[[1]](#footnote-1)

Final Report: Mechatronic Modeling and Design with Applications in Robotics

Student Name (Student Number)

*Abstract*—These instructions give you guidelines for preparing final report for Mechatronic Modeling and Design with Applications in Robotics*.* Use this document as a template to complete the final report of the course.

# INTRODUCTION

T

HIS document is a template for Microsoft *Word* versions 6.0 or later. And it is prepared as the template for the final reports of Mechatronic Modeling and Design with Applications in Robotics course.

Final report (maximum in 8 pages) should be a complete technical document including introduction, literature review, methodology, simulation and experimentation results, and conclusion. It should be considered as an engineering technical report which is planning to be published. DO NOT change the format of this document.

## Figures and Tables

If your figure has two parts, include the labels “(a)” and “(b)” as part of the artwork. Please verify that the figures and tables you mention in the text actually exist. **Please do not include captions as part of the figures. Do not put captions in “text boxes” linked to the figures. Do not put borders around the outside of your figures.** Use the abbreviation “Fig.” even at the beginning of a sentence. Do not abbreviate “Table.” Tables are numbered with Roman numerals.

Figure axis labels are often a source of confusion. Use words rather than symbols. As an example, write the quantity “Magnetization,” or “Magnetization *M*,” not just “*M*.” Put units in parentheses. Do not label axes only with units. As in Fig. 1, for example, write “Magnetization (A/m)” or “Magnetization (Am−1),” not just “A/m.” Do not label axes with a ratio of quantities and units. For example, write “Temperature (K),” not “Temperature/K.”

Please check the figure and table below for reference.

Table 1. Units for Magnetic Properties

|  |  |  |
| --- | --- | --- |
| Symbol | Quantity | Conversion from Gaussian and  CGS EMU to SI a |
| Φ | magnetic flux | 1 Mx → 10−8 Wb = 10−8 V·s |
| *B* | magnetic flux density,  magnetic induction | 1 G → 10−4 T = 10−4 Wb/m2 |
| *H* | magnetic field strength | 1 Oe → 103/(4π) A/m |
| *m* | magnetic moment | 1 erg/G = 1 emu  → 10−3 A·m2 = 10−3 J/T |
| *M* | magnetization | 1 erg/(G·cm3) = 1 emu/cm3  → 103 A/m |
| 4π*M* | magnetization | 1 G → 103/(4π) A/m |
| σ | specific magnetization | 1 erg/(G·g) = 1 emu/g → 1 A·m2/kg |
| *j* | magnetic dipole  moment | 1 erg/G = 1 emu  → 4π × 10−10 Wb·m |
| *J* | magnetic polarization | 1 erg/(G·cm3) = 1 emu/cm3  → 4π × 10−4 T |
| χ*,* κ | susceptibility | 1 → 4π |
| χρ | mass susceptibility | 1 cm3/g → 4π × 10−3 m3/kg |
| μ | permeability | 1 → 4π × 10−7 H/m  = 4π × 10−7 Wb/(A·m) |
| μr | relative permeability | μ → μr |
| *w, W* | energy density | 1 erg/cm3 → 10−1 J/m3 |
| *N, D* | demagnetizing factor | 1 → 1/(4π) |

Vertical lines are optional in tables. Statements that serve as captions for the entire table do not need footnote letters.

aGaussian units are the same as cgs emu for magnetostatics; Mx = maxwell, G = gauss, Oe = oersted; Wb = weber, V = volt, s = second, T = tesla, m = meter, A = ampere, J = joule, kg = kilogram, H = henry.

Diagram, schematic

Description automatically generated

Fig. 1. Schematic model of a Mass-Spring-Damper System.

## MATH

If you are using *Word,* use either the Microsoft Equation Editor or the *MathType* add-on (http://www.mathtype.com) for equations in your paper (Insert | Object | Create New | Microsoft Equation *or* MathType Equation). “Float over text” should *not* be selected.

## References

Number citations consecutively in square brackets [1]. The sentence punctuation follows the brackets [2]. Multiple references [2], [3] are each numbered with separate brackets [1]–[3]. When citing a section in a book, please give the relevant page numbers [2]. In sentences, refer simply to the reference number, as in [3]. Do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] shows ... .” Please do not use automatic endnotes in *Word*, rather, type the reference list at the end of the paper using the “References” style.

**Follow each of section below to complete the final report!!**

* 1. Introduction
  2. What is modeling
  3. Different types of models
  4. Graphical models
  5. How models are used (provide examples and explain in detail)
  6. Provide an example of system in your discipline (e.g., mechanical, automation, electronics, signal and systems)
  7. Provide analytic model of the system introduced above
  8. Generate a graphical model
  9. Discuss your understanding, findings during the modeling process

# Course Project/ Take-Home Exam

Select one of the options below to complete:

1. Repeat the work done in the second reference article.
   1. Read and understand the procure
   2. Learn to use toolboxes in Matlab: Linear Graph, and GA
   3. Introduce design goal and specifications
   4. Compare the results and report your findings
2. Complete the take-home exam provided in the end of the course.

# Conclusion

A conclusion may review the main points of the report, highlighting the contributions of your work in the given report and suggesting possible improvement and extension in future work.

Appendix

Attached the main/key reference paper or document as the appendix. It won’t be counted as the main documents.

References

1. G. O. Young, “Synthetic structure of industrial plastics (Book style with paper title and editor),” in *Plastics*, 2nd ed. vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15–64.
2. W.-K. Chen, *Linear Networks and Systems* (Book style)*.* Belmont, CA: Wadsworth, 1993, pp. 123–135.

1. This report is the final course report of Mechatronic Modeling and Design with Applications in Robotics course in July 2022.

   **Note: This report will be submitted to Turnitin.com for similarity check!!!** [↑](#footnote-ref-1)