מעבדת הוראה -מעבדת בקרה. אחראי אקדמי: פרופ' ג'ורג' וויס

מהנדס המעבדה: ארקדי רפלוביץ'

"מעבדת בקרה ", בניין כיתות, חדר 202

מעבדת בקרה, ניתנת במסלול "בקרה" בשנה ג', ד' , ומארחת גם את הסטודנטים מהנדסת מכונות, היא מבוססת על מערכות סרוו ובקרה, כולל בקרת טמפרטורה. המעבדה כוללת שישה ניסויים ,שמטרתם להדגים ולהמחיש צדדים תיאורטיים ומעשיים במימוש אלגוריתמים שונים של שיערוך ובקרה. במסגרת המעבדה נדרשים הסטודנטים לתכנן , לממש , לבדוק ולנתח מערכות בקרה לינאריות מסדר שני , לבצע אנליזה וסימולציות, אנלוגיות ודיגיטאליות, של מערכות בקרה שונות. ועוד. בין הניסויים : מערכת סרוו, ייצוב כדור על קורה, בקרת טמפרטורה, בקרה דיסקרטית, סימולציות ועוד.

CONTROL THEORY TEACHING LAB. Academic in charge: Prof. George Weiss
Lab engineer: Arkadi Rafalovich
Control lab, Classroom building, room 202

The control lab is taught to students in electrical or mechanical Engineering in years 3 and 4 who take the specialization track "control" or "robotics". This lab course is based on 6 experiments that mostly involve moving mechanisms actuated by electric motors. The experiments demonstrate various aspects of sensing, estimation and application of control algorithms, after suitably tuning them on simulation models. The students have to build mathematical models of given physical systems (mostly linear models of order two), design control algorithms for these models, analyze the resulting closed-loop system, simulate it, tune it, perform the experiment and then analyze the data. The experiments include several servo motors, balancing a ball on a moving beam, temperature control, digital control and more.

Basic Control Lab – syllabus

The lab is where practice and theory meet.

This laboratory course is offered in the control lab of the Faculty of Engineering, Tel Aviv University. The course starts with the preliminary reading of material about PID controllers, including answering several questions and doing some basic Matlab computations concerning the behavior of a second order system with a PID controller, conducted individually. This is followed by six lab experiments conducted by students in pairs. Each lab experiment requires about 4 hours presence in the lab. The experiments are:

1. **Understanding Matlab and Simulink**: This is a basic introduction to this software, with simulation experiments of various control systems carried out on the lab computers.

2. **DC Servo motor control (position):** Estimate the static and dynamic parameters of a DC servo motor from measurements, design and implement control loops. measure and analyze the results.

3. **DC Servo motor control (velocity):** Estimate the static and dynamic parameters of a DC servo motor from measurements, design and implement velocity control loops. measure and analyze the results.

4. **Temperature control**: Understand heat propagation, design a PID control loop, simulate thermal reaction and stability (using Simulink), tune the controller parameters, implement the design, measure and analyze the results.

5. **Discrete motor control**: Evaluate the performance of a discrete control system by performing a series of experiments with variable parameters. Design and implement nested digital PID velocity control loops, understand the function of the encoder, simulate the system, measure and analyze the results. Repeat certain experiments to experience the effects of different controller parameters.

6. **Balancing a ball on a moving beam**: Understanding the Lagrangian modeling and the effect of different plant parameters on the performance of the system. Design and implement digital dual position control loops, simulate the system, measure and analyze the results.

students are expected to have taken a basic course in control theory. The students will receive detailed written instructions for each experiment. Before starting an experiment, they have to read the instructions and to provide a written report and answers to a few questions. The students are required to provide a full report on each experiment within a week.