Syllabus

585.601 - Physiology for Applied Biomedical Engineering I

Instructor Contact

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I prefer that students contact me *via* email. Please be sure to include the course number in the subject line. I will make every effort to respond to your inquiry within 48 hours or earlier. If an issue is urgent, the student is to indicate "urgent" within the subject line of the email and I will respond as soon as is practical.

Office Hours via Zoom

Students can reserve[1] one-on-one Zoom sessions with the instructor during each Module week to address their individual questions or concerns. Zoom sessions, in 20-minute blocks, will usually[2] be available from 8:00 – 10:00 PM[3] on Thursday (Module day 3) evenings and from Noon to 2:00 PM on Sunday (Module day 6) afternoons. Requests for a Zoom session should indicate the time slot requested and **should include a brief description of the material to be discussed or question to be addressed**. Time slots other than those described above are possible but not guaranteed; contact the instructor as necessary.

For more information regarding Zoom, please see the Zoom Student Quick Start Guide.

Course Description

This two-semester sequence is designed to provide the physiological background necessary for advanced work in biomedical engineering. A quantitative model-oriented approach to physiological systems is stressed. First-term topics include the cell and its chemistry, transport and the cell membrane, properties of excitable tissue and muscle, the cardiovascular system, and the respiratory system. The second term course covers anatomy of the nervous system, structure and functions of the auditory and visual systems, motor systems, the kidney and gastrointestinal tract, and the neural and neuroendocrine control of the circulation.

Prerequisites

Courses in 1) mathematics through ordinary differential equations, 2) calculus-based physics, including mechanics, heat and energy, electricity and magnetism, and elementary quantum concepts, 3) chemistry, and 4) molecular biology

[1] By sending an email to the instructor – follow the instructions in the Discussion tab.
[2] There will may be circumstances such that the Instructor is not available at the scheduled times; if so, alternate times can be arranged by request.
[3] All times are east coast time; be aware of the switch to/from Daylight Savings Time, depending on the semester.

Course Goals

To develop a basic understanding of human physiology from an engineering perspective.

Course Objectives

- Understand human physiology at a cellular, tissue, and organ systems level.
- Apply engineering principles to physiological problems in biochemistry, muscle mechanics, and the cardiovascular and respiratory systems.
- Understand the integration and control of the different physiological systems and their roles in maintaining homeostasis.
- Develop an appreciation and understanding of the current literature in the fields of medicine, physiology, and biomedical engineering.

Course Structure

The course materials are divided into modules, each of which runs for seven (7) days. The modules can be accessed by clicking on Course Modules on the left menu. A module will have several sections including the overview, content, readings, discussions, and assignments. Students are encouraged to preview all sections of the module before starting. **Homework is due by 11:59 PM (US east coast time) on Day 7 (Monday) of each Module**. For those Modules with more than one Discussion Question the **response to each Discussion Question is due on the module day and at the time indicated in each Discussion Question. For Modules with only one Discussion Question the response is due by 11:59 PM on Module Day 4**

Textbook

Required

Koeppen BM and BA Stanton, Eds (2016). *Berne and Levy Physiology* (7th edition). Philadelphia, PA: Mosby Elsevier.

ISBN: 978-0-323-39394-2

Textbook information for this course is available online through the appropriate bookstore website: For online courses, search the MBS website.

Optional

Widmaier EP H Raff and KT Strang, Eds. (2019). *Vander's Human Physiology: The Mechanisms of Body Function* (15th ed.)[4]. New York, NY: McGraw Hill.

ISBN: 978-1-259-90388-5

West JB and AM Luks. (2016). *Respiratory Physiology: the Essentials* (10th ed.)[5]. Baltimore MD: Lippincott Williams & Wilkins.

ISBN: 978-1-4963-1011-8

[4] An earlier edition (e.g., 14th or 13th) should also prove useful.
[5] An earlier edition (e.g., 9th) should also prove useful.

Required Software

None

Technical Requirements

You should refer to **Help & Support** on the left menu for a general listing of all the course technical requirements.

Student Coursework Requirements

It is expected that each module will take approximately 9 hours per week to complete. Some modules will require more time to complete; others will require less time to complete. This course will consist of the following basic student requirements:

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Preparation and Participation (20% of Final Grade Calculation)

You are responsible for carefully reading all assigned material and being prepared for discussion. The majority of readings are from the course text. Additional reading may be assigned to supplement text readings.

Post your response(s) to the **discussion question(s)** as indicated in **Course Structure**, above. Posting responses to the discussion questions by the due day/time is part one of your grade for module discussions (i.e., Timeliness).

Part two of your grade for module discussion is content. Responses that address the question asked in a focused, well thought-out manner will score high; responses that do not address the question asked will score poorly. Coherence counts; vaguely worded responses will not score well. Please note that including information that is incorrect will result in the loss of points. Feel free to include Figures from the literature (with proper citation of course) or citations to the literature to support your response. Part two of your grade for module discussion will also include your interaction (i.e., responding to classmate postings with **thoughtful** responses) as appropriate. Please note that responses such as “I said the same thing” or “Good post” or “Gosh – I didn’t think of that” or other similar information-free responses are not acceptable. Be detailed in your responses to your classmates' postings. Feel free to agree or disagree with your classmates. Please ensure that your postings are civil and constructive; *ad hominem* responses are forbidden.

I will monitor module discussions and will respond to some of the discussions as discussions are posted.

Preparation and participation is evaluated by the following grading elements:

1. Timeliness (50%)
2. Critical Thinking (50%)

The below are guidelines for grading preparation and participation:

- 100–90 = A—Timeliness [regularly participates; all required postings; early in discussion; throughout the discussion]; Critical Thinking [rich in content; full of thoughts, insight, and analysis].
- 89–80 = B—Timeliness [frequently participates; all required postings; some not in time for others to read and respond]; Critical Thinking [substantial information; thought, insight, and analysis has taken place].
- 79–70 = C—Timeliness [infrequently participates; all required postings; most at the last minute without allowing for response time]; Critical Thinking [generally competent; information is thin and commonplace].

- <70 = F—Timeliness [rarely participates; some, or all required postings missing]; Critical Thinking [rudimentary and superficial; no analysis or insight is displayed].

Assignments (35% of Final Grade Calculation)

Assignments (homework) will include a mix of qualitative and quantitative problems. Please include a cover sheet with your name and an assignment identifier. Also include your name and a page number indicator (i.e., page x of y) on each page of your submissions. Each problem should include the problem statement, assumptions (if applicable), computations (if applicable), and conclusions/discussion delineated. All Figures and Tables should be captioned and labeled appropriately: Figures and the like taken from the literature should be properly cited.

All assignments are due by 11:59 PM on Day 7 of the Module.

The grade for a late submission will be reduced by 10% of the point total for the assignment for each 24 hours or part of 24 hours that the submission is late, up to day 7 of the following module. An assignment that is not submitted by the end of the following module will receive a grade of zero (0) but must be completed and submitted in order to receive subsequent homework assignments. Special circumstances will be addressed on a case-by-case basis; contact the Instructor as soon as possible.

Qualitative assignments are graded according to the following guidelines:

- 100–90 = A—All parts of question are addressed; Writing Quality/ Rationale/ Examples/ Outside References [rich in content; full of thought, insight, and analysis].
- 89–80 = B—All parts of the question are addressed; Writing Quality/ Rationale/ Examples/ Outside References [substantial information; thought, insight, and analysis has taken place].
- 79–70=C—Majority of parts of the question are addressed; Writing Quality/ Rationale/ Examples/ Outside References [generally competent; information is thin and commonplace].
- <70=F—Some parts of the question are addressed; Writing Quality/ Rationale/ Examples/ Outside References [rudimentary and superficial; no analysis or insight displayed].

Note that the following elements will be part of the assessment:

1. Each part of question is answered
2. Assumptions are clearly stated
3. Intermediate derivations and calculations are provided
4. Answer is technically correct and is clearly indicated
5. Answer precision and units are appropriate

Quantitative assignments are graded according to the following gfuidelines:

- 100–90 = A—All parts of question are addressed; All assumptions are clearly stated; All intermediate derivations and calculations are provided; Answer is technically correct and is clearly indicated; Answer precision and units are appropriate.
- 89–80 = B—All parts of question are addressed; All assumptions are clearly stated; Some intermediate derivations and calculations are provided; Answer is technically correct and is indicated; Answer precision and units are appropriate.
- 79–70=C—Most parts of question are addressed; Assumptions are partially stated; Few intermediate derivations and calculations are provided; Answer is not technically correct but is indicated; Answer precision and units are indicated but inappropriate.
- <70=F—Some parts of the question are addressed; Assumptions are not stated; Intermediate derivations and calculations are not provided; The answer is incorrect or missing; The answer precision and units are inappropriate or missing.

Note that the following elements will be part of the assessment:

1. Each part of question is answered
2. Assumptions are clearly stated
3. Intermediate derivations and calculations are provided
4. Answer is technically correct and is clearly indicated (25%)
5. Answer precision and units are appropriate

Exams (45% of Final Grade Calculation; 15% for each of three exams)

The first exam (covers modules 1 – 5) will be become available on the course Blackboard site (scroll down to Exams at the bottom of Course Modules) during the week of module 7 to those students who are current with their homework assignments and responses to discussion questions. The second exam (covers modules 6 – 10) will be become available on the course Blackboard site during the week of module 11 to those students who are current with their homework assignments and responses to discussion questions. The third exam will be become available on the course Blackboard site during the week of module 14 to those students who are current with their homework assignments and responses to discussion questions. Additional details (e.g., types of questions, timing, etc.) will be provided during the semester.

Exams are graded using the criteria given in the **Assignments** section, above.

Grading

All assigned work is due as described in the **Course Structure** section, above.

A grade of A indicates achievement of consistent excellence and distinction throughout the course—that is, conspicuous excellence in all aspects of assignments and discussion in every week.

A grade of B indicates work that meets all course requirements on a level appropriate for graduate academic work. These criteria apply to both undergraduates and graduate students taking the course.

EP uses a +/- grading system (see “Grading System”, *Graduate Programs* catalog, p. 10).

100-98 = A+
97-94 = A
93-90 = A−
89-87 = B+
86-83 = B
82-80 = B−
79-77 = C+
76-73 = C
72-70 = C−
69-67 = D+
66-63 = D
<63 = F

Please note that class size isn’t sufficient to compose a statistically meaningful universe. Accordingly, the above correspondence of letter grades to numerical grades will be used as a guideline, not an absolute authority.

Help & Support

You should refer to **Help & Support** on the left menu for a listing of all the student services and support available.

Academic Integrity

Academic Misconduct Policy

All students are required to read, know, and comply with the Johns Hopkins University Krieger School of Arts and Sciences (KSAS) / Whiting School of Engineering (WSE) Procedures for Handling Allegations of Misconduct by Full-Time and Part-Time Graduate Students.

This policy prohibits academic misconduct, including but not limited to the following: cheating or facilitating cheating; plagiarism; reuse of assignments; unauthorized collaboration; alteration of graded assignments; and unfair competition. You may request a paper copy of this policy at this by contacting jhep@jhu.edu.

Policy on Disability Services

Johns Hopkins University (JHU) is committed to creating a welcoming and inclusive environment for students, faculty, staff and visitors with disabilities. The University does not discriminate on the basis of race, color, sex, religion, sexual orientation, national or ethnic origin, age, disability or veteran status in any student program or activity, or with regard to admission or employment. JHU works to ensure that students, employees and visitors with disabilities have equal access to university programs, facilities, technology and websites.

Under Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990 and the ADA Amendments Act of 2008, a person is considered to have a disability if c (1) he or she has a physical or mental impairment that substantially limits one or more major life activities (such as hearing, seeing, speaking, breathing, performing manual tasks, walking, caring for oneself, learning, or concentrating); (2) has a record of having such an impairment; or (3) is regarded as having such an impairment class. The University provides reasonable and appropriate accommodations to students and employees with disabilities. In most cases, JHU will require documentation of the disability and the need for the specific requested accommodation.

The Disability Services program within the Office of Institutional Equity oversees the coordination of reasonable accommodations for students and employees with disabilities, and serves as the central point of contact for information on physical and programmatic access at the University. More information on this policy may be found at the Disabilities Services website or by contacting (410) 516-8075.

Disability Services

Johns Hopkins Engineering for Professionals is committed to providing reasonable and appropriate accommodations to students with disabilities.

Students requiring accommodations are encouraged to contact Disability Services at least four weeks before the start of the academic term or as soon as possible. Although requests can be made at any time, students should understand that there may be a delay of up to two weeks for implementation depending on the nature of the accommodations requested.

Requesting Accommodation

New students must submit a Disability Services Graduate Registration Form along with supporting documentation from a qualified diagnostician that:

- Identifies the type of disability
- Describes the current level of functioning in an academic setting

- Lists recommended accommodations

Questions about disability resources and requests for accommodation at Johns Hopkins Engineering for Professionals should be directed to:

EP Disability Services
Phone: 410-516-2306
Fax: 410-579-8049
E-mail: ep-disability-svcs@jhu.edu