

**BMEN 4310**  
**Feedback Systems in Biomedical Engineering**



**Professor** Leonidas Bleris  
**Term** Fall Semester 2016  
**Meetings** Monday & Wednesday: 8:30am-9:45am  
[JSOM 2.714](#)

*These descriptions and timelines are subject to change at the discretion of the Professor*

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**Professor's Contact Information**

**Office Phone** 972-883-5785  
**Office Location** NSERL 4.708  
**Email Address** [bleris@utdallas.edu](mailto:bleris@utdallas.edu)

**Office Hours** Monday 11am-12pm

**Other Information**

- eLearning page will be in place for posting assignments, grades, bulletin board discussions, etc. Class notes and homework solutions will be posted on the eLearning page.
- Teaching Assistant: Maziyar Keshavarzian: [mxk144530@utdallas.edu](mailto:mxk144530@utdallas.edu)
- TA Office hours: Monday 2-4pm, ML1 1.118

**General Course Information**

**Pre-requisites, Co-requisites, & other restrictions** ENG 2300, MATH 2420

**Course Description** BMEN4310 Feedback Systems in Biomedical Engineering (3 semester credit hours) Notions of inputs, outputs, and states. Linearity versus nonlinearity. Deterministic versus stochastic systems. Top down versus bottom up modeling. Sensitivity and reduction of sensitivity via feedback. Introduction to stability. Feedback for stabilization and disturbance rejection. Numerical simulation and controller design via computational approaches.

**Program Educational Objectives** Biomedical Engineering Bachelor's graduates are expected to attain the following Program Educational Objectives within a few years after graduation:

- Careers that lead to leadership roles in biomedical engineering or related fields, or
- Gain admission to graduate, professional, or health related programs.

**Course Learning Objectives**  
(with ABET classifications)

1. Understand the design procedure for feedback control systems and understand how feedback impacts transient and steady state performance. (SO e).
2. Use specifications of feedback system performance. Apply the root-locus method of feedback system design. Under some constraint to meet needs. (SO c)
3. Perform analysis and control methods in the frequency domain. (SO a)
4. Find the transfer function and state space models for control system analysis and synthesis. Controllability and observability of systems. (SO k)

**Required Texts &** *Feedback Control of Dynamic Systems*

**Assignments & Academic Calendar** (*This schedule is subject to change*)

Date	Topic
<b>August</b>	
08/22/2016	Overview of Feedback Control
08/24/2016	Dynamic Models and Examples
08/29/2016	Review of the Laplace Transform
<b>September</b>	
09/31/2016	First Analysis of Feedback
09/05/2016	<b>Labor Day</b>
09/07/2016	Transfer Function/Final Value Theorem
09/12/2016	Block Diagrams
09/14/2016	Time domain Specifications
09/19/2016	<b>Bleris travelling</b>
09/21/2016	Stability
09/26/2016	Basic Equations for Control
09/28/2016	Tracking/Regulation
<b>October</b>	
10/03/2016	Review
10/05/2016	<b>Exam 1</b>
10/10/2016	PID control
10/12/2016	PID control/System Type
10/17/2016	Review/Problem solving
10/19/2016	Tuning
10/24/2016	The Root-locus Design
10/26/2016	Frequency Response
10/31/2016	Frequency Response
<b>November</b>	
11/02/2016	<b>Exam 2</b>
11/07/2016	Bleris Travelling (Exam Solutions by graduate student)
11/09/2016	Bode Gain-phase Relationship
11/14/2016	Bleris Travelling
11/16/2016	Problem solving/Review
11/21-25/2016	<b>Thanksgiving Holidays</b>
11/28/2016	Lead/Lag Compensation
11/30/2016	State Space; Block Diagrams
<b>December</b>	
12/05/2016	Biomedical Systems
12/07/2016	Problem solving/Review
12/12/2016	<b>Exam 3 (TBD)</b>

## Course Policies

<b>Grading (credit) Criteria</b>	<p>Homework/Quizzes: 25%</p> <p>Exam 1: 25%</p> <p>Exam 2: 25%</p> <p>Exam 3: 25%</p> <p>Bonus at instructors discretion</p> <p>There will be two exams given during the semester and a third exam (possibly take-home) during the scheduled final exam period. No makeup examinations will be offered in this course. In the event of an excused absence (illness, job-related travel, holy day absence, etc.; Proper documents should be provided), the weight of the exam will be shifted to the remaining exams.</p> <p>Homework will be assigned and graded.</p> <p>On the day that homework is due, a short quiz may be given that is heavily based on the homework.</p>
<b>Make-up Exams</b>	No make-up exams or quizzes will be given.
<b>Extra Credit</b>	Bonus project may be assigned
<b>Late Work</b>	<b>Not applicable</b>
<b>Class Attendance</b>	Students are encouraged to attend every class.
<b>Classroom Citizenship</b>	Professional at all times. As courtesy to classmates and instructor, electronic devices should be turned off during class, except when permitted by the instructor
<b>Comet Creed</b>	<p><i>This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:</i></p> <p>“As a Comet, I pledge honesty, integrity, and service in all that I do.”</p>
<b>UT Dallas Syllabus Policies and Procedures</b>	<p>The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus.</p> <p>Please go to <a href="http://go.utdallas.edu/syllabus-policies">http://go.utdallas.edu/syllabus-policies</a> for these policies.</p>

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