

# AUTOMATIC FEEDBACK CONTROL IN HUMAN BIOLOGY

## Title of Course

EEL 4930 Section XXXX

**Class Periods:** MWF, period, and corresponding time of day

**Location:** Classroom location

**Academic Term:** Spring 2021

### Instructor:

Name: Jacob Hammer

Email Address: [hammer@mst.ufl.edu](mailto:hammer@mst.ufl.edu)

Office Phone Number: 3523924934

Office Hours: Days of week, hours available, office location MWF 3:50-4:40PM

### Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Name, email address, office location, office hours
- Name, email address, office location, office hours

### Course Description

A course about the automatic feedback control principles that govern biological, biochemical, and genetic mechanisms underlying critical processes in human biology. The course concentrates on case studies, including the automatic feedback control principles that regulate vision, balance, heart rate, and various metabolic and immunologic processes in human biology.

### Course Pre-Requisites

-Basic knowledge of control theory and linear algebra (EEL 4657C or EEL 4610 or equivalent) or instructor consent

### Course Objectives

Introduce students to general principles of automatic control, as they are applied by natural phenomena in human biology.

### Materials and Supply Fees

List if applicable

### Professional Component (ABET):

This course consists of 1.5 credits of Basic Science and 1.5 credits of Engineering Science

### Relation to Program Outcomes (ABET):

The table below is an example. Please consult with your department's ABET coordinator when filling this out.

Outcome	Coverage*
1. an ability to apply knowledge of mathematics, science, and engineering.	Medium
2. an ability to function on multi-disciplinary teams	High
3. the broad education necessary to understand the impact of engineering solutions in global, economic, environmental, and societal context	Medium

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

**Required Textbooks and Software : None**

- Title
- Author
- Publication date and edition
- ISBN number

(if course notes derived from various published sources are used, provide information above for each source)  
(if course notes are developed by the instructor, so state)

**Recommended Materials: None**

- Title
- Author
- Publication date and edition
- ISBN number

**Course Schedule**

Week 1: Introduction: basic concepts in automatic feedback control

Week 2: Automatic feedback control mechanisms in biological systems

Week 3: Automatic feedback control of gene expression

Week 4: Biochemical mechanisms of automatic feedback control

Week 5: The eye, Part I: automatic light control: the eye's iris

Week 6: The eye, Part II: automatic focusing of the eye's lens

Week 7: Automatic balancing: standing up

Week 8: Diabetes: a defect in an automatic feedback control loop

Week 9: The beating heart: automatic feedback control of heart rate

Week 10: Wound healing and automatic feedback control of blood coagulation

Week 11: Automatic feedback control of blood acidity and respiration

Week 12: Automatic feedback control and blood pressure regulation

week 13: Automatic feedback control and reflexes: hand on a hot stove

Week 14: Automatic feedback control loops in the immune system

Week 15: Review

### **Attendance Policy, Class Expectations, and Make-Up Policy**

Attendance not required. Makeups will be provided based on excused absences.

### **Evaluation of Grades**

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Seminar Presentations (1)	100	30%
Midterm Exam	100	30%
Final Exam	100	40%
		100%

### **Grading Policy**

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### **Course Evaluation**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### **University Honesty Policy**

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any

condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

#### *Health and Wellness*

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

##### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

##### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

*Academic Resources*

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.  
<https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers.  
<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://care.dso.ufl.edu>

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.