BIOE 598 B1 **Final Project Guidelines**

Graduate students taking this for 1 credit will do this project by themselves and this time constitutes for 1 credit.

Goal: The overarching goal is to put your learning into practice. To assess your ability to apply the basic concepts of circuit design to study/evaluate/test/create a biomedical device/instrumentation for an application of your choosing. Image processing is not in the scope of our class, please do not pick a project in Image processing or data analysis.

The theme this year is Cardiovascular Diseases (CVD). Any sensor/instrumentation related to CVD will be appropriate.

Please note: (i) Image processing projects outside the scope of this class; (ii) This is not a report on critical discussions on an instrument; (iii) Use of circuit analysis is mandatory (LTSpice etc or any other circuit analysis software – for example MULTISIM, SIMULINK etc)

Description: Essentially any instrumentation aspect of biomedical engineering could be chosen as a study topic. The link below has an extensive (but not complete) list of biomedical instrumentation project ideas – you are welcome to choose from this or from any other project. https://ece-eee.final-year-projects.in/final-year-project-ideas-for-biomedical-engineering.

A key requirement is that your project should address the circuit characteristics of a bioinstrumentation/sensor related to any aspect of health, patient care, or even instrumentation/circuits used in biology. This involves either simplifying an existing circuit (from the literature) or you can design your own for a sensor/instrumentation. You can then use LTSPICE to analyze the circuit characteristics. Please not that your final project cannot be a literature review. The project is done in teams for all BIOE/ECE 414 registrants. A team typically comprises of 3 students. When a team has more than 3 members, the project scope should scale up accordingly. Please assign yourself to the group/team and each group/team will have a number and a name reflecting the topic, for example, "Team 5 – Wearable Sensors". Graduate students who are enrolled in BIOE/ECE 414 as well as BIOE/ECE 598 for 1 credit, please discuss your project with the instructor for work load corresponding to the 1 credit.

Please go to Canvas and include your name in one of the 20+ teams – I have already created this. Please do not create your own Group/Team. You have done this!

What to Submit and When (all submissions via canvas):

(A) Project Idea (1 para – half a page: 5 points) **Oct 15.**
(B) Progress – (1-2 pages with schematic/concept diagram etc page: 10 points) **due Nov 7th.**
(C) Upload a 3-minute video of your Final Presentation [25 points] (**due last day of class**)
(D) Final Report (for formatting details see below) [60 points] (**due last day of class**)

Note: (i) Formatting details are provided below (ii) 10% detection/day for late submission

Format details of the presentation and reports (submit ONE REPORT per team)

A) Preparation of your Power Point Presentation – limit to 8-10 slides (25 pts)
Your power point presentation should address the following –

- TITLE SLIDE: Project Title, BIOE 414, Semester-Year; Team #, name of the team, and member names [FAILUE TO FOLLOW THIS FORMAT WILL RESULT IN DEDUCTION OF POINTS] [1 slide]

Introduction/Motivation: What is the need? Why is this exciting? What problem or biomedical condition will your project address, what is the novel/interesting aspect of your project – discuss biomedical relevance [1 slide] [4 points]

Techniques/Methods: Provide background information on the basic principles of measurement, instrumentation used, circuit design, data processing – pay attention to sensitivity, LOD, controls, linear range, sample preparation etc. Discuss the instrumentation and components, sensors used, what signal is being measured, how signals are amplified, how noise is being handled etc. [2 slides] [8 points]

Results: Be sure to present each data figure/table. Explain the experiment and the data that resulted from your analysis. Explain your results and interpret your data. Signal amplification, filtering, data collection etc as appropriate. If you have taken information from a paper (for example, a publication) and modified the circuit, explain how/why your results should be/is different from the results obtained in the reference paper – focus on your results and use the publication you referred to only for discussion purposes [3 slides] [8 points]

Critique: Discuss your own observations and opinion. Does the sensor/instrumentation work as well as you expected? Does the data support your conclusions on how well the instrumentation/circuit functions? What other design considerations could be proposed for improvement? What are the limitations of the approach? Is the system appropriate for the conceived application? [1 slide] [3 points]

Miscellaneous: Title slide (title of the talk, course info, Semester, Group number (very important) and a group name (Optional), name of members in the team), Acknowledgement slide. Cite references where appropriate in the respective slide as relevant or list the references in the last slide. [2 points]

B) Project Written Report [60 points] (5 pages max – 12 pt Arial font, 1" margins all around and 1.5 line spacing). You can include an Appendix (2 pages max):
Introduction [15 pts]
Methods and Materials [20 pts]
Results and Discussion [20 pts]
Conclusion [5]; References.
Include figures as relevant in the respective sections. If you want to add extra figures, circuit diagrams, simulation results etc, you can add these in an Appendix section that has a 2-page limit. [a total of 5 + 2 pages].
General formatting (figures, tables, circuit diagram) and Language [5 pts]