BACHELOR THESIS PEER REVIEW

I. PERSONAL AND STUDY DETAILS

Student's name:	**Irorobeje Emmanuel Oghenekaro**	Personal ID number:	**491347**
Faculty:	**Faculty of Biomedical Engineering**		
Study program:	**Biomedical and Clinical Technology**		
Branch of study:	**Biomedical Technician**		

II. EVALUATION OF THE BACHELOR THESIS

Bachelor's thesis title in English:

Design of EMG amplifier

	Evaluation criteria	N. of points
1.	Fulfillment of the aim of the thesis and suitability of the structure of the thesis with respect to the topic (compliance with the assignment). (0 – 30)* Any part or sentence of the bachelor thesis assignment has to be dealt with. The full amount of points can be given to the excellent thesis only. The points are reduced in relation to the part of the assignment which is not properly dealt with or is not included at all.	24
2.	Theoretical level and application of accessible sources. (0 – 30)* The reader evaluates the relevance of the theoretical part of the thesis with respect to the assignment and structuring of the ideas. If word-for-word citing prevails, the reader shall decrease the rating by 15 points. (of course if copyright is abided). Moreover, another reason for decreasing the overall assessment is insufficient amount of theoretical knowledge, references and sources.	18
3.	Scope of experimental work (SW, HW) and applied knowledge, quality of methodology and conclusions of the thesis. (0 – 30)* Maximum number of points can be granted to a thesis which is fit for publishing. This aspect is judged with respect to enhancement of theoretical knowledge and practical implications. Creation of a model, SW or technical realization is valued. For minor methodological flaws, the assessment is reduced by up to 5 points. Inconsistency of elaboration with the theoretical background and unclear or not fully professional approach leads to a reduction by at least 15 points. Another decrease can be due to insufficient discussion. A total of 30 points can be given to a very complex and flawless work, including other activities such as participation in scientific-research project or grant, active participation in the writing publications, patents and utility models.	8
4.	Formal requisites and layout of the thesis (writing mastery, structuring, graphs, tables, citations in the text, list of references etc.). (0 – 10)* Reader evaluates formal requisites according to the rules of writing, attributes of final works, i.e. text formatting, structure of the text, references, quality of charts and tables and citations. Number of points can be reduced for noncompliance with the rules by the maximum of 2 points for each disrespected attribute. Grammatical mistakes, spelling mistakes and improper stylistics and terminology decrease the evaluation by 2-4 points. Only standard terminology should be used, especially in the English language (it is necessary to judge the ability to use the technical language - 2 points), graph are according to the rules (see tolerance and the influence of statistical processing - 2 points), captions are included for graphs and tables and everything is readable (2 points), citation rules are complied with according to ISO690 and ISO690-2 (2 points).	2
5.	**Total points**	52

* Verbal evaluation should be part of the Comments

III. PROPOSED QUESTIONS FOR THE DEFENSE (OPTIONAL)

1. 1. On page 56, Figure 5.4 shows a signal with a swing of approximately 15 mV (1.5 divisions with vertical scale 10 mV/division). On page 55 you state that "Two different sine waveforms of 1 Hz frequency,30 mV of amplitude and 2 kHz frequency,70 mV amplitude, were modulated and sent to the oscilloscope ...". How is the above picture related to the generated signal?

2. 2. Figures 5.6 (page 57) and 5.7 (page 58) show the signals from the test measurements. How did you verify that these are the correct signals that should have been recorded? And if you did not verify this, how could such verification be done?

3. 3. What does the value of 120 dB/octave in the sentence "Currently, the best CMRR achievable with current technology is around 120 (dB/Octave @ 50Hz, for example)" on page 27 mean?

IV. THE OVERALL ASSESSMENT OF THE LEVEL OF THE BACHELOR THESIS

Grade**:	A (excellent)	B (very good)	C (good)	D (satisfactory)	E (sufficient)	F (failed)
Number of points:	100 - 90	89 - 80	79 - 70	69 - 60	59 - 50	< 50
	❑	❑	❑	❑	X	❑

** in case of F (failed) please explain in detail

I give the above grade to the bachelor thesis and I recommend/~~do not recommend~~ it for the defence.

V. COMMENTS

The presented bachelor thesis deals with the design and implementation of an EMG amplifier for surface measurements of myopotentials.
The student Emmanual Irorobeje in his bachelor thesis carried out a research of the problem and a design of the EMG amplifier, designed the PCB, which was subsequently mounted and verified the realized device. The student has demonstrated the ability of independent development work.
The student fulfilled the assignment of the thesis, but especially the implementation part of the work and the verification of the results show numerous shortcomings.
The text indicates what filters were designed for the amplifier, but the frequency characteristics of the real amplifier were not evaluated. It would have been useful for the student to at least measure the amplitude frequency characteristics of the amplifier to show that the characteristics of the real amplifier correspond to the design values.
It is also not clear from the text what is the sampling frequency used for the EMG signal measurement. However, the table of measured values in the attachment shows a sampling period of 30 ms, which corresponds to a sampling frequency of 33 Hz. However, such a sampling frequency is quite insufficient for EMG signal sensing; the student himself states that it is necessary to measure at least in the 50-150 Hz band (pp. 14 and 17), commercial devices normally measure up to units of kHz. The code for the Arduino that was used for the evaluation measurements is not included in the appendices, so the sampling frequency cannot be read from it either.
In the Results section on page 42, the student states that "input bias current is approximately 10 nA", and on page 45, under preamplifier characteristics, he writes that "This circuit excels in a low quiescent current (60 µA)." How the currents were measured is not mentioned in the paper, but it is obvious that for such small currents the procedure used can have a significant effect on the measured values.
The Conclusion section states "The spectrum characteristics of the sampled surface EMG signal are analyzed, and the practicability and validity of the EMG signal acquisition system are verified." However, how and with which results the spectral characteristics of the EMG signal were analyzed is not stated anywhere in the thesis.
The typographic level of the work is very low. The way of citing the literature used in the References section is chaotic. The quality of the figures used in the text is often poor, Figure 5.1 (p. 43) is distorted, Figure 5.3 (p. 45) is turned upside down, Figure 5.7a (p. 49) and Figure 5.7b (p. 5.7b) are identical but with different captions. The numbering of the figures is quite confusing, Figure 10 (p. 35) is included between Figures 4.8 (p. 33) and 4.2.1 (p. 38). Figures 5.4 to 5.7 are on pages 47 to 51, but the same labels are duplicated for figures on pages 56 to 58.

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