

I. IDENTIFICATION DATA

Thesis title:	Artificial intelligence supported mechanical engineering design
Author's name:	Akiki Charbel
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Designing and Machine Components
Thesis reviewer:	Mgr. Ing. Daniel Hadraba Ph.D.
Reviewer's department:	Designing and Machine Components

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment	ordinarily challenging
<i>How demanding was the assigned project?</i>	
The field of AI is highly popular nowadays, however the full potential in mechanical engineering and mainly designing elements and mechanisms is still to find. The work was expected to introduce the current applications of AI in mechanical engineering, select one of the applications as a case study and compare the AI supported design to a traditional approach including calculations.	

Fulfilment of assignment	fulfilled with major objections
<i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	
The student mapped the area of AI in a very general manner and targeted the topic very superficially. Only general information was provided with a little relevance to the mechanical engineering and designing. Some of the chapters are confusing such as the one which discusses the top-down and bottom-up approaches. The chapter about ethical concerns is too long, wrongly placed and inappropriate to the field of mechanical engineering. Finally, the practical part called Engineer's Ally is impossible to verify and provides no technical information about the product and no way to the supervisor to test and validate it. The student did not set any particular goals at the beginning of the thesis, therefore it is difficult to evaluate the achievements. Methodically, the thesis is very weak and the content is very general with no usage of knowledge that the student gathered during the bachelor study program.	

Activity and independence when creating final thesis	D - satisfactory.
<i>Assess whether the student had a positive approach, whether the time limits were met, whether the conception was regularly consulted and whether the student was well prepared for the consultations. Assess the student's ability to work independently.</i>	
The whole work was accessed by the student independently and with no help or consulting from the supervisor. There were no consultation or revision processes at all until the thesis was submitted by the student, although the help and organization of the work had been offered several times (e-mail, establishing the shared folder, citation manager, etc.). The final thesis was reviewed by the supervisor for the first time after submitting the thesis in the KOS system.	

Technical level	F - failed.
<i>Is the thesis technically sound? How well did the student employ expertise in his/her field of study? Does the student explain clearly what he/she has done?</i>	
The thesis belongs more to the humanities than natural sciences. The student is using very general and vague language with no technical justifications or explanations. For instance, the statement that the product, "Engineer's Ally, is the pinnacle of AI integration for mechanical engineering" is completely unproven. The student did not inform the reader what the purpose of the thesis is, what the goals are and how the goals are going to be achieved. There is no technical explanation to any of the described problems or models, no validation or check of the introduced studies and no proof that the student is capable to replicate or solve the problems or areas of interest.	

Formal level and language level, scope of thesis

E - sufficient.

Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?

The language is sound but the sentences are often empty or vague. The structure does not follow the traditional methodological standard, i.e. theoretical part, practical part, discussion, and conclusion. Some of the chapters are illogically placed and would need to reorder, for instance, Revolutionary applications or Ethical considerations should be in the first part of the thesis. There are no notation or technical expressions. The figure numbers under the pictures and in the text do not always correspond, for instance, page 28 – Road wheel. The thesis includes several typos such as “Studies benn undergoing since the 1950s”.

Selection of sources, citation correctness

E - sufficient.

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

The student strongly relies on popular sources, i.e. towardsdatascience.com, rather than on current reviewed articles and books. The references sometimes relate little to the written text in the thesis, for instance the reference (4) seems to have very little in common with the original paper and carry very general information. The citation is sometimes incorrect as for example on page 15 the sentence: “So we can define AI as: ...” was literally copied from the web and not paraphrased. Therefore the whole sentence should have the quotation marks. In addition to that, it does not seem that the student used the primary source for the citation.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

The topic of the thesis is very current and had great potential for targeting very recent field of mechanical design. Unfortunately, the result is very vague with no knowledge that one would expect from a bachelor student to demonstrate. It would be very beneficial to dedicate the half of the thesis to the product of Engineer's Ally and focus on this aspect or to take AI design and compare it to the traditional approach. The current thesis just summarizes very general knowledge that can be found on average webpages in much better quality.

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

There are a lot blank places in the thesis which needs to be explained in more engineering manner. The topic is very current, however, it maps the current situation in very superficial way. There is no practical part.

Content related questions:

Page 10. Explain the bottom-up and top-down approach on designing a single stage reduction gearbox.

Page 12. Reference to a picture. “A simple picture shows how top-down...”. Could not find the picture. Can you draw it and explain it.

Page 12. Explain the statement from technical point of view and in the context. What did you mean by: “We learn about the acceptability of the solution and the relationships between the different sub-parameters as we develop and assess complete solutions.”

Page 39. Could you explain more technically what the requirements are for the dataset? How many datasets, etc.?



THESIS SUPERVISOR'S REPORT

General questions:

- 1) *State at least three disadvantages of using AI specific for design in mechanical engineering.*
- 2) *Explain the purpose of Engineer's Ally, what the inputs and outputs are, what model it uses, and what the accuracy and precision of your product is.*
- 3) *Select one of the examples from pages 28 to 31 and indicate how you would compare the AI design product to a classical designing approach in mechanical engineering.*

The grade that I award for the thesis is **E - sufficient**.

Date: **24.1.2024**

Signature: