

**Course Code :** ME 754

**Course Title :** Simulation and Modeling of Mechanical systems

**Credit Hours :** 3

### **Course Description**

Introduction to system concepts, Complex analysis, differential equations and Laplace transform, Solution of PDEs using the finite element method, System model representation, Modeling of lumped mechanical systems, Electrical, electronic and electro mechanical systems, Fluid and thermal systems, System response, High order systems in closed form, State variable, Dynamic system simulation for MATLAB, SIMULINK, (modeling, simulation and implementation).

### **Course Objectives**

Gain knowledge about model trends to combine modeling, theoretical analysis, and computer simulation. The present course service as a valuable source of information on mathematical modeling and analysis of dynamic systems, combined by selected computer simulation. The course assists the student in acquiring a solid background in the principles and techniques of modeling and analysis.

### **Course Topics**

Week no. 1: Introduction to system concepts.

Week no. 2: Complex analysis, differential equations and Laplace transform.

Week no. 3: Solution of PDEs using the finite element method.

Week no. 4: System model representation.

Week no. 5: System model representation.

Week no. 6: Modeling of lumped mechanical systems.

Week no. 7: Modeling of lumped mechanical systems. / 7<sup>th</sup> week evaluation.

Week no. 8: Electrical, electronic and electro mechanical systems.

Week no. 9: Electrical, electronic and electro mechanical systems.

Week no. 10: Fluid and thermal systems.

Week no. 11: System response.

Week no. 12: System response. / 12<sup>th</sup> week evaluation

Week no. 13: High order systems in closed form.

Week no. 14: State variable.

Week no. 15: Dynamic system simulation for MATLAB, SIMULINK, (modeling, simulation

and implementation).

Week no. 16: Final exam.

### **References**

I. Cochin and W. Cadwallender, "Analysis and Design of Dynamic Systems", Addison Wesley, 1997.

Hung V. Vu and Ramin S. Esfandiari, "Dynamic Systems, Modeling and Analysis", McGraw-Hill, 1998.

- Dynamic System Simulation for MATLAB, Prentice-Hall, 1998.