where can you get the materials (papers, books etc.) on the topic?

Assignment

- Select a research area of your interest and study about the area (may be start from a survey paper or similar article)
- Describe the topic, especially in terms of target population, sampling frame, sampling unit, observation unit, sampled population, problems, ….
- Summarize the main findings
- Summarize whether the the survey was well done in your opinion
- Define your topic and research questions

- Present all this on some slides in next lecture (08.03.2022) ➔ 5-7 minutes presentation
- Deadline for topic submission is 03.03.2022 23:59 CET

Next Steps

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