ME 242: MECHANICAL ENGINEERING SYSTEMS LEARNING OBJECTIVES

1. Assign an appropriate role to dynamic modeling and analysis in the design of complex mechanical engineering systems.

2. Define generalized velocity, displacement, force and momentum variables appropriate for the creation of approximate lumped analytic models of systems involving mechanical, hydraulic, electric and hybrid media.

3. Identify the constraints between variables implicit in the structures of mechanical engineering systems.

4. Identify and evaluate compliance and inertance energy storage elements appropriate to the lumped modeling of mechanical engineering systems.

5. Represent the models implied by items 2-4 above in the form of bond graphs.

6. Convert bond graphs to sets of first-order differential equations.

7. Understand different alternatives to represent dynamic models.

8. Solve linear differential equations with specified initial conditions and impulse, step and sinusoidal excitations, using direct, complex number and operational methods.

9. Understand static and dynamic equilibrium and, in simple cases, how to adjust an equilibrium.

10. Understand numerical methods used for simulation of dynamic models described by ordinary differential equations.

11. Simulate the dynamic performance of a model represented by a set of first-order differential equations, using a computer package namely MATLAB.

12. Linearize nonlinear models and differential equations about nominal states.

13. Analyze stability by eigenvalue method.

14. Identify vibration modes and frequencies in dynamic systems.