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MENG 5314 – Micro Electro Mechanical Systems (MEMS)
Course Syllabus

Semester / Year	*Spring / 2024*
Catalog Description	*This course introduces the students to principles, modeling, interfacing, and signal conditioning of micro-electro-mechanical systems (MEMS) such as motion sensors and actuators. It also covers basic electronic devices, MEMS resonators, embedded microprocessor systems and control, power transfer components, and mechanism design. The course provides knowledge in the analysis and design of hardware-in-the-loop through simulation and rapid prototyping of real-time closed-loop computer control of electromechanical systems.*
Prerequisites	*ENGR 2302 Dynamics, MATH 3305, or Graduate student standing.*
Section Number	*001*
Instructor Name	*Dr. A. Ibrahim*
Contact Information	*Email: aibrahim@uttyler.edu* *Office: RBN 3008*
Class Type / Instruction Mode / Location	***Mode**: F2F* ***Tyler**: Ratliff Building North 03040*
Class Time	*Mo 5:00 PM –7:45 PM*
Office Hours	*Mo 1:00 PM – 4:00 PM or by appointment*
No. of Credits	*3*
Required Textbook	*MEMS Linear and Nonlinear Statics and Dynamics, Younis, Mohammad I., Springer, New York, 2011.*
Optional References	*NA*
Additional Rules and Requirements	*MATLAB Programming skills.*
Evaluation Method	*Assignments 25%* *Midterm Exam 25%* *Project 25%* *Final Exam 25%*
Grading Policy / Scale	*Letter grades, scale:* *A: 90 – 100; B: 80 – 89; C: 70 – 79; D: 60 – 69; F: < 60* *Note: **89.4 == B***
Important Events / Dates	***Census date:** January 29th, 2024,* ***Last date to withdraw courses**: March 23rd, 2023,* ***Midterm Exam:** After Ch4, Week 7 or 8, 2024,* ***Project article and Presentation:** Mo April 22nd, 2024,* ***Final Exam:** As scheduled by UT Tyler.* ***No class**: Mo Jan. 15, 2024: **Martin Luther** King, Jr. Holiday* ***No class**: March 11-15, 2024, **Spring Break***
Attendance / Makeup policy / other rules	*Attendance is required / No makeup.* ***Missing 3 classes ≡ F grade***
Course Learning Objectives / ABET &	*By the end of this course, students will be able to:* *1. Describe MEMS and their related design components.*

PEOs Relation	2. *Analyze nonlinear dynamic responses of MEMS devices.* 3. *Design MEMS resonators and analyze their static and dynamic behaviors.* 4. *Apply analytical and numerical techniques to model and simulate MEMS, considering nonlinear multi-physics interaction and actuation forces.* 5. *Conduct a major project leading to a draft of a publishable level paper.*
Tentative Topics / Course Plans	1. *Introduction to MEMS and their modeling challenges laws of motion.* 2. *Sensing and Actuation in MEMS.* 3. *Elements of Lumped-Parameter Modeling in MEMS.* 4. *Introduction to Energy Harvesting.* 5. *Introduction to Nonlinear Dynamics.* 6. *Continuous Systems: Microbeams.*
University Policies	*https://www.uttyler.edu/academic-affairs/files/syllabus_information_2021.pdf*