The scientific works

- From the task to the defence -

Introduction

- Aim of a scientific work
- Task
  Requirements – Application – Finding a topic – Return – Repetition
- Processing
  Task analysis - State of the art - Specification of the task – Solution finding- Solution presentation- Summary and outlook
- Layout
  Structure (Outline) – Text – Formal Requirements
- Scientific Colloquium
  Presentation – Review (assessment) – Questioning or Inquiry
- Assessment

Master of Science degree (M.Sc.)

- § 5 Objectives of the course of study

„ By successfully completing...the...master's thesis, the graduates have proven that they can **independently** integrate **existing** and **new knowledge** in complex contexts, **carry out** application- or research-oriented projects in a largely **self-directed manner** and can **explain** and critically interpret their **research results** in an appropriate **written** and **oral form**."

https://www.tu-chemnitz.de/verwaltung/studentenamt/abt11/ordnungen/2020/AB_2020_11_2.pdf

Aim of the scientific work

Deadline:	4 Months (+2 Months extension)
Engineering science::	- ~~Construction of a device~~ - Finding solution variants for parallel kinematics
Independent:	Consultation – ~~every week?~~
Scientific methods:	Unique
Clear and understandable:	Logically structured, comprehensible, step by step, expression, sketches, pictures, tables, diagrams...
Standard form:	DIN, Duden

Task

Requirment:	All required study achievements fulfilled
Application:	Form (Document) in the examination office
Return the topic:	Within one month, once
Repetition:	Once
Finding topics:	Internet - https://www.tu-chemnitz.de/mb/UFF/studentische_Arbeiten.html
Contents:	• Scientific potential • Sustainable • Future field of application
Ownership:	• Author's rights • Scientific work is the property of TUC

Processing of scientific work

- **Analysis** of the task description, categorization of the topic, and development of
  subtasks 1, subtasks 2, subtasks 3, …
  → focus A, focus B, focus C, …

- **Gathering** the current state of knowledge (state of the art) for each focus (focal point)
  - superordinate topics
  - directly "matching" topics
  - analogous topics in other fields
  - …

Regarding:
- technical contents
- technical Assessments
- evaluation criteria
- solution methods
- calculations
- …

Example:

Focus A: Grinding wheel wear calculation
/7/ …
/8/ …
:
:

Focus B: Grinding wheel wear causes

/1/	is linearly dependent on…no conditions mentioned
/12/	no dependence on x … exact conditions
/23/	varies depending on…
:	
:	

List of References

/1/ …
/2/ …
:
:

Processing of scientific work

- **Presentation** of the state of knowledge
  - structured according to the main focus of the task
  - present contradictory or binding statements
  - mention unaddressed topics
  - summarize statements, generalize
  - Describe the impact on the processing of the diploma topic

The dominant causes of wear on ceramic bonded grinding wheels are reported to be:
- … /1, 14, 13/
- … /2, 14/…
- … …

The following causes are listed with less influence:
- … I13I under extreme temperature conditions
- … I7I for processing …

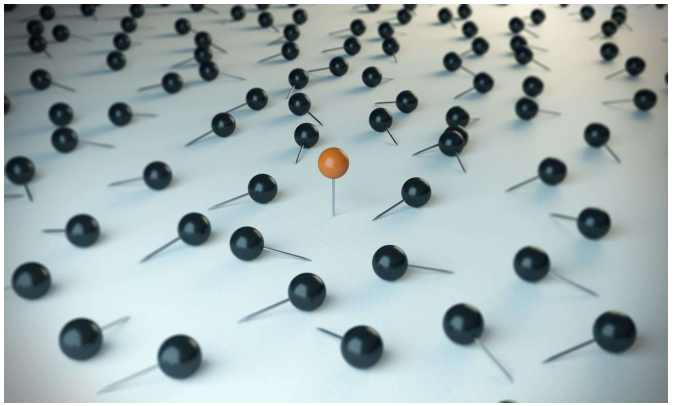
No qualitative statements were found on the wear of cut-off wheels with a synthetic resin bond. In addition, it is therefore necessary:
- to make analogous considerations
- realize experimental wear measurement :

:

Processing of scientific work

- **Clarification** of the task
  - Summary of the conclusions drawn from the presentation of the state of knowledge

Example:
It is necessary to study …
Main focuses are …
Were adopted from the literature…
Is limited ... because…

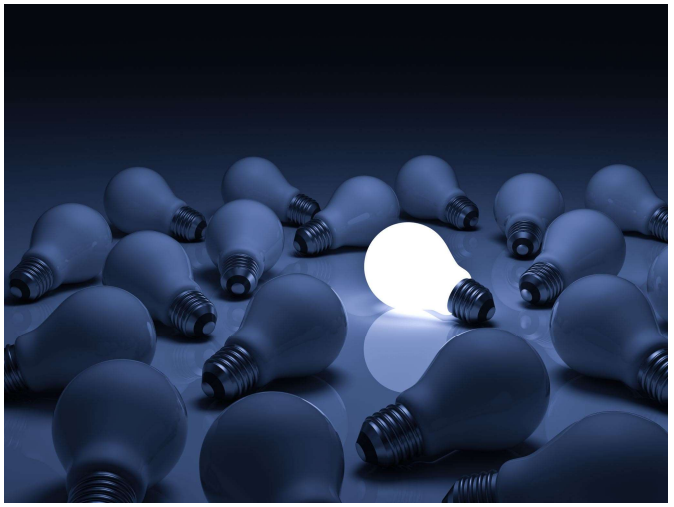


Attention !!!!

No copy of the official task!
This provides the rough structure of the scientific work!

Processing of scientific work

- **Finding solution**
  - for the individual subtasks
    - Work out limitations of the solution area in a well-founded way
    - Logically derive evaluation criteria (knock-out criteria)
    - Present solution variants with their properties
    - Select solution(s)
    - Analyze or summarize and evaluate overall solution



Attention !!!!

Strictly separate from:
- Principle separation
- Design calculation
- Elaboration (construction)
- Verification
- Results evaluation

Clearly present:
- Original thoughts
- Adopted solutions
- Developed approaches

Processing of scientific work

- **Summary**
  - Task – Approach – Result – Outlook
- **Submission**
  - Minimum 2 copies
  - Stamped at the examination office
  - Then to the supervisor
- **Preparation** for the academic colloquium
  - Usually within 6 weeks after submission

Structure of scientific work

- see Guidelines for writing scientific paper

  https://www.tu-chemnitz.de/mb/UFF/studentische_Arbeiten.html#voraussetzung


TECHNISCHE UNIVERSITÄT
CHEMNITZ

Arbeitshinweise zum Erstellen wissenschaftlicher Arbeiten

am Institut für Werkzeugmaschinen und Produktionsprozesse

Professur für Umformendes Formgeben und Fügen

IWP WERKZEUGMASCHINEN UND PRODUKTIONSPROZESSE

UFF Professur für Umformendes Formgeben und Fügen

Januar 2023

Autoren: Dr.-Ing. Andreas Kunke und Dr.-Ing. Dipl.-Wi.-Ing. Anja Rautenstrauch

Structure of scientific work

- Paper
  - DIN A4, white, 80 to 100 g/m2
  - Printed on one side

- Margins

Left	3.0 cm
Right	2.5 cm (for comments)
Top	3.0 cm (including header)
Bottom	2.5 cm (including footer)

- Schrift

Font	Size	Line Spacing
Arial	11 pt	1,5-lines
Times New Roman	12 pt	1,5-lines

Structure of scientific work

- **Structure of the work**

  Cover Page
  Task Description
  Bibliographic Description** and Abstract
  Table of Contents
  List of Abbreviations and Symbols
  List of Images/Tables/Diagrams
  Acknowledgments*
  Introduction
  Literature Analysis (State of Research and Development)
  Specification of the Task
  Main Section (Headings can be freely defined; pay attention to the “red thread")
  Summary
  Outlook
  List of References
  List of Appendices*
  Appendices*
  Theses**
  Declaration of Independence

* optional
** only for master thesis

Structure of scientific work

- **Outline (structure)**
  - Section subdivision only makes sense,
    - if text of at least 1/2 page (half a page) follows
    - if at least one complete sentence is written (as a prefix for enumerations, pictures, tables, etc.)
  - Section heading starts with noun or adjective, not with preposition
  - Short section headings
  - Pay attention to equal hierarchy levels
  - Do not use abbreviations in section headings

Example

3 Forming Processes	
3.1 Sheet Metal Forming	
3.1.1 Deep Drawing	
3.1.2 Stretch Forming	
3.1.3 Bending	
3.2 Bulk Deformation	
3.2.1 Forging	→ wrong, because only one section in this level
4 Rolling	→ conditionally incorrect; incorrect content, belongs under 3.2

Structure of scientific work

- List of abbreviations

Example

Abbreviation	Designation
TTT-Diagram	Time-Temperature-Transformation Diagram
TTA-Schaubild	Time-Temperature-Austenization Diagram

- List of symbols

Example

Abbreviation	Unit	Designation
S	mm	Sheet thickness
$u_{1,2}$	mm	Undercut
A	m²	Area

- List of indices

Example

Indices	Unit	Designation
dyn	-	dynamic
eff	-	effective
r	-	radial

Structure of scientific work

- List of references

Beispiel

/1/ Müller, H.-J.: Title of the work, (possibly also type of work [e.g., dissertation]), Location, Institution/Publisher, Year of Publication, Edition
/20/ Author Collective: Title of the work, ... (as above)
/30/ DIN 12345: Title, Year of Publication

Examples of referencing and citations of literature.

Example

…(see Sect. 3.2, p. 37).
…/11, 24/.
…/25, p. 17/.
…. by MÜLLER /12, p. 20/ it was stated that ...

Structure of scientific work

- Appendix Index

Example

Appendix 1: Experimental Results of Stiffness Measurement...
Appendix 2: Source Code for the Calculation Program...

All the components of a work are included in an appendix,

- which should not necessarily be included in the text part, because they are superficially not important for the understanding of the work (e.g.: derivations of equations, measurement protocols of investigations etc.)
- which, due to their size, require an unreasonable amount of space in the text part of the paper (e.g.: full-page or larger-format compilations, diagrams, etc.)

Structure of scientific work

- Writing recommendations
  - Use of the hyphen

Examples of using hyphens	
Werkzeugmaschinen-Mechatronik	no space before and after the hyphen
Werkzeug- und Vorrichtungsbau	Spaces only after the hyphen
Werkzeugkonstruktion und -fertigung	Space only before the hyphen
…….. – zusammen betrachtet – …….	For textual insertions, add one space before and after the hyphen
6stufig, 4spindelig, 8fach	without hyphen
n-stufig	with hyphen

  - Avoid juxtaposition of nouns

(Instead, relate the individual nouns to each other using articles or prepositions)

Example:	*unfavorable*	*better*
	Bedienpult Werkzeugwechsler (Tool changer control panel)	Bedienpult für Werkzeugwechsler (Control panel for tool changer)
	Konstruktion Baugruppe Spindelstock (Construction headstock assembly)	Konstruktion der Baugruppe „Spindelstock“ (Construction of the "headstock" assembly)
	Sicherung vertikal (backup vertical)	vertikale Sicherung (vertical backup)

Structure of scientific work

- Writing recommendations
    - Listing various facts with bullet points

(Do not use long, punctuated sentences in each bullet point!)

Example

For the assessment of machine quality, the following criteria are significant:
- Stiffness of the machine, taking into account the various contact points between individual components
- Mass of the motion-executing components involved in the assembly, including their associated drive units
- Impact on the machine's environment due to noise generated by individual gearbox assemblies

Major errors

- Content-related:
  - Violation of the principles of scientific work (copyright)
  - References to advisors, personal style
  - Unjustified decisions, choices, approaches ...
  - Lack of a logical structure: 'red thread'

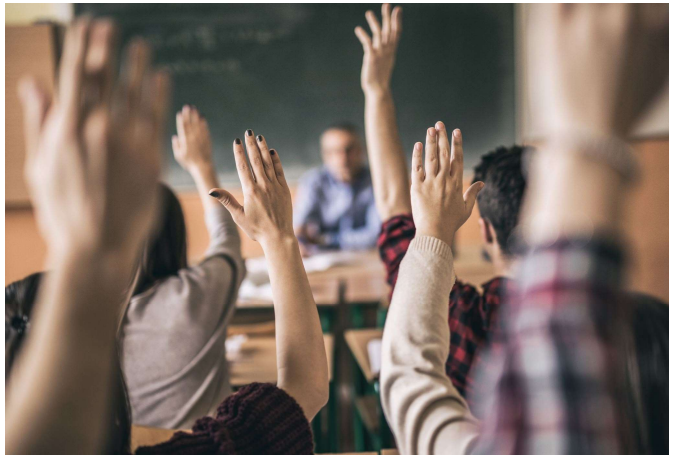
- Format-related:
  - Lack of numbering and labeling for images, tables, appendices, and equation numbering
  - Incomplete references, abbreviation key

Attention !!!!

Even a negative result can be a scientific achievement if it is logically derived and justified!

Scientific colloquium

- Greeting
- Presentation (20 Minutes, free)
  - Salutation, speak to the listeners
  - „Dramaturgy of the presentation“
  - Pay attention to the level of the listeners
  - Contents:
    - Task
    - Literature and Derived Tasks
    - Solution approach
    - Key points - Highlights
    - Result
    - Outlook
- Reading of Assessments (without Grades)
- Questioning, Discussion, announcement of grades



Event is public - guests are welcome - observe dress code

You did it!


The End.