ESC101 Engineering Science Praxis I -- Design Report Independent Assessment Tool

Constraints

1. **Must** be submitted as a single PDF file through Quercus.
2. **Must** use a recognized reference format
3. **Should** be in 11pt serif font with 1.25 line spacing and 1.0 inch margins on letter paper
4. **Must not** exceed 2500 words of text, exclusive of captions, headings, references, graphical elements, and appendices
5. **Must** include a total word count at the top of the document.
6. **Must** include relevant extracts from any used references in an Appendix titled “Source Extracts.”
7. **Must** include the original Design Brief that provided the initial framing for the opportunity in an Appendix

Content Constraints

1. **Must** be a standalone document, including appendices.
2. **Must** include a complete set of requirements in the body of the report.
3. **Must** recommend one (1) credible design concept that addresses an opportunity framed from a Design Brief.
4. **Must** document comparisons of the performance of the recommended design concept against at least three (≥3) other credible candidate design concepts.
5. **Must** integrate a Pugh Chart.
6. **Must** justify three (3) key design decisions in the recommended design, using a combination of verification (testing), prototypes, research, and or calculation.
7. **Must** document using at least one (≥1) prototype in verification activities.

Characteristics of Evaluation

	Unacceptable	Satisfactory	Good	Outstanding
Quality and credibility of engineering argument • Emphasis on justification of claims through credible use of engineering-appropriate sources	☐ An over-reliance on opinion, description, or "it's obvious" statements. A lack of evidence throughout. Variety of evidence used is limited, with over-reliance on sources that are lacking in one or more of currency, relevance, authority, accuracy, or compatible purpose.	☐ Claims appear credible at first glance, with most supported by evidence. A variety of resources were used (textbooks, handbooks, reviews, direct testing, interviews...). Some evidence may be inappropriate or weak for the claim being made.	☐ Claims are supported by credible evidence throughout. Interpretive claims are supported by more substantial evidence. Personal considerations are supported with attached evidence.	☐ ***As per Good +*** resources are used credibly, with qualifiers and triangulation regularly applied. Acknowledgements/analysis of possible {weaknesses, risk, error, omissions} are provided.
Quality of the engineering requirements developed in response to the Design Brief	☐ Requirements missing critical components (e.g. objectives) or present but do not allow alternative designs to be evaluated (e.g. metrics are unconnected to objectives), and/or requirements are not credible (e.g. constraints come from contrived numbers) Requirements make little or no reference to relevant standards, handbooks, DfXs, or stakeholders.	☐ Requirements allow most alternative designs to be evaluated and compared, but may not be robust or fine-tuned enough to evaluate a broad range of potential designs Requirements founded in some credible basis (standards, guidelines, DfX definitions, handbooks, or stakeholders.)	☐ Requirements are well supported by evidence, including research beyond the stakeholder statements into the context of the opportunity, research that supports engineering considerations of chosen DfXs; metrics are informed by relevant codes and/or standards Codes and standards are specific to the opportunity, as applicable, rather than general	☐ ***As per Good +*** requirements are internally consistent from objectives through metrics to constraints and criteria, such that a team can work with the whole set with minimal reframing. Uses of codes, standards, DfX are not only appropriate but are modified to be made usable for Engineering Science students in their 1st term of study who have limited time to complete their design activities.
Quality of the application of engineering tools	☐ Report shows a lack of evidence of tool use, using inappropriate tools, or using tools without gaining insight from them.	☐ Report documents standard use of a limited range of tools. Tools are handled appropriately.	☐ The tools were chosen with consideration given to the information they can provide, well used to gain insight and promote informed diverging and/or decision-making (converging).	☐ ***As per Good +*** a diversity of tools/approaches are used in combination to triangulate across different approaches and enable the team to apply judgment.
Quality of the recommended concept, as demonstrated through verification against the requirements	☐ Recommended concept evokes immediate and warranted scepticism due to issues related to (e.g.) thermodynamics (perpetual motion), materials (unobtanioum), un-usability, etc. Recommended concept is at a level of development expected at Alpha.	☐ The recommended concept has been verified using one or more approaches; the tests may be flawed, calculations overly reduced, or the concept may still have problems that prevent it from meeting all requirements. Recommended concept appears more developed than something seen at Alpha.	☐ The recommended concept meets the team’s prioritized requirements through the development of one or more design decisions to more completely meet design objectives. Verification demonstrates that the design decisions were appropriate for the concept.	☐ ***As per Good +*** the design shows a unique approach to the opportunity reflective of the team’s values and/or perspectives.
Quality of the verification process of the recommended design concept	☐ No, or minimal evidence of verification through (e.g.) prototype testing, calculations, research, etc. Verification data collected but use of or consideration of results demonstrates lack of thought and due diligence. Measurement processes do not address a metric linked back to the opportunity and its stakeholders. Strengths and limitations of the measurement processes and test protocols are not discussed.	☐ Verification data generated from multiple approaches. Testing data collected but justification for protocol or use of data may be awkward. Measurement processes addresses a metric that may not be the most important, but can still be argued as relevant to the opportunity and its stakeholders. Basic strengths and limitations of verification data discussed, though discussion may be imbalanced or superficial.	☐ Verification data used appropriately to guide design, based on your (thorough) discussion of the strengths and limitations of the data, your measurement process, test protocol, and prototype(s). Both the measurement processes and the metric(s) that it address are well-justified with research, logic, or other strong evidence.	☐ ***As per Good +*** Verification data is effectively generated to support critical metrics and decisions in the design concept. Where relevant, measurement process credibly augments 'standard' or more commonly-used processes with your own modifications based on your context and prototype
Quality of the document as a Design Report • Allows reader to find information quickly • Uses structure to aid readability • Structure responds to content	☐ Structure and tone used inappropriate to genre. Introduction lacks some elements. Arrangement of information (including sub-headings) within the report may be illogical or confusing. Paragraphs lack clear claims, support for claims, or organization.	☐ Structure and tone appropriate to genre. Introduction contains all elements, although some may be generic. Arguments and headings follow a logical structure. Structural elements such as bullet lists or tables are present, but may be poorly used or over-used.	☐ Introduction is efficient, clear, and specific to establish purpose. Headings and sub-headings provide a clear structure for a reader. Structural elements are used appropriately and aid in clarity and understanding.	☐ ***As per Good +*** the document guides readers through the report structurally and conceptually. Readers can understand the central claims of the document by skimming the sub-headings or topic sentences.
The coherence and clarity of your written and visual communication • Visual and text are chosen and integrated to clearly communicate meaning • Uses specific language of Engineering and design	☐ No visuals present or are all relegated to the appendix. Visuals lack captions. Or visuals are illegible or irrelevant and thus not useful to enhance the document's message. Language errors significantly detract from the readability and professionalism of the report.	☐ Visuals are present in the document (and captioned), but may not be integrated into text. Visuals may be lacking in areas where they would aid in a reader's understanding. Writing is clear, but may be repetitive or show a disruptive preference for flourish over concision.	☐ Visuals referred to and integrated with text. Choice of visuals improves understanding and clarity. Writing is clear, concise, and demonstrates awareness of specific engineering and design language. Coherence is maintained throughout paragraphs and arguments	☐ ***As per Good +*** Visuals include appropriate guidance for the reader. Writing style and structure demonstrates nuanced control of language through appropriate use of qualifiers in arguments, clear and concise expression, and precision in word choices
Coherence of the vision of the team’s work represented in the writing style of the document	☐ Document sections are clearly authored by different writers with no attempt to establish an overall style or approach. Statements in one section may contradict statements in another section.	☐ Different sections of the document may differ in style or use of terminology but do not contradict one another. Attempts have been made to link different sections with reference to relevant information in other sections although perspective may vary. Vocabulary is used consistently throughout the document.	☐ A recognizable voice is present, although inconsistently, throughout the document. Different sections reference one another to establish evidence for claims and to establish a line of logical reasoning throughout the entire document.	☐ ***As per Good +*** the document flows smoothly from one section to the next without breaks in the line of logical reasoning, use of evidence, reference to actions the team took, or descriptions of product/process.