

ECE 645 Recommended Project Specification Outline

Your project may include one or more of the following parts: analytical, software, hardware.

Below is a proposed list of items that you may consider including in your specification.

Common Items (required):

- List of team members
- Title of your project
This title may be different than a corresponding project topic proposed by the instructor. It should take into account the exact scope of your project.
- Introduction and motivation.
Why is this project worth working on? Why is it interesting for you? Why is it original? What will be a practical value of the obtained results?
- Tentative time schedule (April 1–May 11). Please provide the list and dates of major milestones specific to your project.

Analytical Part (optional):

You can use this part as

- The main part of your project
- A secondary part of the primarily hardware project, used to select an algorithm, architecture, or parameter values
- A secondary part of the primarily software project, used to select implemented algorithms and parameter values

In either case, please do your best to describe:

1. List of alternative solutions (algorithms, hardware architectures, hardware/software/mixed implementations) you are planning to explore.
Names of the investigated solutions and pointers to appropriate papers or book chapters will be sufficient.
2. List of criteria you are planning to use to select the best solution (e.g., throughput, latency, throughput/area, latency*area, area, power, energy, flexibility, scalability, testability, fault-tolerance, ease of implementation, etc.)
3. List of assumptions used in your analysis
4. List of potential practical applications of the analyzed solutions
5. Previous work and additional literature
Shortly describe if the analysis you are planning to perform has been done in the past. If so, please shortly summarize major findings and limitations of the previous analyses.

Software Part (optional):

You can use this part as

- The main part of your project
- A secondary part of the primarily hardware project, used to generate test vectors
- A secondary part of the primarily analytical project, used to strengthen and enhance your analysis.

In either case, please do your best to describe:

1. Algorithm(s) you are planning to implement (a pointer to a specific pseudocode in a paper or a book would be sufficient)
2. Supported parameter values
3. Goal of writing software
(e.g., source of test vectors for hardware implementation, illustration of operation, software implementation optimized for speed, software implementation optimized for minimum memory usage, etc.)
4. Programming language
5. Libraries
6. Tools you are planning to use (e.g., IDEs, compilers, profilers, benchmarking tools (e.g. SUPERCOP), etc.)
7. Previous work and additional literature
Shortly describe if the program you are planning to develop has been implemented in the past. If so, please describe what level of description is available for each of the earlier implementations you are aware of: pseudocode, flowchart, source code (if so, in what programming language, url), etc.

Hardware Part (optional):

1. Version of the algorithm

Please choose a specific version of the algorithm you are planning to implement. Please note that it is sufficient to point to a specific section of a paper, book, or thesis. Finding a pseudocode (or detailed description) of the selected version is highly recommended.

If the choice of an algorithm is unclear at this point, please treat it as an analytical part of your project.

2. Supported values of parameters

The implemented algorithm(s) may have several parameters. Your implementation should be as generic as possible, but you are certainly allowed to either limit a range of a given parameter, or fix its value. Please note that the parameter values will most likely affect sizes of operands you will be dealing with, and thus the area and speed of your implementation.

3. Optimization target

The choices include: throughput, latency, area, throughput/area, latency*area, power, energy, etc.

4. Architecture

Please provide basic features of your architecture, such as:

- datapath width
- pipelined vs. non-pipelined
- using embedded resources of modern FPGAs, such as DSP units and BRAMs, etc.

5. Source of test vectors

For majority of algorithms, software implementation may be necessary in order to generate test vectors. Please locate (or develop as a part of the software part of your project) software implementation that most closely matches the algorithm you are trying to implement (including its version and parameters' range). Please make sure that you are able to modify and compile source codes for this implementation.

6. Target FPGA family (or families)

7. CAD tools you are planning to use (e.g., simulator, synthesis tool, implementation tool, etc.)

8. Previous work and additional literature

Please go beyond basic resources provided to you as a starting point for your investigation, and prepare an extended list of literature related to the hardware part of your project.

Shortly describe if the design you are planning to develop have been implemented in the past. If so, please describe what level of description is available for each of the earlier hardware designs you are aware of: block diagrams of the datapath (high-level, detailed), FSM of the controller (ASM charts, state diagrams), results (for Xilinx FPGAs, Altera FPGAs, ASICs), HDL code (VHDL, Verilog), etc.