## Graduate Term Project: Analysis of a Solenoid Valve -Applying Dynamics & Mechatronics Principles

*Dynamics and Modeling of Mechatronic Systems - Graduate Research Project*

**Problem Statement & Goal:**

The main goal of this report is to analyze a solenoid valve using the principles discussed during the Dynamics and Modeling of Mechatronic Systems course. This report presents an overview of the common applications of these actuators. It also explains the working principles and slight variations currently used by the industry. The report then goes into the full dynamics and modeling of the solenoid valve's electromechanical system. It analyzes the valve's magnetic circuit as well as its interactions with the electromechanical model. The report ends with an overall conclusion of the analysis.

**Concepts learned while working in this project:**

- Understand **dynamics and modeling of lumped-parameter** and **continuum electromechanical systems.**
- Analyze and design **linear and nonlinear actuators** and transducers as crucial elements in electromechanical systems.
- Understand and model **mechanical-electrical interactions with dynamics and electromagnetics principles using lumped elements.**
- Determine force using force-energy and force-coenergy relations in lumped electromechanical systems.
- Analyze and model **magnetic circuits**. This will enable you to design linear and nonlinear actuators.
- Analyze and design rotary and linear **DC and AC motors**.
- Understand dynamics of mechatronic systems.
- Understand dynamics of electromechanical continua and derive equations of motion