# Mechatronics Course Project

Fall 2023

I.   Project Description

The project comprises design, fabrication and control of a solenoid-driven rotary motor. Solenoid actuator converts the electrical energy into a linear motion which is then translated to rotational motion of the rotor using a crank mechanism. Given the force-producing nature of the solenoid, we will always have force generated in one direction which necessitates the precise timing of the solenoid actuator activation cycle. A closed-loop control system will be required to measure and feedback the rotational speed and regulate the solenoid force to achieve speed control.
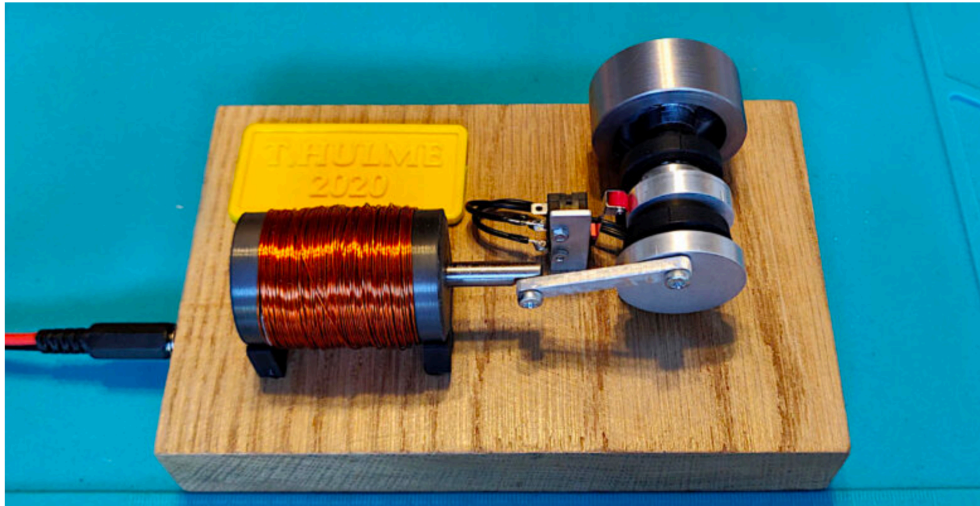
II.   Specifications

- The device envelope should not exceed a cube of dimensions $20\ cm \times 20\ cm \times 20\ cm$.
- The solenoid must be custom-designed and custom-built.
- The system must be equipped with closed-loop speed control.
- The system must have a digital display for indicating rotational speed.
- The supply voltage must be 12 Volts with maximum continuous current of 2Amps.
- The solenoid coil temperature must be measured to avoid overheating the solenoid.
- A flywheel is required for the motor to run smoothly (The flywheel spec will be provided).

III. Deliverables

- Operational motor setup
- A design report consisting of :
  - Electromagnetic design
  - Dynamic Simulation
  - Mechanical design and engineering drawings
  - Circuit design
  - Firmware

IV. Test Procedure

- The motor speed will be measured at 5 reference speeds to validate the speed control system.
- The temperature measurement system will be tested using an external heating system.