

Biomedical Mechatronics
BMEN 4100- Spring 2026
Course Syllabus

Instructor: Dr. Amir Jafari
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Office Hours: By appointment
Class Schedule: Tu/Th 1:00 pm-2:20 pm

Catalog description:

3 hours credit. The students will be introduced to, and study electromechanical design and analysis as coupled with control systems. Sensor integration and some special topics in signal conditioning may be covered, as needed.

Major prerequisites by topic:

1. Electric circuits and components
2. Sensors and measurement systems
3. Error introduction and propagation
4. Basic statistical analysis
5. Continuous, classical controls

Topics covered:

1. Review of electric circuits and components
2. Introduction to analog signal processing
3. Introduction to digital circuits and microcontroller programming
4. Review of data acquisition
5. Review of sensors and measurement methods
6. Introduction to actuators
7. Introduction to mechatronic control architectures

Contribution of course to meet the professional component:

This course builds the foundation for preparing students to work professionally in the area of biomedical mechatronics devices.

Student Learning Outcomes:

- (i) an ability to apply knowledge of mathematics, science, and engineering
- (ii) an ability to identify, formulate, and solve engineering problems
- (iii) apply principles of engineering, basic science, and mathematics to model, analyze, design, and realize physical systems, components or processes; and work professionally in mechanical systems area.
- (iv) ability to define a mechatronic system, its primary elements, and to model a multi-energy domain system
- (v) ability to exercise a computational model of the mechatronic system and evaluate the system response

Textbook(s) and/or required material:

No required textbooks

Course Policies:

- Exam:
 - There will be no make-up exams except for medical emergency. You will need a note from a doctor that you had a genuine medical emergency. The content of the make-up exam may be different from the regular exam.
 - The schedule of Final Exam is set by UNT and should not be violated.
 - Honor code must be strictly followed in every exam.
 - All exams will be in-class and close book.
 - Students are allowed to bring a calculator to exam but **cannot** get laptop/computer/tablet.
 - Cell phones should be shut-off during exam. No exception to this rule for anybody.

Evaluation Methods:

- Mid-Term Exam (Feb. 10th)– 20%
- Second Mid-Term Exam (April 2nd) – 30%
- Final Exam (May 7th- 10am to 12, it needs to be checked by UNT: <https://registrar.unt.edu/exams/final-exam-schedule/spring.html>)– 50%

UNT Policies and Resources:

- 1) no bathroom breaks during an exam (unless student provides medical note).
- 2) no electronic device (phone, smart watch, camera, electronic glasses, computer, unapproved calculator) on student body (in pockets, boots, clothing, etc) or within reach (under seat, on adjacent seat) during exam
- 3) if calculators are needed, students can only use approved calculators during exams, based on the FE exam approved calculator list
- 4) Students are allowed up to three (3) excused absences.

Exam Policy:

No bathroom breaks during exams. No electronic device (phone, smart watch, camera, electronic glasses, computer, unapproved calculator) on student body (in pockets, boots, clothing, etc) or within reach (under seat, on adjacent seat) during exam. It is considered cheating to have a phone, computer, or other electronic device accessible during an exam.

Approved Calculators for Exams

The FE exam calculator policy (<http://www.ncees.org>) will be used in this course. Only the models listed below may be used during exams.

Hewlett Packard - HP 33s and HP 35s models, but no others

Casio - all FX 115 models (must contain fx-115 in its model name)

Texas Instruments - all TI-30X and TI-36X models (must contain either TI-30X or TI-36X in its model name)