

## SYSC 4907 M4

### Design and Development of an Autonomous Self-Moving Chessboard



*AI-generated image illustrating the concept*

**Group size:** 4 or 5 students.

**Suitable for:** Chess enthusiasts with interest in mechatronic systems, electromagnetism, programming, Electrical, Computer Systems, and Software Engineering students. A multidisciplinary team with students from different programs is preferred.

**Desired background:** Mechatronics, programming, microcontrollers, embedded systems, software engineering, robotics, machine vision.

**Supervisor:** Prof. C. Rossa: [carlosrossa@cunet.carleton.ca](mailto:carlosrossa@cunet.carleton.ca)

**Lab information:** <https://www.biomechatronics.ca>

*Before joining the project, please form a group of 4 or 5 students and contact Prof. Rossa by email. Approval is required before joining the project.*

**Project Description:** Students in this project will design and build a self-moving chessboard capable of autonomously repositioning chess pieces in accordance with game rules. The team will study and compare multiple technical solutions, including an electromagnetic, coil-based actuation system embedded beneath the chessboard that moves magnetized pieces smoothly across squares, as well as an alternative using an external low-cost robotic arm guided by a camera to detect piece locations and execute moves. A software engineering component will integrate the physical chessboard controller with a chess engine (such as Stockfish or LiChess) for move generation and game analysis, enabling human-vs-computer play, demonstrations, or remote gameplay. Students will develop the necessary communication protocols between hardware and software, along with a user interface for move input, game control, and system feedback. The project includes the design and fabrication of a complete physical prototype, as well as the development of algorithms and control electronics to manage piece actuation, position sensing, path planning, and collision-free motion.

**Anticipated deliverables:** A functional actuated chessboard prototype with software integration with a chess engine.