Student Engineer Portfolio & Handbook

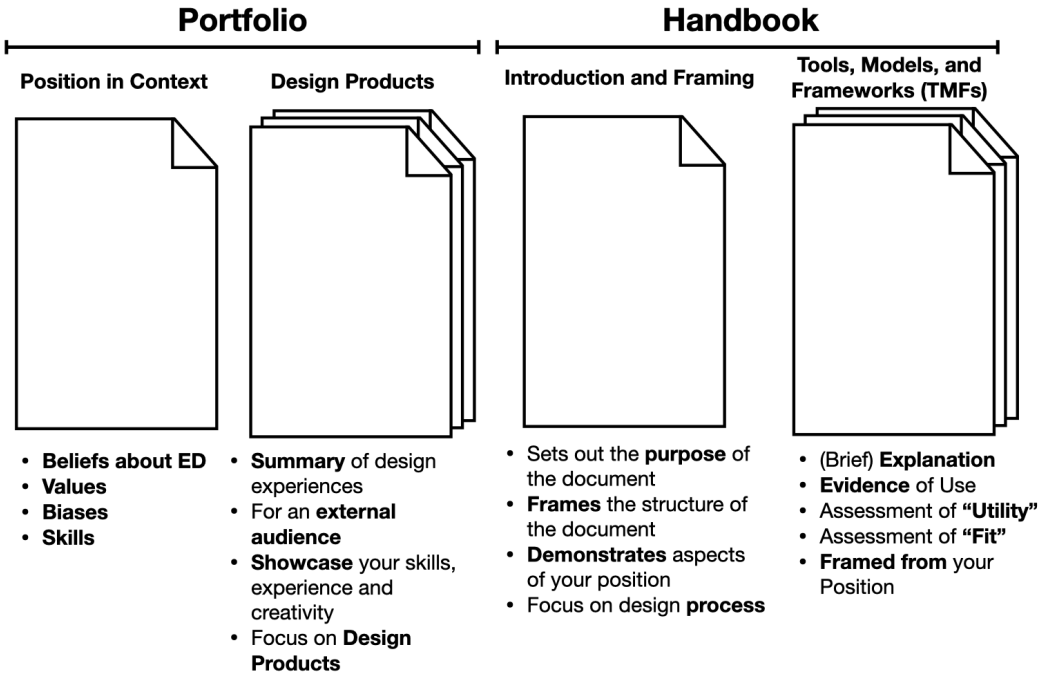
Due: as per exams **Weight:** 18% **Submitter:** Individual

Overview

Each student will create an individual Student Engineering Portfolio and Handbook[1]. These documents provide an opportunity to organize and reflect on your first-year design experiences and to provide you with a guide for future design activities (e.g. support your work in ESC204 or capstone design courses). This assignment asks you to enact all three learning objectives from Praxis II (for more detailed explanations, see the Syllabus):

1. Engage in quality, credible engineering design;
2. Express engineering designs and arguments using modes appropriate to engineering;
3. Work effectively as a member of a team

These documents share these high-level objectives, but have different goals and audiences. This means that the portfolio and handbook may be separate documents that have a different form or a single unifying document that balances the requirements of the different foci.



[1] Note that this handbook differs from a traditional handbook in that it is personal and not intended for a wide audience of practitioners. So where a traditional handbook would attempt to present a way of practicing and associated tools in an unbiased or generally-applicable way, this deliverable presents its contents with specific reference to your own biases and preferences.

The Design Portfolio

The Design Portfolio is a document that showcases you and the products of your design activities for an *external* audience. Design Portfolios are often used as an accompanying document for job applications in design, or to solicit clients. Design Portfolios are curated collections of the designer's works that shows their skills and experience, and provides evidence that you practice according to your position. A Design Portfolio often includes summarized descriptions of the products of your design work, similar to the One-Pager you create for your Praxis II Showcase. The Design Portfolio is a document that you can build upon into your future career as you encounter more design experiences.

Design Portfolio Stakeholders

Your portfolio has a number of stakeholders:

***You**:* The goal of this assignment is for you to create something that will be useful to you in your future career. These activities may be in the classroom (e.g. ESC204 Praxis III and your Capstone design course), as part of a student club (e.g. UTAT, BlueSky, etc.), or on the job (e.g. summer employment, your Professional Experience Year, or after you graduate). This document will give you a quick and professional way of representing your design work.

***Praxis II Teaching Team**:* The Teaching Team's primary interest is to assess whether you can represent your work in a way that expresses who you are, and the type of work that you do. They would also like to be able to complete this assessment in a reasonable amount of time.

***Other Engineering Designers**:* Your portfolio can be presented to other designers as part of your undergraduate career or beyond. Other designers are interested in knowing the design experiences that you have, and how your position is enacted through your designs.

External Community: Your Design Portfolio is to showcase your design skills and experience to someone who doesn't know you or what you have done. This could be engineers looking to hire you, or clients who want to know what experience your company's team have. They may or may not have an engineering background so ensure your language is accessible to a wide audience.

Design Portfolio Requirements

Requirements language in this and following sections are to be interpreted as described in RFC 2119.

Portfolio Objectives

The objectives of the Portfolio are as follows:

1. Represent a personal position on engineering design that enables you to effectively manage your engineering design activities and teams.
2. Document and summarize the product of your design activities for an external audience.

Portfolio Components

Your portfolio presents who you are, and the work you have done at this moment to an external audience

1. **Establish your Position in Context**. This can (should) draw on your Position Statement to demonstrate that you understand your relationship to your design work. Introduce yourself and your portfolio in terms of your position as an engineering designer, including your skills, values, strengths, and biases. Your position may have changed from your initial Position Statement assignment.
2. **Present the Products of your Design Experiences**. You should summarize your design experiences in a creative and informative manner. The summary should give enough information that someone who is not familiar with the project or context can understand what was done and why. It should emphasize how your position was enacted in your designs.

Portfolio Constraints

Your Student Engineer Handbook:

1. **Must** be submitted to Quercus as a PDF document or link to external website.
2. **Must** include a statement of your position as an engineering designer (note: consider how /whether that understanding has developed since your Position Statement in January)
3. **Must** give credit for design work performed by teammates (as per the University of Toronto Code of Academic Behaviour and the Professional Engineers Ontario Code of Ethics)
4. **Must** include one-page summaries of your primary design activities completed since September 2022 (Praxis I project, CIV102 Bridge Project, Praxis II project) in the Design Portfolio. **May** include one-page summaries of any other relevant design activities since September 2022.

Portfolio Characteristics of Evaluation

Please refer the assignments associated Independent Assessment Tool for the metrics associated with these characteristics of evaluation. For all characteristics, the criteria "more", "higher", or "greater" are preferred.

1. Clear statement of your position in context (values, abilities, strengths, biases, and strategies to compensate for areas of weakness).
2. Evidence of your position in practice as demonstrated by your projects.
3. Ease of navigation through the Handbook, including the ease with which a reader can find supporting evidence for the claims in your document.
4. Clarity, correctness, and conciseness of written prose.
5. The value, quality, and integration of visual elements in your Portfolio.[2]

[2] Since some of these images may be taken from whiteboard, virtual whiteboard, etc. the quality of the image itself is less important than the quality of the content represented. If the image is difficult to read, you should make use of annotations, captions, and/or other means to facilitate the viewers' understanding.

The Handbook

A handbook is a reference intended for individuals (such as yourself after you complete Praxis I and II) who are already familiar with the topic area. For this assignment, this is a personal handbook; the audience is *you*. It is a reference that you can use, for example,

- as a checklist to ensure you have rigorously practiced engineering design,
- to remind yourself of which tools you use, and why/how you have used them in the past,
- to remind yourself how to perform a specific task or select among different tools or models, and/or
- to browse when you're exploring possible approaches to addressing a design opportunity.

We are asking you to use your design process work—whether notes, prototypes, final concepts, or process components—to create a curated record of tools, models, and frameworks used in developing your design practice and the value of these tools to your design work and team function.

As with any good handbook, you will need to include enough explanation of each tool or model such that you can use it later, know when and why to use it, and what you should expect to gain from it. You will select your best evidence to demonstrate your effectiveness with the tools or models, and you will reflect upon your work in a way that provides an honest appraisal of your accomplishments.

This assessment is built on understanding yourself as engineering designer—this invites you to explore how the tools and evidence that you present will help you to strengthen your strengths and compensate for your blind-spots, biases, and weaknesses. We encourage you to use your position or personal design process as a way to frame your handbook. Your position and/or personal design process may be helpful in thinking about how to structure your document, or may influence the types of descriptions you make about the tools you use(d).

Handbook Stakeholders

Your handbook has a number of stakeholders:

You: The goal of this assignment is for you to create something that will be useful to you in your future engineering design activities. These activities may be in the classroom (e.g. ESC204 Praxis III and your Capstone design course), as part of a student club (e.g. UTAT, BlueSky, etc.), or on the job (e.g. summer employment, your Professional Experience Year, or after you graduate). Rather than having to continually refer back to generic resources when undertaking a design task, you could benefit from a specific resource that is tailored to your approach, skills, and values (and can counter your blindspots), by reminding you of past design experiences to help inform your future ones.

Praxis II Teaching Team: The Teaching Team's primary interest is to assess whether you have developed a personal engineering design practice to complement your engineering design values, an accompanying set of design tools and models you can and have used in your design practice, and a nuanced understanding of your process and tools. They would also like to be able to complete this assessment in a reasonable amount of time.

Other Design Courses (e.g. ESC204; Capstone Design; etc.)*:* The Teaching Teams and supervisors in other design courses would like to focus their teaching on new content, not on reminding you about materials that you have already been taught. They also expect you to be able to manage your own design activities in a rigorous and comprehensive way.

Other Engineering Designers*:* Depending on your format, you could end up deciding to share your position on engineering design and associated methods with other engineering designers. This would be especially true if you were trying to collectively determine a way to collaborate on a design opportunity.

Handbook Requirements

Requirements language in this and following sections are to be interpreted as described in RFC 2119.

Handbook Objectives

The objectives of the Handbook assignment are as follows:

1. Represent a personal position on engineering design that enables you to effectively and efficiently manage your engineering design activities and teams.
2. Document preferred engineering design tools, models, and frameworks[3] (from the design literature; from lecture in Praxis I and II; from practice; etc.) that are relevant and applicable to your position on engineering design.
3. Demonstrate having applied, or attempted to apply such tools, models, and frameworks in your design activities.
4. Reflect on your application of the tools, models, and frameworks and document your assessment of their usefulness and value in the context of your design activities, skills, teamwork, and values.
5. Demonstrate your engineering communication skills. Clearly communicate your content to audiences that include the Teaching Team, teammates, and your future self. In addition to the sections denoted here, such communication should include, at minimum,
    a. an introduction that will prepare a reader (which could include you 8 months later) to understand the purpose and navigate the document effectively;
    b. a logical organization and formatting that a viewer can follow easily, with flexible navigation suitable to the content structure;
    c. concise writing, such that each word or sentence is adding meaning and value;
    d. consistent and well-chosen images to illustrate concepts or design process work;
    e. appropriate use of conventions such as table of contents, headings, paragraphs, bullet lists, and captions for images.

[3]These tools, models, and frameworks should enable you to practice engineering across an entire engineering design project from opportunity finding to verification and validation of a recommended design.

Handbook Components[4]

In thinking about how to set up your handbook, the following steps may help guide your work.

1. **Select representations of your design process activities** to serve as reference points for your design practice. E.g. You could select one or more of your candidates from the Converging Strand in Praxis I to represent prototyping or calculation.
2. **Select and assess design tools, models, and frameworks** (TMFs[5]) that you have used and want to capture for future use (or to ensure you do not get trapped using them again).
   - demonstrate how your position has been enacted in your design process
   - cover all strands of Frame•Diverge•Converge•Represent, and show how you braid them together
   - Provide evidence for the use of design TMFs, at very least, to represent Frame•Diverge•Converge, but organized in a manner consistent with your practice. This evidence should be connected to your design process and/or your representative products.
   - Evaluate the effectiveness of the selected TMFs. An assessment could critique the TMF, or consider when, where, and why you should use it and what can be gained by using it.

Handbook Constraints

Your Student Engineer Handbook:

1. **Must** be submitted to Quercus as a single PDF document or link to an external website. The use of internal PDF links is encouraged but is not required.
2. **Must** include a reference list at the end of the PDF document in the Praxis "embedded extract" form using a standard format (e.g. APA, IEEE).
3. Must include TMFs that cover all strands of Frame•Diverge•Converge•Represent
4. **Should** include no more than twenty (≤20) different tools, models, or frameworks.
5. **Should** include only TMFs for which you can provide evidence of your use in an engineering project context.
6. **Must** only include elements from design activities done since September 2022, including Praxis I, other courses, and extracurricular design activities. The Handbook **should** primarily focus on Praxis II experiences.
7. **Must** give credit for design work performed by teammates (as per the University of Toronto Code of Academic Behaviour and the Professional Engineers Ontario Code of Ethics)

[4] Note that in the figure the use of single or multiple pages is **not** intended to communicate the amount of content associated with the different elements. Those representations are intended to indicate that you should document a singular Position, and multiple Personal Engineering Design Products and TMFs.

[5] This assignment uses these related terms to avoid anchoring you to the commonly understood engineering design tools (e.g. Measurement Matrix; Pugh Chart; Pairwise Comparison; etc.) The additional terms are intended to suggest that other design, communication, and teamwork concepts can also be included in your handbook.

Precision in distinguishing between a tool, model, and framework is not necessary.

Handbook Characteristics of Evaluation

Please refer the assignments associated Independent Assessment Tool for the metrics associated with these characteristics of evaluation. For all characteristics, the criteria "more", "higher", or "greater" are preferred.

1. The accuracy and utility of your Introduction as both an introduction to your Handbook and as an introduction to your position in this context (values, abilities, strengths, biases, and strategies to compensate for areas of weakness)
2. The utility and applicability of your Position to the framing and structuring of your Handbook.
3. The appropriateness of the selection of tools, models, and frameworks based on actual experience in using the tools, and legitimate ability to assess them from having used them.
4. The appropriateness of the selection of evidence from projects to reflect how you practice engineering design according to your Position, to show your teamwork and contributions in engineering design.
5. The utility and clarity of your explanations and figure annotations in providing context for your evidence and in linking your evidence to your Position and representative products.
6. The ease of navigation through the Handbook, including the ease with which a reader can find supporting evidence for the claims in your document.
7. The clarity, correctness, and conciseness of written prose.
8. The value, quality, and integration of visual elements in your Handbook.[6]

[6] Since some of these images may be taken from whiteboard, virtual whiteboard, etc. the quality of the image itself is less important than the quality of the content represented. If the image is difficult to read, you should make use of captions or other means to facilitate the viewers' understanding.