MLZ 331 FORMAL REPORT GUIDELINES

Dear Students,

You are required to submit **a detailed formal report covering all experiments during the term.** All students must prepare their formal reports in a clear and academically appropriate format. To ensure consistency across submissions, the following formatting rules must be strictly followed:

- **Font:** Times New Roman or Arial
- **Font size:** 12 pt (main text), 10 pt (figure/table captions and footnotes)
- **Line spacing:** 1.5
- **Alignment:** Full justification (two-sided alignment)
- **Paragraph indentation:** First-line indentation of 1.25 cm for all paragraphs
- **Margins:** 2.5 cm on all sides
- **Page numbering:** Bottom-center or bottom-right, starting after the cover page
- **Figure and table captions:**
    - Figures: Caption below the figure
    - Tables: Caption above the table
    - All figures and tables must be numbered sequentially and referred to in the text
- **Units:** SI units must be used consistently throughout the report
- **Equations:** Centered, numbered on the right (e.g., Eq. (1)), and variables must be defined after use
- **File format:** Reports must be submitted as a single PDF file unless otherwise stated
- **Every primary chapter (1, 2, 3, …) is required to start on a separate page.**

The report must follow the structure and the include the following sections:

1. **TITLE PAGE:**

It contains:

- Your full name and student number
- Your group name
- Course code and name and head of report (exp=**Formal Report**)

Ensure that this information is clearly visible.

2. ABSTRACT

This section should provide a concise synthesis of the overall purpose and the major outcomes obtained from all experiments conducted in the laboratory course. The abstract should:

- Clearly present the **collective aims** of the experiments and the fundamental results achieved.
- Be concise, informative, and focused on the essential findings.
- Include a brief overview of the experimental objectives and summarize the key results without excessive detail.
- Not exceed **300 words** in total.
- Avoid methodological descriptions; instead, emphasize the **overall outcomes**, **main conclusions**, and the broader significance of the experimental work.

Note: Although the abstract appears at the beginning of the report, **it is strongly recommended** that students write this section *after* completing all other parts of the report to ensure accuracy and coherence.

3. TABLE OF CONTENTS

Include a comprehensive table of contents that outlines all main sections and subsections of the report along with their corresponding page numbers to ensure clear and easy navigation. If the report contains any figures or tables, include separate **Lists of Figures** and **Lists of Tables** within the table of contents as well, each indicating the title and page number of every figure and table presented in the report.

4. BACKROUND

This part should introduce the experiments, addressing:

- Briefly explain the purpose and rationale of the experiments.
- Indicate the connection between the experiments in a few sentences.
- Include short references from reliable academic sources **(e.g., peer-reviewed journals, textbooks). Do not rely on general websites!**
- It should not exceed **one page.**

5. EXPERIMENTAL PROCEDURE

This section must present;

- **<u>A single flow chart</u>** that summarizes all five experiments conducted throughout the semester. Each experiment should appear as a separate box in the flow chart. For every box, **<u>students must add keywords that indicate</u>**:
  (i) the main equipment used, and
  (ii) the critical parameters for that experiment.
- These keywords should be placed next to each box, connected with short arrows, rather than written in long sentences.
- The flow chart should remain visual, concise, and schematic, and the information must be taken directly from the provided report sheets for each experiment.

5.1.EXAMPLE

The overall workflow of the laboratory experiments conducted during the semester is presented in **Figure X**. This flow chart summarizes the sequence of all five experiments and highlights the key steps, equipment, and critical parameters using concise keywords. It provides a clear visual guide to the experimental progression, while detailed explanations are given in the following subsections.

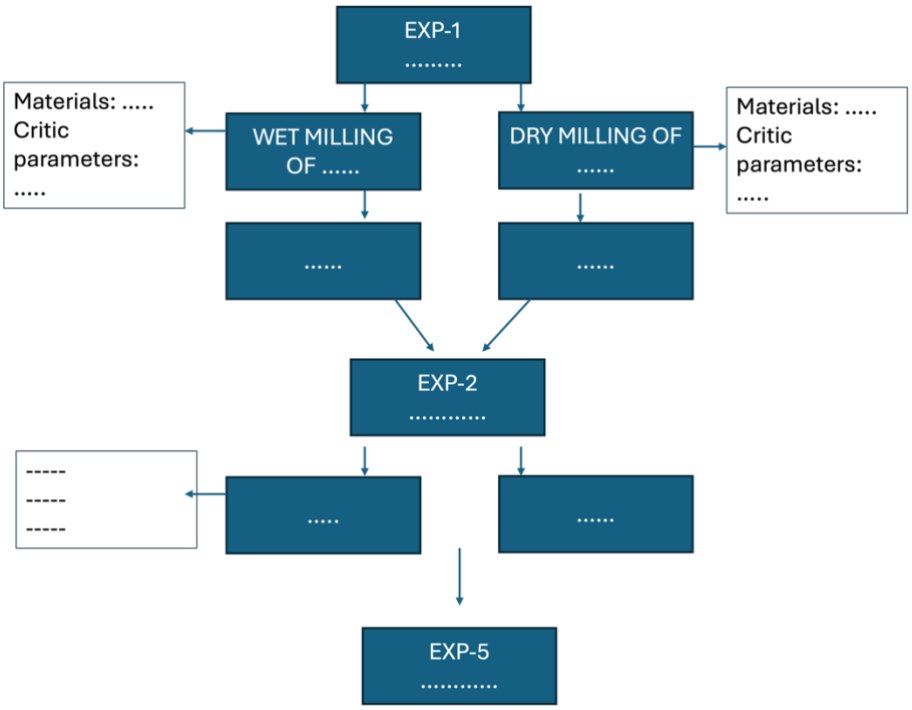

Fig X. The overall workflow of the laboratory experiments conducted during the semester

6. RESULT AND DISCUSSIONS

This section should present and interpret the key findings of each experiment using clearly labeled tables, graphs, and calculations. Your discussion must relate the results to the experimental objectives, highlight the influence of processing parameters, and be supported by appropriate academic literature. Below, the specific expectations for each experiment are outlined; ensure that your analysis addresses all listed points and reflects a clear understanding of the experimental outcomes. **For each experiment, you are expected to address the requirements listed below under separate subheadings, so that the discussion for each experimental task is clearly organized and systematically presented.**

From the Exp-1 section, it should include:

- Discuss how the milling parameters used in the experiment (wet milling vs. dry milling, milling time, speed, ball-to-powder ratio, etc.) influenced the particle size distribution and the degree of homogenization. Explain the differences between the powders processed under different conditions.
- Based on the sieving results and the particle size distribution graph, explain the d10, d50, and d90 values and discuss what these parameters reveal about the width, shape, and central tendency of the distribution. Using your own data, interpret how the resulting particle size distribution is expected to influence subsequent processing steps and the final ceramic properties, including packing behavior, flowability, sintering kinetics, densification, and mechanical performance.

From the Exp-2 section, it should include:

- Identify the common defects observed in powder compacts. Discuss how physical factors and processing parameters—specifically granulation characteristics, springback behavior, applied pressure, additives, and ejection—contribute to defect formation. Finally, explain the strategies to minimize these defects.
- Evaluate the final surface quality and integrity of the glazed tiles. Identify observed defects (such as crazing, crawling, or pinholes) and discuss their root causes by considering thermal expansion mismatch (CTE compatibility), applied glaze thickness, and the effect of firing conditions on body-glaze interface formation.

From the Exp-3 section, it should include:

- Using your measured values, assess whether your specimen reached an adequate level of densification for wall tile applications. Then, using studies from the literature, discuss how modifying the pressing pressure would likely change the sintering response of the same composition.
- Using the bulk density, apparent porosity, and apparent solid density values you have already calculated for the SPS-sintered Al_2O_3 samples during the experiment, discuss how these results compare with relevant literature and what they reveal about the influence of SPS parameters on densification, microstructural development, and the overall performance of the material.

From the Exp-4 section, it should include:

- Compare dielectric, ferroelectric, and piezoelectric materials by highlighting their key similarities and differences. Support your comparison with specific examples of typical applications for each class.
- Classify the semiconductor type based on your Seebeck coefficient and discuss why oxide ceramics are preferred over metals for waste-heat recovery in industries like steelmaking? Please check the 'Background' section of the experiment sheet.

From the Exp-5 section, it should include:

- Discuss that why does the viscosity increase in the case of over-deflocculation? Please check the lecture notes of MLZ218 Ceramics Processing

7. CONCLUSIONS

Provide a concise summary of the key results and the overall significance of the experiments. The conclusion should:

- Recap the main findings without repeating too much detail
- Highlight the importance and implications of the experiments.

8. REFERENCES

This section is vital and must be handled with care. Your references should:

- Not solely consist of web pages; prioritize books, journal articles, and academic papers
- Follow a consistent citation style (e.g., APA, MLA, or your preferred style)
- Ensure all sources cited in the text are included here.

Note: The EXPERIMENT MANUAL should not be used as a reference. Aim to search and cite reputable academic sources.