Final Exam

Course Title:	**Terminología Especializada en Documentos de Tecnología e Ingeniería**
Course ID:	**IT0627 (Marron, 25-2)**
Cohort ID:	**6A2**
Exam Date:	**24 Apr 2025**

General Instructions: This is a take-home exam. The exam is comprehensive and will cover material from the entire course. You are encouraged to organize and review all of your homework and previous exams before starting this final exam. Answer in English unless requested to do so otherwise. Please do your own work and do not share your answers; academic integrity is always your choice.

Attempt to answer all questions, even if you are uncertain. Whenever possible, provide answers in bullet list format with complete content. Tasks will be evaluated by sub-tasks. Three (3) points are available for each sub-task: Accuracy (1 pt), Completeness (1 pt), and Sufficiency (1 pt). Points will be awarded in 0.1 increments. There are **39 points** available.

Please provide your answers on separate sheets of paper. The first page should have the title, "Final Exam." Make sure your name and the date are written in the top right-hand corner of every page. You may type out your answers or answer in written form with pencil or black/blue pen. When you have finished the exam, please staple all of the pages together in the proper order.

This exam is **DUE Thursday, April 24, 2025 by 19:00 hrs in Room 202, UTECA.** If you prefer to take the exam on April 24 during the regular class period you are welcome to do so.

I. Foundations of Science and Engineering

Task 1 (3 pts)

Read the following excerpt and answer the question below (excerpt from Carli and Calaresu (2007) *Language and Science* In: Marlis Hellinger, Anne Pauwels (eds.), Handbook of Language and Communication: Diversity and Change. Handbooks of Applied Linguistics vol. 9. De Gruyter Mouton; pp.525-554.)

The description of scientific language. *One of the main problems when describing scientific language is how to categorize it in relation to the other linguistic varieties inside the diasystem they all belong to. If, for instance,scientific language is treated only as a professional jargon this implies: a) that there are no particular ontological differences in status between the specialized language of a biologist and the equally specialized language of a stockbroker; and b) that the field of its users and that of its scholars is restricted only to those who have a specific working interest in it (scientists, science students, teachers of scientific subjects, translators and specialized journalists).*

Scientific language, however, beyond the most striking external aspects (lexical ones in particular) which often give it the obscurity of a downright jargon, is instead a type of language which has a broader social and cognitive relevance. It is indeed the language of "complex thought" which reconstructs experience and construes knowledge, and, according to Altieri Biagi (1990: 192-193), should be defined in a balanced three-way relationship with common language on the one hand, and

with literary language on the other: both scientific and literary language represent the tools of complex thought which pursues knowledge from the viewpoint of objective perception (scientific language) and of subjective perception (literary language).

a) Do you think scientific language is just professional jargon or, as Altieri Biagi suggests, do you think scientific language is the language of objective complex thought?

Task 2 (3 pts)

Johnson-Laird, authoritative scholar on mental models states, "What is the end of perception? What is the output of linguistic comprehension? How do we anticipate the world, and make sensible decisions about what to do? What underlies thinking and reasoning? One answer to these questions is that we rely on mental models of the world." (see Johnson-Laird, Philip N. "The history of mental models." *Psychology of reasoning*. Psychology Press, 2004. 189-222).

a) Explain the concept of mental models and how they guide scientific inquiry.

Task 3 (3 pts)

Lenat states that heuristics are "informal judgmental rules … which guide [a] system toward plausible paths to follow and away from implausible ones. Yet what is the nature of heuristics? What is the source of their power? How do they originate and evolve? Heuristics are compiled hindsight, and draw their power from the various kinds of regularity and continuity in the world" (see Lenat, Douglas B. "The nature of heuristics." *Artificial intelligence* 19.2 (1982): 189-249)

b) What are heuristics and how are they used in science?

Task 4 (9 pts)

Richards provides us with a nice explanation for the foundations of engineering science as well the general method for the analysis of systems (see Donald E. Richards, Rose-Hulman Institute of Technology. Basic Engineering Science LibreTexts (2024) https://libretexts.org)

a) Briefly explain the six fundamental laws of conservation.

b) Imagine that you are a scientific researcher. First select a system for study and briefly describe the system, and then answer the following specific questions about your system,

i) Is the system open or closed?
ii) What are the boundaries of the system?
iii) What are the surroundings of the system?
iv) What types of energy / materials flow into and/or out of the system?
v) What measurements will you make on the system?

Task 5 (3 pts)

The first lecture by David Mackay of Cambridge University in his series on Information Theory deals with the fundamental problem addressed by Claude Shannon: communication across a noisy channel. Mackay also discusses this in the first chapter of his book on Information Theory (see MacKay, David JC. *Information theory, inference and learning algorithms*. Cambridge University Press, 2003)

a) How does Mackay diagram verbal communication? That is, in verbal communication, i) what is the signal generator; ii) what is the communication channel; and iii) what is the message receiver?

II. Translation of Research Papers

Task 6 (9 pts)

Scientific research papers typically have a standard format that includes an abstract, an introduction, a methods section, a results section, and a conclusions section.

a) Which sections of a research paper are most useful to the professional translator? Why?

b) Translate the following excerpt into Spanish (from Khan, M.I., Fei, J., Chen, X. *et al.* Usage of permeability ratio to check the stability of a pile-soil model with retaining wall support – Huizhou slope failure as a case study. *Geo-Engineering* **16**, 7 (2025)).

> *This paper presents a comprehensive investigation into the role of soil permeability variation on the stability of slopes reinforced by retaining walls, with a focus on the Huizhou slope failure as a case study. The study demonstrates that rising groundwater levels diminish the Factor of Safety (FoS) for retaining walls, with stability most compromised under combined loading from adjacent soil and lightweight concrete. These findings emphasize the need for enhanced drainage or structural support in retaining wall designs subjected to elevated groundwater conditions. It integrates advanced numerical simulations, utilizing Abaqus and GeoStudio, with empirical field data to analyze the interactions between soil permeability, pore water pressure, moisture content, shear strength, and the overall stability of the slope. The dynamics of water infiltration are influenced by permeability, moisture content, and the groundwater table. These factors change the pore pressure and decrease shear strength, which causes shear failure in the slope mass. This research also looks at how surcharge loading affects slope stability. Higher permeability soils cause faster infiltration rates, leading to higher pore pressures, lower effective shear strengths, and a higher likelihood of slope failure. The opposite is true for reduced permeability, which makes drainage more difficult and ultimately leads to hydrostatic pressure building up behind retaining walls, which in turn makes the slope even more unstable. This study demonstrates the critical need for optimized drainage systems to reduce the hazards of infiltration-induced failure and the role of precise permeability evaluation in geotechnical design. Geotechnical engineers can use these results to better understand how to construct and maintain slope stabilization systems.*

III. Technology Futures in Mexico and Beyond

Task 7 (3 pts)

W have read papers which propose engineering research or education specifically geared to boosting Mexico's engineering standing on the international stage.

a) Of the three engineering areas we looked at (semiconductor engineering, battery engineering, and digital design engineering), which area do you think will have the greatest impact for Mexico? Explain

IV. Building Vocabulary

Task 8 (6 pts)

From the list of 218 vocabulary words, select 10 words of your choice. Try to select words that you find interesting. Provide a translation and definition for each of the 10 words in both English and Spanish. See the attached document, "6A2_All-Vocab_25-2_Python.txt" for the complete list of vocabulary words.