

■ Picture 01: Pendulum

- Rotational system
- Analogy between translational – rotational
- System parameters
 - L, m
- Model — Newton's second law
- Nonlinear → linearization
→ $\sin(\theta) \approx \theta$ →
- Solve analytically — sketch system response
- **SIMULINK** model
- Linearized Vs. nonlinear
- MATLAB session/
- **Pendulum** → model → system parameters → changing the values of the parameters change the system response

■ Picture 02: RC circuit

- Resistance – Inductance – Capacitors
- Kirchhoff current law - Kirchhoff voltage law
- Transfer function
- Step response — capacitor charge curve
- Time constant
- System order – 1st order system
- Mercury-in glass
- **Report:** RLC example - MATLAB session
- **Report:** RLC numerical example – toolbox - SIMULINK

■ **Picture 03: Mass – Spring - Dashpot**

- Free body diagram
- Fixed at one end
- Get model using Newton's second law
- Solve analytically – solve using MATLAB
- Sketch step response
- System parameters shown in transfer function
- Draw with Excel sheet change Mass - stiffness – damper

■ Laplace transforms

- Initial value theorem/ final value theorem
 - Pole
 - Zero
 - Pole – Zero plot

■ $Y(S) = \frac{3(S+2)}{S(S^2+2S+10)}$

- Final value theorem
- response

■ $Y(s) = \frac{3}{s(s-2)}$

- Final value theorem
- response