UNIVERSITÄT WÜRZBURG

Graduate Schools
Life Sciences
Science & Technology

# Guidelines for preparation and submission of a doctoral thesis at the Graduate School (GS)

The aim of the doctoral thesis is to compile the candidate's work as a doctoral researcher, and to contextualise and discuss the work in relation to the broader research field.

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## 1) Thesis type

As decided by the Graduate School of Life Sciences (GSLS) Common Graduation Commission ("Gemeinsame Promotionskommission") on 10th February 2022, the thesis may be prepared in the form of **a monograph ("Monographie")** or a **manuscript/chapter- based compilation thesis ("Manuskript-/Kapitel-basierte Thesis").** Both thesis types are considered equivalent; there is no *a priori* difference in quality constituted by the choice whether a thesis is written as a monograph or as a compilation thesis. In either case, it is essential that the thesis forms a cohesive body of work.

Before starting the writing process, **the doctoral researcher must discuss with their thesis committee which type of thesis will be best suited**. When handing in a thesis at the Graduate School office, a signed approval must be provided that confirms that the advisory committee members agree with the submission of the thesis in the current manuscript-based form. Further approval by the section speakers or the GSLS Common Graduation Commission is not required. The formal structure of the thesis will be checked by the GS upon submission. In cases of potential concern, the section speakers may be asked for advice.

## 2) Thesis formats

### A) Monograph

• The monograph is a coherent body of text that includes a detailed report of the material and methods used, and of the results obtained by the candidate.

• The monograph should give sufficient detail to allow to understand and assess, what has been done and achieved by the doctoral researcher.

A monograph should include the following sections:

- ✓ **Title page:** based on the GS template
- ✓ Names of the thesis committee members and the chairperson Table of contents
- ✓ **Summary:** A one-page summary in English
- ✓ **Zusammenfassung:** A one- to two-page summary in German

- ✓ **Introduction**: The introduction should provide a **clear and comprehensive overview** of the research project, outlining its **overall aims** and the **key research questions** being addressed. It should explain **how these questions are tackled** within the included research articles and manuscripts. This section typically incorporates a **targeted review of the relevant background literature**, offering the necessary context without attempting to provide an exhaustive account of all prior research in the broader field. The introduction should conclude with a **concise statement of the thesis's specific aims and objectives**.

- ✓ **Material & Methods**: This section gives a comprehensive description of the material and methods used. Sufficient detail must be given to allow reproduction of the experiments by other researchers. We recommend the use of a format similar to the STAR Methods (see https://www.cell.com/star- authors-guide).

- ✓ **Results:** This section should present, in **detailed and structured form**, the **results obtained by the candidate** during the doctoral project. It may also include results generated in **collaboration** with others. If necessary, results obtained entirely by others, **without the**

**candidate's contribution**, may also be included — but these must be **clearly identified** and **properly cited**. For any **unpublished data** referenced, appropriate **permissions** must be obtained and acknowledged (e.g., noted as "personal communication").
Whenever results from others — whether collaborative or independent — are included, this must be **explicitly stated in the text** at the relevant points. Similarly, if **figures or figure elements** present data not generated by the doctoral candidate, this must be **clearly acknowledged** in the **figure legends**.
If **text, figures, or figure panels** in the results section are taken from manuscripts (in any format) **co-authored by the candidate**, including those **in preparation or not yet accepted for publication**, the corresponding **publication or manuscript** must be **cited** (e.g., in the figure legend).
All use of materials — whether text, figures, or tables — must also comply with the requirements outlined in **point 4 ("Proper Citation and Publisher Approval for Illustrations and Texts")**, ensuring correct attribution, transparency regarding reused material, and obtaining any necessary **publisher permissions** when copyrighted content is included.

- ✓ **Discussion:** This section should go beyond merely summarizing the results presented earlier. Instead, the candidate is expected to **critically reflect** on their findings and situate them within a broader **scientific and theoretical context**. The "Discussion" should address potential **experimental limitations**, evaluate the **theoretical and practical implications** of the work, highlight how the results **advance the field**, and offer **well-founded suggestions for future research**.

  In this section, the candidate is expected to **critically evaluate their findings** and position them within a **broader scientific and theoretical framework**. The summarizing discussion should:

  - **Integrate and interpret** the main findings from all included works,
  - Address **limitations** of the research,
  - Consider the **theoretical and practical implications** of the work,
  - Explain how the research **advances the field**, and
  - Provide **well-founded suggestions for future directions**.

- ✓ References
- ✓ Publication list
- ✓ Signed CV
- ✓ **Statement of individual author contributions and of legal second publication rights**
- ✓ **Statement of individual author contributions to figures/tables**
- ✓ **Affidavit/"Eidesstattliche Erklärung"**

Further relevant information, such as a list of figures, abbreviations, raw data etc., may be given in an Appendix section at the end of the thesis.

**B) Compilation (manuscript/chapter-based) thesis**

• The compilation thesis consists of **at least two research articles or manuscripts ("chapters")**, which are framed by an **introduction** and a **comprehensive summarising discussion**.

• The included research articles and manuscripts must either be **published, accepted for publication**, or meet the **quality standards required for publication** in recognized international peer-reviewed academic journals.

• Each research article or manuscripts ("chapters") must follow a **standard scientific format** suitable for peer-reviewed journals. Typically, this includes the following sections: **Abstract, Introduction, Materials & Methods, Results, and Discussion** (with the possibility of combining Results and Discussion into a single section).

• In addition to the minimum of two research articles or manuscripts **("chapters")**, the thesis may also include:

- **Technical manuscripts** describing a novel method established during the doctoral project, provided they are formatted according to the standards of methods journals or books.
- **Systematic reviews** that generate new insights (e.g., through meta-analyses of published data).

**Note:** Narrative review articles are not considered original research and **cannot** be counted as research articles or manuscripts.

• The doctoral candidate must be **first author (or shared first author)** on at least **two** of the included research articles or manuscripts. This first authorship indicates a **substantial contribution** to the writing, experimental design and execution, data analysis, and interpretation of results. In addition to these two first-author works, further **published articles or accepted manuscripts** where the candidate is a **co-author** may also be included, provided that the research and findings are of **clear relevance** to the doctoral project.

• The candidate must **clearly specify** which experiments and results stem from their own work and which are attributable to colleagues. For each article or manuscript, a **Statement of Individual Author Contributions** must be provided using the **GS templates**, regardless of whether the article/manuscript is published or unpublished. This includes:

1. Statement of individual author contributions and of legal second publication rights
2. Statement of individual author contributions to figures/tables)

• Since multiple authors may have contributed to the included articles and manuscripts, the **framing sections** of the thesis (**Introduction** and **Discussion**) hold particular importance. Reviewers will rely on these sections to assess the **candidate's independent and autonomous contribution** to the overall work.

A compilation thesis should include the following sections:

- ✓ **Title page:** based on the GS template
- ✓ Names of the thesis committee and chairperson
- ✓ Table of contents
- ✓ **Summary:** A one-page summary in English
- ✓ **Zusammenfassung:** A one- to two-page summary in German

✓ **Introduction**: The introduction should provide a **clear and comprehensive overview** of the research project, outlining its **overall aims** and the **key research questions** being addressed. It should explain **how these questions are tackled** within the included research articles and manuscripts. This section typically incorporates a **targeted review of the relevant background literature**, offering the necessary context without attempting to provide an exhaustive account of all prior research in the broader field. The introduction should conclude with a **concise statement of the thesis's specific aims and objectives**.

✓ **Manuscript section ("chapters")**: This section presents the **original research articles or manuscripts** as outlined above. These works must include detailed descriptions of the **methods and materials** used, as well as the **results** generated during the doctoral research. Each chapter must adhere to the **standard scientific format** specified earlier. **Narrative review articles are not permitted** in this section. A minimum of **two original research articles or manuscripts** must be included, with the candidate serving as **first author (or shared first author)** on these works. The **total number** of articles or manuscripts included is **not decisive**; rather, the evaluation will focus on their **scope, significance, and contribution** to the field, taking into account the nature of the discipline. In general, at least **one** of the included articles or manuscripts should already be **published** or **accepted for publication**. Any **additional data** or **methodological details** that are not part of the manuscripts may be placed in an **appendix** at the end of the thesis.

✓ **Summarising Discussion**: This section should go **beyond simply summarizing or repeating** the results already presented in the individual research articles and manuscripts. Instead, it must be written from a **holistic perspective**, addressing the **overall aims** of the thesis and weaving together the findings into a coherent narrative.

It is encouraged to include reflections on **unsuccessful initial approaches** or **methodological adjustments** made during the course of the research, as these insights contribute to the transparency and depth of the work. The discussion should clearly convey the **connections between the individual projects** and the results described in the included articles and manuscripts.

In this section, the candidate is expected to **critically evaluate their findings** and position them within a **broader scientific and theoretical framework**. The summarizing discussion should:

- **Integrate and interpret** the main findings from all included works,
- Address **limitations** of the research,
- Consider the **theoretical and practical implications** of the work,
- Explain how the research **advances the field**, and
- Provide **well-founded suggestions for future directions**.

- ✓ References
- ✓ Publication list
- ✓ Signed CV
- ✓ Statement of individual author contributions and of legal second publication rights
- ✓ Statement of individual author contributions to figures/tables
- ✓ **Affidavit/"Eidesstattliche Erklärung"**

Further relevant information, such as a list of figures, abbreviations, raw data etc., may be given in an Appendix section at the end of the thesis.

### 3) Publication Requirements and Graduation Criteria at the Graduate School

Independent of the thesis type, **at least one accepted co-author publication in a peer-reviewed international journal** is a prerequisite for graduation at the GSLS. The distinctions **"magna cum laude" or "summa cum laude"** require at least one first-author publication (shared first authorship is also acceptable) in a peer-reviewed international journal. The time period between submission of a manuscript and its acceptance for publication may be substantial. In order to account for this, the GSLS accepts not yet accepted first/co-authorship manuscripts in conjunction with a **guarantee of the primary supervisor ("Bürgschaft")** that 1) the manuscript will be published in a peer-reviewed international journal and 2) the doctoral researcher will remain first/co- author even in the case of potential revisions.

### 4) Proper Citation and Publisher Approval for Illustrations and Texts

The doctoral candidates must provide complete and correct references to both their own and others' preliminary work and intellectual content. Upholding best practices requires full transparency about one's own role and the contributions of third parties.

To explain the terms: In cases of "plagiarism", it concerns the authorship of the material, figure, or text in question. In the case of "self-plagiarism", it concerns the novelty (or uniqueness) of the "own" corresponding material. The author of the thesis should not mislead the readers about the novelty of the work.

To avoid plagiarism or self-plagiarism, the origin, source, or provenance of a text or text excerpt must be appropriately disclosed, referenced, or clearly indicated. This means that, regardless of the thesis format, the candidate must ensure that all text, illustrations, figures, and tables, directly sourced from publications or manuscripts (including their own) are explicitly credited or referenced in the corresponding figure legend or text. This also applies to modified figures.

Likewise, when reusing one's own text ("text recycling") from publications, manuscripts, or preprints (accepted, submitted, or in preparation), authors or researchers must be transparent by including a statement in the text, mentioning that the document or thesis contains recycled material.

If material or text in a monography thesis is based on collaboration and is identical or highly similar to the material or text in another publication (e.g. preprints, manuscripts, other theses) not written by the doctoral candidate, permission must be obtained from any coauthor(s) who initially wrote, created, or contributed to the material being recycled. Examples are method sections, figures, graphs, or text elements. For monographs, it is not permissible to reuse entire publications or manuscripts.

If approval from the publisher is required (e.g. copyright for figures, schemes), it is the candidate's responsibility to obtain it. Corresponding permissions from publishers should be referenced or included in the thesis document.

**5) The use of generative artificial intelligence during the thesis writing process**

The primary criterion for evaluating a dissertation is the student's independent scholarly achievement. The use of generative artificial intelligence (AI) including large language models (LLMs), such as ChatGPT or Perplexity, in the preparation of a doctoral thesis is generally permitted, provided that it complies with the principles of good scientific practice and is fully disclosed in a clearly identifiable section (e.g. the Material and Methods section or a dedicated AI statement). AI may support the writing process or may be used to generate figures, illustrations and schematic representations, but must not replace the doctoral candidate's independent scientific reasoning, interpretation, or authorship. AI may not be used to generate independent scholarly work in its entirety or to a predominant extent.

Routine technical assistance that does not generate or alter the content of the thesis - such as conventional spelling and grammar correction, reference management, or standard formatting functions - does not require separate disclosure. In cases of doubt, the use of generative AI should be disclosed.

Any use of generative AI during the preparation of the thesis must be fully disclosed, regardless of whether it was used for language editing, grammar and spelling correction, generation of research questions or summaries, literature searches, formatting assistance, content generation or other purposes.

The disclosure should clearly describe:

- which parts of the thesis are affected
- which AI tool(s) and -if possible- version were used,
- the purpose for which generative AI was used, for example:
  - generation of research questions
  - structuring and logic of the thesis
  - language editing
  - literature searches
  - formatting assistance
  - creation of figures
- the extent to which AI-generated output was incorporated in the final thesis
- where appropriate, representative examples for prompts or instructions that were used.

The doctoral candidate bears full responsibility for the entire content of the thesis, including the accuracy of scientific statements, figures, conclusions, quotes, and references. AI-based statements need to be backed up by references in the same fashion as statements made by the author. AI systems cannot be regarded as authors and cannot bear responsibility for errors, fabricated information, inappropriate interpretations, or incorrect references. The use of generative AI does not in itself diminish the scientific achievement represented by a doctoral thesis. The relevant criterion is whether the thesis continues to demonstrate the candidate's own scientific reasoning, methodological competence, critical judgement, and independent contribution. It is the task of the reviewers and the GSLS to assess whether, and to what extent the use of AI affects the candidate's independent scientific contribution.

- The use of AI-based methods as part of the scientific methodology - for example machine learning, image segmentation, classification, modelling, or AI-supported data analysis – should be distinguished from the use of generative AI as an aid in preparing the thesis. Such methods are permissible provided that they are scientifically justified, appropriately validated, sufficiently

documented, and reported transparently to allow their role in the research process to be understood and, where applicable, reproduced. They should in this respect be treated according to the same principles as other scientific software, computational methods, and analytical tools.

- Confidentiality, data protection, copyright, and intellectual property requirements must be respected when using external AI systems. In particular, unpublished research data, personal or patient-related data, confidential information, copyrighted material, or information subject to contractual restrictions must not be submitted to external AI services unless such use is permitted under the applicable legal, institutional and contractual framework.

### 6) Plagiarism Check (optional)

A voluntary plagiarism check can be performed using the software iThenticate. The result should be discussed with the first supervisor. It is not required to integrate the result into the dissertation or to inform the GSLS

**Access to Plagiarism Detection Software iThenticate:**
Access can only be granted to the supervisor(s).
**For JMU staff:** Apply via the Würzburg University WebShop (LINK).
**For UKW staff:** Free access via SMI. Complete the "Order Licensed Software" form (LINK, only accessible within UKW Intranet), signed by the requesting supervisor and clinic/institute director. Send the application to Thomas Schüll: schuell_T@ukw.de.
Access is granted regardless of location or device.

After receiving login details, access is available via:https://app.ithenticate.com/de/login

### 7) Requirements by the University Library

Prior to the publication of the dissertation and thus prior to receiving the doctoral degree, the University Library demands that the candidate signs an “Author Contract” (www.bibliothek.uni-wuerzburg.de/fileadmin/ub/pdf-Dateien/OPUS/Autorenvertrag_OPUS_de.pdf). This document certifies that the candidate is legally entitled to publish the manuscripts within the dissertation. Issues to be considered in this respect:

• Co-Authors

Copyright law and good scientific practice require that any publication be approved by all co-authors. Therefore, the candidate must inform all co-authors about the intended (secondary) publication of a manuscript in the context of the dissertation and obtain permission to do so (e-mail suffices).

• Publishers

The candidate must clarify with the journal publishers the publishing rights for each manuscript to be included in the dissertation. The candidate must also clarify with the journal publishers the publishing rights for each adopted original figure from other publications (e.g. reviews) to be included in the dissertation. The respective rules and regulations of most publishing companies can be found at “SherpaRomeo” (www.sherpa.ac.uk/romeo). However, the information obtained on this web page is not legally binding. Alternatively, most relevant journals can now be asked for permissions online via https://marketplace.copyright.com/rs-ui-web/mp. If still in doubt, it is necessary to check the

publisher's homepage (for an example see: https://ashpublications.org/blood/pages/rights-permissions) or to directly ask the publisher for permission. Many publishers allow a secondary publication of an already-published manuscript within a dissertation. However, restrictions often apply in case of manuscripts which are still in the review process ("Pre-Print"). Please note that this is also true for manuscripts which are not yet submitted. In other cases, it is not allowed to use the layout of the journal, or there may be an embargo period. If the latter is the case, the candidate may still immediately submit the dissertation to the University Library, asking for a publication deferment until the embargo period is over. This fulfills the requirement to submit the dissertation to the library and the doctoral diploma can be awarded without delay.

**Remarks**

The requirement to clarify with the journal publishers the publishing rights for each manuscript included in the thesis cannot be circumvented by submitting to the library printed copies or microfiche only. Even then, consent of the publisher is required. Please consider that all the issues raised above may apply also for manuscripts that have not yet been submitted. In case of questions regarding citations and copyright, we recommend contacting the University library for advice.