Department of Mechanical Engineering Technology

Course number/name:
MECH 3550 Simulation and Visualization

Credits/contact hours:
3 credits, 2 class hours, and 2 lab hour

Instructor/coordinator:
Angran Xiao, Assistant Professor of Mechanical Engineering Technology

Text book/title/author/year

Specific course information
Catalog description:
Introduces students to important aspects of a simulation study, and use of computer tools to visualize simulation model. Topics include simulation basics, planning, data collection and analysis, model building, model verification and validation, output analysis, experimental design, visualization technique.

Pre/Corequisites:
MAT1475

Required/elective/selected elective:
Selected Elective from General Concentration of Mechanical Engineering Technology

Course learning objectives:
1. Students apply knowledge of mechanical engineering, physics, and mathematics to the simulation and visualization of systems in the field of manufacturing, fluid mechanics, vibration, and control.
2. Student will work in teams to generate computing models using simulation and visualization software and conduct analysis on these models.
3. Students will develop skills in using visualization tools to verify design intent. Students will demonstrate skills in validating and refining simulation models to achieve desired outcome.

Course addresses ABET student outcomes: 3a, 3b, 3c, 3e, 3k, and PC-1

Brief list of topics to be covered:
- Overview of Simulation and Visualization. Basic simulation modeling, system dynamics, discrete-event simulation, data collection and analysis. Relationship among systems, models, and simulation. Laboratory work: Overview of Simulation and Visualization software. Familiarize with Promodel, or Expertfit, and Matlab or other programming software.
- Build Simple Simulation Models. Modeling simple manufacturing systems, modeling service systems, model verification and validation, basic modeling concepts. Random-number generators, Probability Distributions. Laboratory work: Hands-on Practice on
ProModel 6.0 or Expertfit. Running sample simulation models using the software provided.

- Modeling Complex Systems. Building valid, credible, and appropriate detailed simulation models; output data analysis; comparing alternative system configurations; Model verification and validation; Laboratory work: Simulation Project I. Creating simulation models to meet various design criteria.


- Creation of a Vibration Model. Single-degree-of freedom systems, multi-degree-of freedom systems, vibration of thin beams. Laboratory work: Creation of a Model to Simulate and Visualize Vibration. Use of simulation and visualization software to create the model.

- Fluid Mechanics Simulation. Hydrostatics, internal viscous flow, external flow, open channel flow. Laboratory work: Creation of a Model to Simulate and Visualize a Fluid Mechanics System. Use of simulation and visualization software to create the model.

- Simulation of a Control System. Representation of systems in Matlab, response of systems, design tools, design examples. Laboratory work: Creation of a Control System. Using tools in Matlab to create a model to simulation a control system.