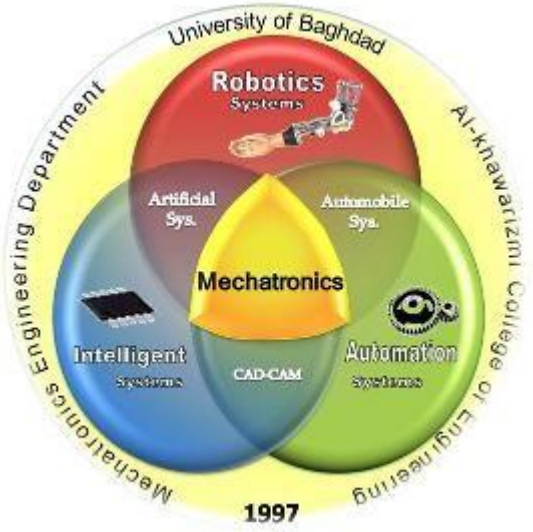
Mechatronics System Design and Modeling 2024

Lecture 1: Course Introduction

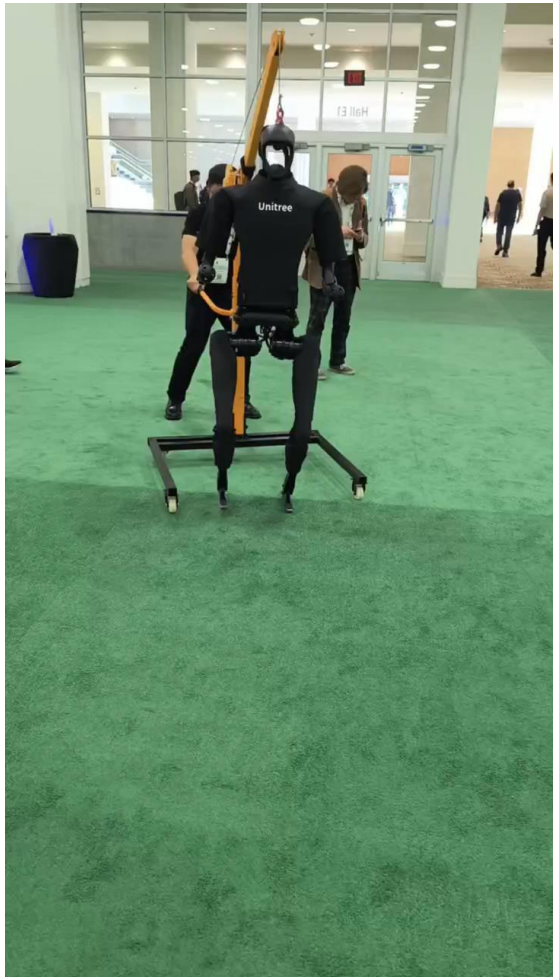
Ibrahim S. Hussein

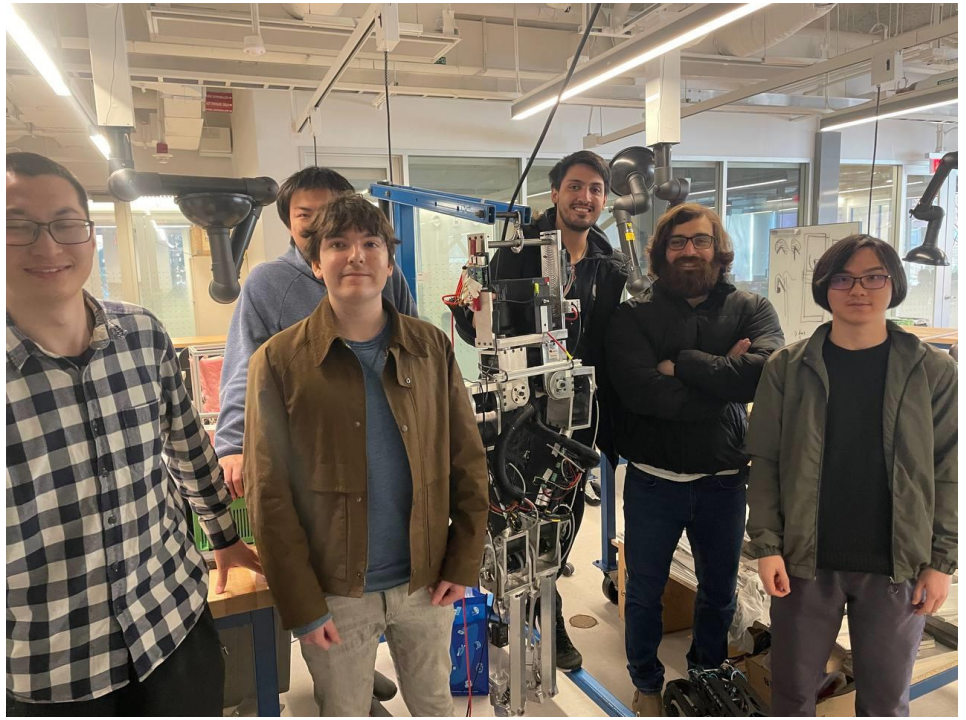


Today’s Lecture

- About Me: Research Interests and Beyond
- Schematic Diagram of the Mechatronics System
- Course introduction
  - Objectives
  - Topics
  - Logistics (Communication, Grading Rubric, References, Instructions)

About Me: Research Interests and Beyond





About Me: Non-Robotics Stuff

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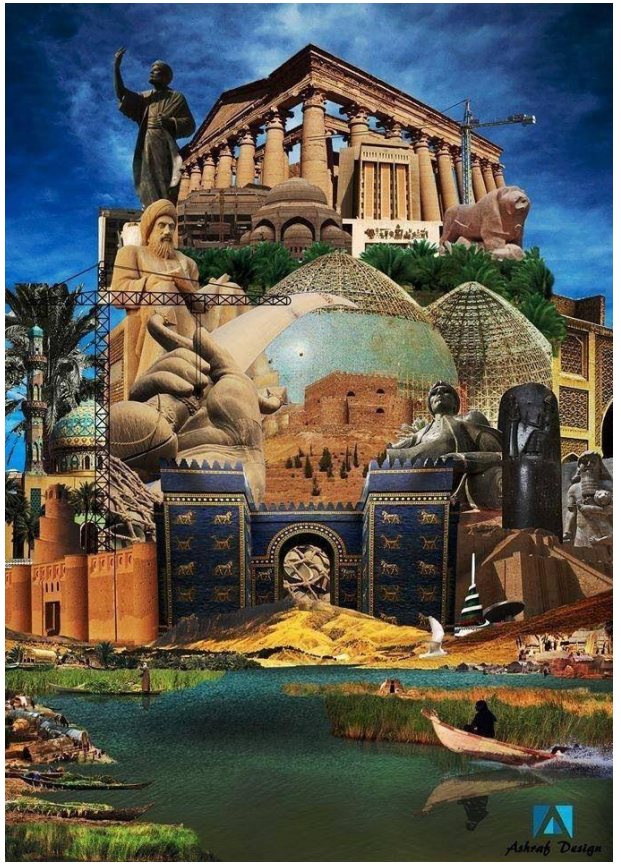
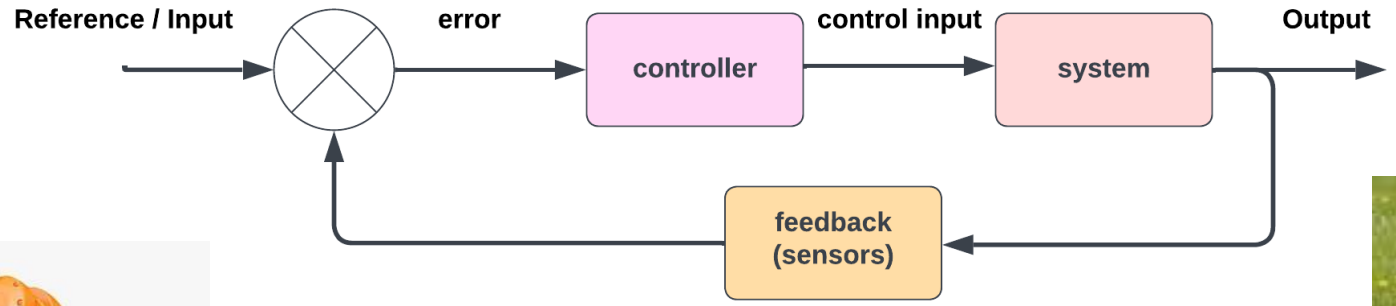


[1]

Schematic Diagram of the Mechatronics System



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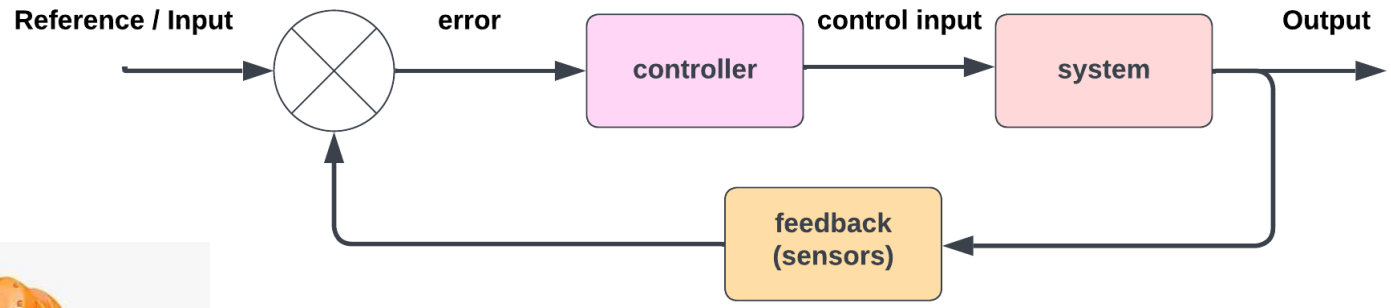

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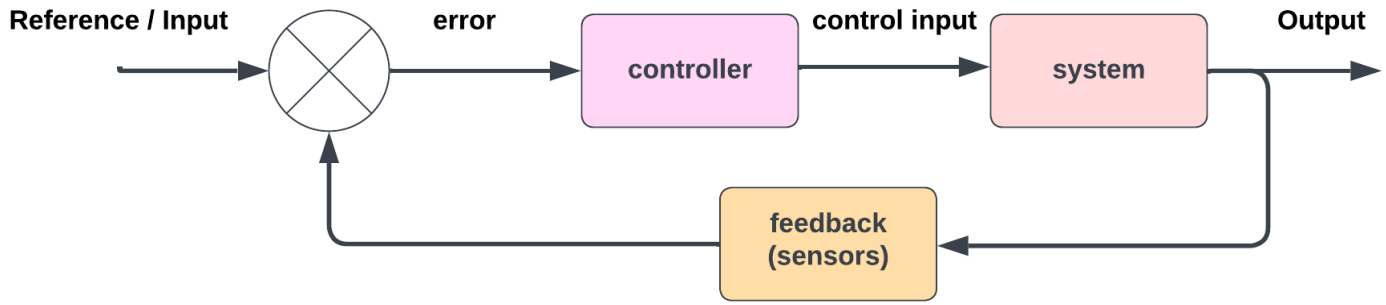

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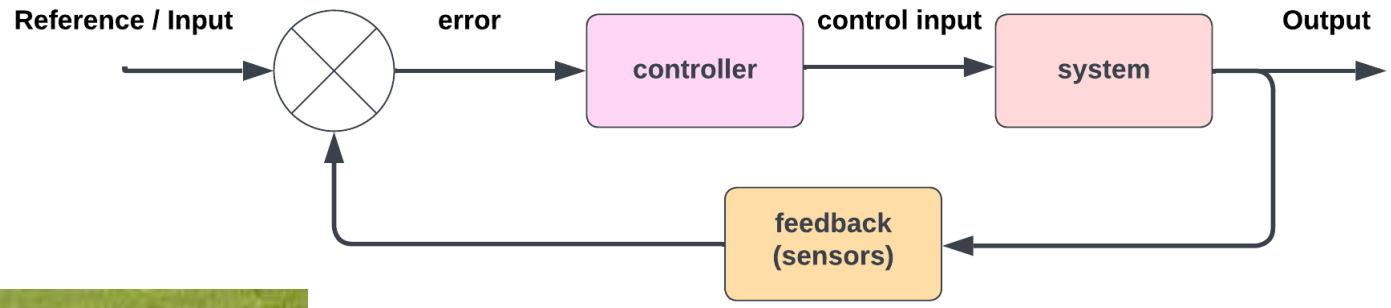

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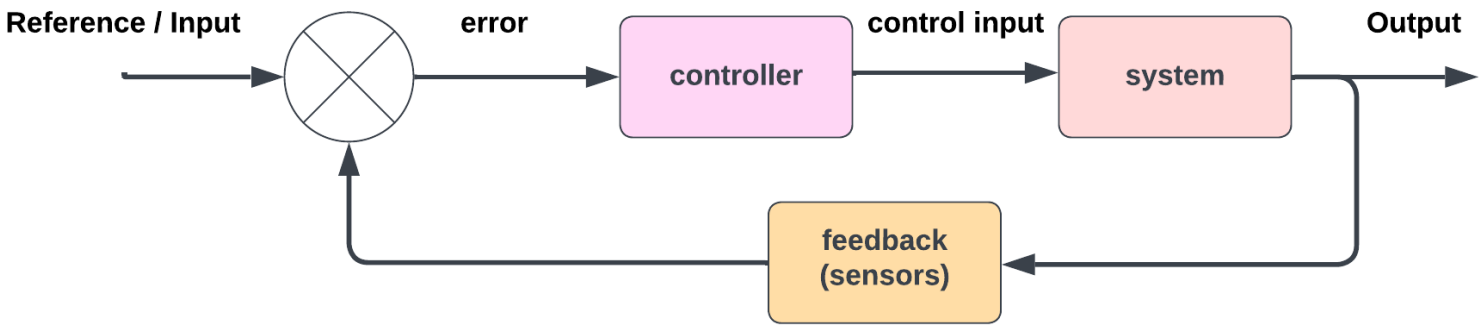

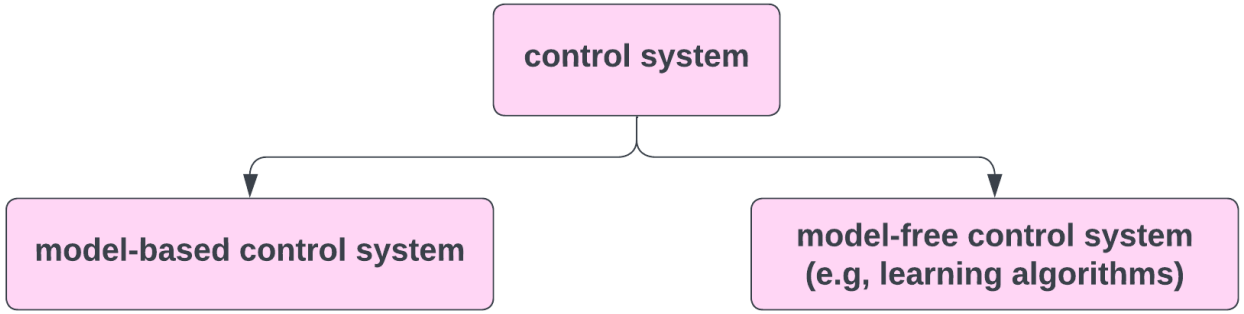

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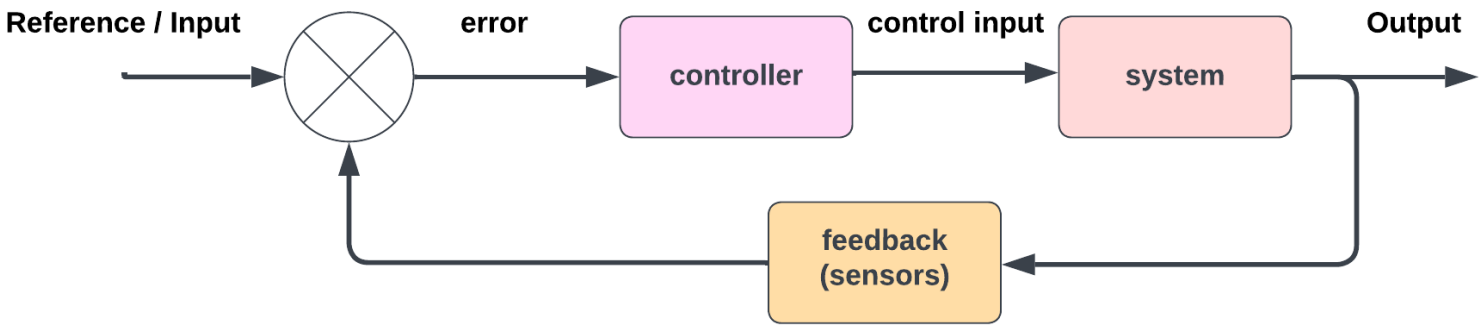

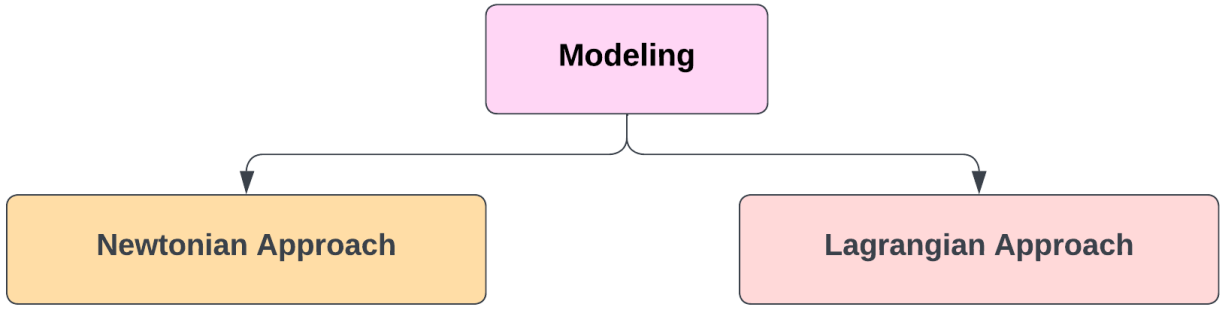

This approach is based on Newton's laws of motion.

It involves analyzing the forces and torques acting on the system to derive equations of motion.

This approach is based on the principles of Lagrangian mechanics, which uses the Lagrangian function (L = T - V, where T is the kinetic energy and V is the potential energy) to derive the equations of motion.

Course introduction: Objectives & Topics

Objectives

- Learn to model and analyze mechanical systems
- Understand advanced modeling techniques for complex systems
- Apply modeling principles to electrical and thermal systems
- Develop skills in different system representations and analyses

Topics

- **Mechanical System Modeling:**
- Model simple systems (e.g., spring-damper-mass) using Newton's Laws
- Analyze system responses
- Convert models to different forms (e.g., state-space, input-output)
- **Advanced Mechanical Systems:**
- Model complex systems (e.g., robotic arms, mobile robots) using Lagrangian Mechanics and Newton’s Recursive Laws
- **Electrical System Modeling:**
- Model circuits with capacitors, resistors, and inductors
- **Thermal and Mixed Systems:**
- Model thermal systems
- Integrate mechanical, electrical, and thermal systems

Course introduction: Logistics (Communication)

- Lectures are in-person Monday 11am-12:50am in 4th hall.
- Lab. Monday 1pm-2pm.
- Office Hours: (1:00 pm-2:00 pm (choose later / in-Person)).
- Email: ibrahim.s@kecbu.uobaghdad.edu.iq

Course introduction: Logistics (Grading Rubric)

- Assignments:
  - Group Homeworks – 35%
  - Journal Discussions (Individual) – 15%
  - 2 Midterm Exam (Highest Score Counts) – 35%
  - Quizzes – 10%
  - Participation in class discussions and engagement in activities – 5%

- Late Assignment Policy
  - In general late assignments will not be accepted

Course introduction: Logistics (References)

- Dynamic System Modeling and Control by Hugh Jack
- Dynamic Modeling and Control of Engineering Systems by Bohdan T. Kulakowski
- Modeling Engineering Systems by Jack W. Lewis

Course introduction: Logistics (Instructions)

Be Punctual:

1. Arrive on time for each class and return from breaks promptly.

Respect Others:

1. Listen actively and respectfully when others are speaking.
2. Avoid interrupting and engage in discussions constructively.

Participate Actively:

1. Contribute to class discussions and activities.
2. Ask questions and seek help when needed.

Complete Assignments on Time:

1. Submit all assignments by the due dates.
2. Inform the instructor in advance if an extension is needed.

Follow Academic Integrity:

1. Do not engage in plagiarism or cheating.
2. Cite sources properly and collaborate only as allowed.

Maintain Professionalism:

1. Use appropriate language and behavior in class.
2. Dress appropriately for a professional learning environment.

Keep the Classroom Clean:

1. Dispose of trash properly and keep your workspace tidy.
2. Respect classroom equipment and materials.

Turn Off Mobile Devices:

1. Keep phones and other devices on silent or turned off during class.
2. Use devices only for class-related activities when permitted.

Respect Classroom Environment:

1. Follow instructions for group work and classroom procedures.
2. Respect the physical space and belongings of others.

Provide Constructive Feedback:

1. Offer feedback in a positive and constructive manner.
2. Address conflicts or concerns with the instructor directly and professionally.

Thank You!