

Guidelines for Writing Diploma Thesis

Ing. Petr Keller, Ph.D.

Thesis – style is according rector's directive no. 5/2018 , rev 2022

The thesis is submitted:

- **two copies in printed form**, the work must be tied to a fixed (permanent) binding, hardcover with sufficiently contrasting print, the formalities of work see next page
- electronically is permitted only **PDF** format (preferably PDF / A - archival) text searchable, electronic version of the thesis must be the same in printed form

Before the work is submitted it is mandatory to **submit it's data to IS STAG** (title, annotation, keywords – in Czech and English). It is also mandatory to upload the thesis in pdf format (in one file only, max. size of file 50MB). Work attachments are saved separately in a *.zip file (max. size of zip file 50MB)

The electronic version must be the same as the printed one!

Sections of the thesis are in this order:

- a) **Envelope (cover)** – according to the rector's directive – see next page
- b) **Title Page** – is generated by IS STAG, use only English version
- c) **Thesis Assignment** – is generated by IS STAG
- d) **Diploma Thesis Declaration** – is generated by IS STAG
- e) **Abstract and Keywords** – both in Czech and English
- f) **Contents**
- g) **Alphabetical List of Abbreviations and Symbols**
- h) **Text of the Work**
- i) **References** – according to ČSN ISO 690
- j) **List of Attachments and Drawings, Attachments**
- k) **Drawings (copies).**

Envelope (cover) – according to the rector's directive

The diagram shows a rectangular envelope cover template with the following layout and labels:

- Top margin:** 30 mm
- Faculty name:** FACULTY OF MECHANICAL ENGINEERING TUL
 - Label: faculty brand (full name version)
- Left margin:** 30 mm
- Thesis title:** **Diploma Thesis**
 - Label: thesis type (Inter Bold, 24 b)
- University name:** Technical University of Liberec
 - Label: university name
 - Label: 2 empty rows
 - Label: name of the student
 - Label: year of submission (Inter Regular, 18 b)
- Student name and year:** Mary Somebody
2022
- Bottom margin:** 30 mm

Title Page – from IS STAG (old version)

 TECHNICAL UNIVERSITY OF LIBEREC
Faculty of Mechanical Engineering ■

Testing of Multi Material Printing by FLM Additive Manufacturing

Master Thesis

Study programme: N2301 Mechanical Engineering
Study branch: Manufacturing Systems and Processes

Author: 

Thesis Supervisors: Ing. Petr Keller, Ph.D.
Department of Manufacturing Systems and Automation



Assignment Form – from IS STAG (old version)

Master Thesis Assignment Form

Testing of Multi Material Printing by FLM Additive Manufacturing

Name and
surname:

Identification
number:

Study
programme:

Study branch:

Assigning
department:

Academic year:

██
N2301 Mechanical Engineering
Manufacturing Systems and Processes
Department of Manufacturing Systems and Automation
2019/2020

Rules for Elaboration:

Perform the testing of the FLM Rebel II 3D printer for printing of parts from two different materials (eg ABS and TPU, ABS and Iglidur, two colors of the same material, etc.). Design a calibration procedure and print settings, and if necessary, make changes of the printer design (such as head cleaning during printing, etc.).

Recommended methods of elaboration:

1. Become familiar with the existing 3D printer Rebel II in the lab.
2. Make research of used materials for FLM technology and print requirements for these materials.
3. Design a suitable shape of the testing part, as assembly of two parts where each part will be printed from different color / material. Select at least three different combinations of materials and perform experimental 3D printing.
4. Design calibration procedure for printer setting and if necessary make changes of the printer design, typically some mechanism for cleaning heads during printing.
5. Evaluate the results and conclusions.

Scope of Graphic Work: according to need
Scope of Report: approx. 55 pages
Thesis Form: printed/electronic
Thesis Language: English



List of Specialised Literature:

- [1] GEBHARDT, A. *Understanding Additive Manufacturing: Rapid Prototyping – Rapid Tooling – Rapid Manufacturing*. Munich: Hanser, 2011. ISBN 978-3-446-42552-1
[2] WIMPENNY, D. I., L. J. KUMAR a P. M. PANDEY. *Advances in 3D Printing & Additive Manufacturing Technologies*. New York, NY: Springer Berlin Heidelberg, 2016. ISBN 978-981-10-0811-5.
[3] SRIVATSAN, T. S. a T. S. SUDARSHAN. *Additive manufacturing: innovations, advances, and applications*. Boca Raton: Taylor & Francis, 2016. ISBN 9781498714785.
[4] REPRAP. *RepRap Forums* [online]. 2016 [cit. 2019-09-23]. Available from: <http://forums.reprap.org/index.php>
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Date of Thesis Assignment: November 20, 2019

Date of Thesis Submission: May 20, 2021

prof. Dr. Ing. Petr Lenfeld

Dean

L.S.

Ing. Petr Zelený,
Ph.D.
Head of
Department

Liberec November 20, 2019

Diploma Thesis Declaration – from IS STAG

– according to rector's directive 5/2018, rev 2022

Declaration

I hereby certify, I, myself, have written my bachelor thesis/master thesis/rigorous thesis/dissertation as an original and primary work using the literature listed below and consulting it with my thesis supervisor and my thesis counsellor. I acknowledge that my bachelor thesis/master thesis/rigorous thesis/dissertation is fully governed by Act No. 121/2000 Coll., the Copyright Act, in particular Section 60 – School Work.

I acknowledge that the Technical University of Liberec does not infringe my copyrights by using my bachelor thesis/master thesis/rigorous thesis/dissertation for internal purposes of the Technical University of Liberec.

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At the same time, I honestly declare that the text of the printed version of my bachelor thesis/master thesis/rigorous thesis/dissertation is identical with the text of the electronic version uploaded into the IS STAG.

I acknowledge that the Technical University of Liberec will make my bachelor thesis/master thesis/rigorous thesis/dissertation public in accordance with section 47b of Act No. 111/1998 Coll., on Higher Education Institutions and on Amendment to Other Acts (the Higher Education Act), as amended.

I am aware of the consequences which may under the Higher Education Act result from a breach of this declaration.

Abstract and Keywords

Abstract – one paragraph of about 200 words.

- (1) Background: Place the question being addressed in a broad context and emphasize the purpose of the study;
- (2) Methods: briefly describe the main methods or processing used;
- (3) Results: summary of the main findings of the article;
- (4) Conclusions: state the main conclusions or interpretations. The abstract should be an objective representation of the article and should not contain results that are not presented and substantiated in the main text, and should not exaggerate the main conclusions.

Keywords - important terms, areas and concepts within the content of the work, better to use more keywords (4 - 6)

Abstract and Keywords

TÉMA: ULOŽENÍ VŘETENE SOUSTRUHU SU

ABSTRAKT: Práce shrnuje informace o užívaných uloženích, zvláště valivých ložisek - otáčky, teploty, přesnost chodu, tuhost trvanlivost možnosti montáže, sledování provozního stavu. Zabývá se výpočtem optimalizace uložení a změn vlivem předpětí ložisek a užitím ložisek různých výrobců.

KLÍČOVÁ SLOVA: soustruh, vřeteno, uložení, ložiska, tuhost

THEME: SPINDLE SUPPORT IN LATHE SU

ABSTRACT: The work summarises information on work spindle support, mainly rolling bearing, speed limit, temperature, precision, rigidity, durability, assembly conditions, monitoring and maintenance. It deals with calculation of optimised support and changes in performance due to preloading and different manufacturers of bearings.

KEYWORDS: lathe, spindle, bearings, stiffness

The basic outline of the text

- a) Introduction - introduction, outlining what the work will look
- b) Aims (goals) of the work** - to clearly define the goals of this work
- c) The theoretical part – review of the present state of knowledge, finding new ways of solutions
- d) Practical part – description of author's own solutions, description of alternative solutions, a selection of the best solution and its completion, etc.
- e) Conclusion - summary of work, evaluation of the achievement of the goals

The basic rules

- when using ideas, images, etc. of another author, it is necessary to record the source in your work – so called **citation**
- citations are written according to ISO 690, for their creation it is possible to use some generator of citations, e.g. on www.citace.com (Czech pages)
- it is good idea to use Zotero software and its plugin to Word for easy generation of citations
- **DO NOT COPY** parts of other works, if it is necessary, copied text must be in quotation marks accompanied with citation
- style of citation is different, recommended is numbering - see example on the next page

Citation - sample text

3.1 Available solutions of extrusion heads

The most common extrusion head designs are listed in this chapter. One of the criteria for dividing extruders into categories is the means of feeding filament using feeding mechanism into the hot part of the extrusion head. Vast majority of extruders using a printing wire to uses one of the following feeding solutions:

- Geared extruders
- Direct drive extruders
- Bowden extruders

Geared extruders uses a gear reduced feeding mechanism to feed the filament. Due to that, these extruders offer higher torques than direct extruders and are therefore suitable mainly for printing wires with higher diameter (3 mm). However, the disadvantage lies in somewhat more robust structure and size [6]. Example of this extruder is shown in fig. 12.



Fig. 12. Example of the geared extruder [11]

Citation - demonstration of writing citations

References

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- [6] Bowyer, A. *RepRap*. [online]. 2006/2016 [date of citing 2016-07-07]. Available from <www.reprap.org>.
- [7] E3D Online: your blueprint for everything 3D printing. *E3D-Online.com*, 2014, England [online]. [date of citing 2016-04-08]. Available from <<http://e3d-online.com>>
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- [9] Getech Ltd. *Metal J-head long-distance*. [online]. 2014 [date of citing 2016-10-31]. Available from <http://www.geeetech.com/wiki/index.php/Metal_J-head_long-distance>
- [10] Mendricky, R. Accuracy analysis of additive technique for parts manufacturing. *MM Science Journal* [online]. 2016, **2016**(05), 1502-1508 [date of citing 2016-12-2]. DOI: 10.17973/MMSJ.2016_11_2016169. ISSN 18031269. Available from: <http://www.mmscience.eu/november-2016.html#2016169>
- [11] Prusa, J. *Original Prusa i3 Plus 2.85 mm kit*. [online]. 2015/2016 [date of citing 2016-10-14]. Available from <http://manual.prusa3d.com/c/Prusa_i3_kit>

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