



Subject name and code		Strength of Materials Laboratory – IME02					
Academic area		Machine Design and Manufacturing					
Group and schedule		Group 1, Friday 10 a.m. to 1 p.m.					
Semester	Credits	Prerequisites	Contact hours (CH)			Independent work hours	Total hours
			Theoretical	Practical	Total CH		
7	1	IM583 (R1)	0	3	3	0	3

1. GENERAL OBJECTIVE

To perform mechanical tests to determine the mechanical properties of different materials, correctly selecting and applying the standards required for the tests. To write the reports of the tests carried out, with their corresponding analysis, and using appropriate units of measurement.

2. COURSE LEARNING OUTCOMES

- To identify the equipment, measuring instruments, technical standards, and data interpretation procedures applicable to each test.
- To write test reports in accordance with the applied standards, paying attention to the content; structure; process; results; writing and flow of ideas; presentation; orthography; use of variables, units, punctuation marks, tables, equations, and figures.
- To perform teamwork as either a leader or team member.
- To identify the differences in the properties of materials, in order to apply them functionally in the mechanical systems design or exploitation stage.
- To communicate adequately in English language both written and oral.

3. CONTENTS ^[1-4]

1. Use of measuring instruments and treatment of experimental data ^(10%)
2. **Tensile test 1.** Determination of mechanical properties of metallic materials. ASTM E8 Standard ^(12%)
3. **Tensile test 2.** Determination of the modulus of elasticity (E). ASTM E111 Standard ^(7%)
4. **Tensile test 3.** Determination of the Poisson ratio of steel. ASTM Standard E132
5. **Compression test.** Determination of mechanical properties of some metals. ASTM E9 standard ^(10%)
6. **Bending test.** Determination of the MOR* and the E apparent of a wood. ASTM D143 Standard ^(7%)
7. **Brinell hardness test.** Determination of Brinell hardness. ASTM Standard E10 ^(10%)
8. **Vickers hardness test.** Determination of Vickers hardness. ASTM Standard E92 ^(7%)
9. **Rockwell B y C hardness test.** Determination of Rockwell hardness. ASTM Standard E18 ^(7%)
10. **Dynamic bending test of grooved specimens (Charpy test).** ASTM Standard E23
11. **Erichsen cupping test.** Erichsen and Olsen tests. ASTM Standard E643

* MOR: modulus of rupture. The percentages correspond the values of the respective reports.

4. METHODOLOGY

- This course has **theoretical** and **practical** activities. The lecturer presents a theoretical background of the principles related to the test and explains its procedure. Then, the test is performed under the supervision of the lecturer and the laboratory assistant. There are **active learning** activities such as hands-on activities, workshops, questionnaires, discussions, class participation, and oral presentations.
- The students make one or two presentations (with active learning activity) in English during the semester.

- It is suggested that the students read information related to the test **prior** to attending the session.
- The students write in teams a report of the practical laboratory session.

5. EVALUATION

- Eight **written reports** (by hand, in English, and in teams of 3 or 4 students) related to the presentation, interpretation, and analysis of the experimental data and the results obtained (**70%**). Unless otherwise stated, reports are due no later than 10 a.m. on the Friday following the corresponding session.
- **Quizzes, questionnaires, workshops, etc. (15%)**.
- One or two **presentations in English (including an active learning activity)** prepared by the students (in pairs), on the topic assigned by the lecturer. (**15%**).

“The absence of twenty percent (20%) of the scheduled classes in the practical courses will imply the loss of the course with a mark of zero point zero” (Article 67, Paragraph 3 of the Student Regulations)

6. BIBLIOGRAPHY

- [1] Gabriel Calle. Guías para el Laboratorio de Resistencia de Materiales [Online] <https://sites.google.com/site/labresmatutp/> (accessed: 7 August 2024).
- [2] Norman E. Dowling. Mechanical Behavior of Materials, 4th ed. Pearson, 2013.*
- [3] Kyriakos Komvopoulos. Mechanical Testing of Engineering Materials, 2nd ed. Cognella Academic Publishing, 2017.**
- [4] ASTM, Annual Book of ASTM Standards.

* Mainly Chapter 4. There is a 2020 edition, but it may not available in the Internet. ** Mainly Appendix A and Chapter 2.

INSTRUCTIONS AND RECOMMENDATIONS FOR PREPARING THE REPORTS

- Reports must be in legible **handwriting**. However, tables and graphs prepared using a spreadsheet program (e.g., Excel) may be printed. Therefore, all drawings must be done by hand; photocopies or impressions of figures made by others are not allowed.
- The general outline of a report may be: title page, objectives, theoretical background (very concise, but complete, including definitions, equations, and variables), specimens, equipment, measuring instruments, procedure, experimental data (generally recorded in tables), data treatment, results and analysis (usually presented with graphs; include comparisons with data from the literature), conclusions, references.
- The different sections of the report are organized consecutively; it is not necessary to start each section on a new page. The titles of the different sections must be numbered.
- The title page must contain an appropriate title of the test carried out, names of the students who prepared the report, name of the lecturer, name of the course, name of the university, and date.
- The conclusions are a concise summary of the work, the fulfilment of the objectives, the results, the comparisons made, difficulties, and other circumstances of the test.
- Properly report the names of the variables in the text, tables, and figures and their respective units. Use *italics* for *variables*.
- The reported magnitudes must be accompanied by the units. Use normal letters (without italic) for units. See document on the use of units in the link “Recommendations on the use of units” on the page <https://www.libardovanegas.com/sml>.
- Present information clearly: text, tables, and figures (pay attention especially to clear figures).
- Use proper spelling, punctuation, writing, organization, and presentation.
- In general, units are reported in the tables only in the header.
- Figures must be numbered and have appropriate captions (e.g., “Figure 1. Dimensions of the specimens”; these should be placed below the figures. The axes of graphs should be defined completely.
- Tables must also be numbered and have appropriate titles, which should be placed above them.
- Strictly follow the guidelines set forth in the manual and those of the lecturer.
- Make a serious and professional **analysis** of the results.
- **It is important to be rigorous in handling data and obtaining results.**
- **Do not write verbatim** from other sources; paraphrase (write in your own words) and cite the source.