Semester	Fall 2021
Course Number	Technical Elective
Course Title	MATLAB-Simscape for Engineering Applications
Instructor	Ping C. Sui, Ph.D. Office: 4-223 E-Mail: ping.sui@scupi.cn
Teaching Assistant	TBA
Office Hours	Tuesday 1:00-5:00PM Wednesday 1:00-5:00PM
Lecture Time/Room	Thursday 13:50-16:25 Teaching Building 1 A-108

Prerequisites
1. Engineering 0011 and/or prior MATLAB fundamental training
2. At least junior-level per SCUPI engineering disciplines
3. Mechanical Engineering

Textbook (Optional)
1. Russell, K., Shen, Q., Sodhi, R.S., 2019, Kinematics and Dynamics of Mechanical Systems - Implementation in MATLAB and Simmechanics, CRC Press, Boca Raton, FL
2. Magrab, E.B., Azarm, S., Balachandran, B., Duncan, J.H., Herold, K.E., Walsh, G.C., 2011, An Engineer's Guide to MATLAB, Prentice Hall, Upper Saddle River, NJ

Course Description This is a project-based course rather than a topic-based course, and students will learn the network-based programming, computational, and problem solving skills needed to complete the projects rather than progressing through a typical programming text.

This class is about…..
- Developing solution algorithms for solving governing equations in single- or multi-physical domains,
- Mostly linear/nonlinear ODE's, and
- A few PDE's
- Applying MATLAB Simscape libraries in developing physical models and solving the subsequent engineering analyses
- Most physical models will be dynamic motion analysis for mechanical systems

This class is not about learning…..
- MATLAB programming,
- Simulink block diagrams, or
- control algorithms.

Class Outline

I. MATLAB Fundamentals
    a. Polynomial and Curve-Fitting
    b. Solving Nonlinear Differential Equations
II. Motion Analysis of Planar Mechanisms
    a. Review of Complex Number
    b. Vector Loop Equation of Planar Mechanisms
    c. Motion Analysis of Planar Mechanisms
    d. Numerical Methods for Motion Analysis

          e.   MATLAB Nonlinear Solver for Motion Analysis
  III.   Simscape Fundamental
          a.   Simscape and Simulink
          b.   Simscape Fundamental Library
          c.   Application Examples
  IV.   SimMechanics and SimMultibody
          a.   Single- and Multi-DOF Dynamic System Analysis
          b.   Dynamic Analysis of Close-Loop Mechanisms
          c.   Analysis of Geartrain Systems
  V.   Application Example: Vehicle Driveline Modeling
  VI.   Application Example: Introduction to Robotic Manipulator
  VII.   Preview of SimHydraulics

In-Class Workshops	Hands-on practices to be given during the class throughout the semester. Purpose is to promote in-class discussions and keep students in-sync with course material during lecturing.
Lab Assignments	Will be distributed each week after the class. Due Day: 11:00 AM on the day of the next class Late assignment will not be accepted. Unforeseeable emergencies will be dealt with on a case-by-case basis.
Final Project	Hands-on, independent task assignment Details will be furnished later Expected deliverables: • Developed project model • Written final report • ~10-minute Presentation
Exams	There will be three section exams. The final exam is comprehensive. Test duration: ~2 hours Exams in this course will be open-book and open-notes. No make-up will be given for the missing exam. Exams missed due to unpredictable events will be dealt with on a case-by-case basis.
Grades	In-Class Workshops: 20% Lab Assignments: 20% Section Exams: 45% Final Project: 15% 附件：等级成绩和百分成绩、绩点对照表 | 字母等级	A	A-	B+	B	B-	C+	C	C-	D+	D	F
中文等级	优秀		良好		中等		合格				不合格
百分制	100~90	89~85	84~80	79~76	75~73	72~70	69~66	65~63	62~61	60	<60
绩点	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0	
Class Attendance	Students are expected to attend every class period. Early is on time, on time is late. As a courtesy to your fellow classmates, be punctual and arrive no later than the class starting time.

| Academic Honesty | All of us are equally responsible for ensuring a fair and positive learning environment. Students are permitted to discuss homework assignments together, but should do their own work when preparing a problem solution. All exams are to be completed without unauthorized assistance. Any student caught cheating on an assignment or exam will receive disciplinary action, up to and including receiving a grade of "F" for the course. |