

Control system *Ctrl*

Lecture 03 — Modeling in Mechanical systems

■ Mathematical model

- Set of mathematical equations, differential equations that govern the system behavior
- Experimental data — alternative to mathematical model
 - How system output responds to known inputs
- Order

■ Translational mechanical systems

- Newton's second law
 - $\sum Forces = ma$
- Free body diagram
- Spring
 - $f(t) = k y(t)$
- Damper – dashpot
 - $f(t) = \beta y(t)$

■ Example

- Spring – mass – damper
- Page 72
- Solve analytically
- Use MATLAB to solve
- Comments on time response
- **Report:** Use EXCEL

■ Elements not fixed from either side

- Example
- Model
- How to sketch block diagram
 - To get Transfer function later
- Read ---page 84