**EEL 4914 Senior Design I**

**Divide and Conquer Guideline**

The Divide and Conquer document acts as the proposal of your Senior Design project. It should be at least 10-page long and contain all, but not limited to, the following content.

**Cover Page**

* + descriptive title of the project
  + group number
  + group members’ names
  + group members’ degree majors
  + reviewers, advisors, sponsors, customers or significant contributors

**Content** (at least 10 pages)

* + motivation and background

Our senior design group is tasked with designing an Application-Specific Integrated Circuit (ASIC), specifically, the design and synthesis of a RISC32 Central Processing Unit Core (CPU Core). A full CPU is composed of multiple computational units and of other interconnects to outside hardware such as RAM, PCI-e devices, etc. Our project focuses on the computational unit of the CPU. The CPU core is responsible for processing the user’s instruction which are logic, arithmetic, and memory read/write.

Semiconductor fabrication and design are integral to the United States' economic stability, national security, and supply chain resilience. A disruption in the steady supply of chips can have significant consequences, as demonstrated by the global semiconductor shortage triggered by the COVID-19 pandemic in 2020. Industries ranging from defense to automotive manufacturing experienced substantial setbacks due to port closures in key production regions. This disruption highlighted the dependency of modern industries on a reliable supply of chips. For example, the automotive sector faced production halts as critical components became unavailable, and the defense industry experienced delays in both maintenance and production of essential equipment. This project aims to address such vulnerabilities by advancing the design of Application-Specific Integrated Circuits (ASICs), contributing to a more secure and self-sustaining semiconductor ecosystem.

* + goals and objectives/design requirements including basic, advance and stretch goals
  + description of features/functionalities
    - * + reference any input from customers or marketing analysis of comparable products/projects that has been used to identify project features
  + existing product/past project/prior related work
  + table of at least 7 key engineering specifications with quantitative measures
    - highlight 3 demonstrable specifications
  + detailed hardware block diagram (at least one)
    - use color blocks to indicate work distribution
    - indicate both the input and output of each block
    - illustrate clearly the external inputs and outputs of your system
    - indicate the status of each block (to be acquired, acquired, investigating, designing, prototyping, completed)
    - legend (if applicable)
    - include as much detail as possible to facilitate clear understanding of the diagram
  + detailed software diagram/flowchart (at least one)
    - use color blocks to indicate work distribution
    - indicate both the input and output of each block
    - legend (if applicable)
    - include as much detail as possible to facilitate clear understanding of the diagram
  + prototype illustration (if applicable)
  + house of quality
  + budget and financing
  + project milestones for SD1 and SD2

**NOTE:** The above sequence of items does not necessarily indicate the order of content of your report. To produce a well-written report, you need to organize the content in a way that allows the passages to flow, paragraphs to be coherently interconnected, and ideas to be logically connected from one to another, so that your readers can easily grasp and understand the overall pictures and details of your project.

**Appendices**

* + **Appendix A** – reference
  + **Appendix B** – copyright permission
  + **Appendix C** – etc.

**NOTE:** The answer to the question “Do I need to cite this material?” is always a

'YES’. The reason is simple. It is always better to provide proper citation than

not. So, please contact the authors/creators/producers to request for permission to use

their material. All requests and approvals should be documented in this section. For

all requests that have been rejected, the corresponding materials MUST be removed

from the final document.