Physiology for Engineers (BENG 313) – 3 Credit Hours, Fall 2016

Instructor
Dr. Wilsaan Joiner, PhD
E-mail: wjoiner2@gmu.edu
Office: 3910 Nguyen Engineering Building
Office Hours: Monday (3:00-4:30 PM) or by appointment
Office Phone Number: (703) 993-4297, Monday and Wednesday (10:30-12:00 PM)
Emergency Phone Number: Bioengineering Department, (703) 993-4190 (9 AM-5 PM)

Teaching Assistant:
Amana Khokhar (akhokha2@masonlive.gmu.edu)

Prerequisite:
BIOL 213 and MATH 113

Textbook Required
Medical Physiology (2011), second edition (Boron and Boulpaep)

Other sources (non-required):  
The Neurology of Eye Movements (Leigh and Zee)  
Quantitative Physiology for Engineers (Feher)  
Human Physiology (Silverthorn)  
Principles of Neural Science (Kandel, Schwartz and Jessell)  
Human Physiology (Widmaier, Raff and Strang)  
Foundations of Cellular Neurophysiology (Johnston and Wu)  
Hole’s Human Anatomy (Sheir, Butler, and Lewis)

Time and Location:
Monday, Wednesday 9-10:15 AM  
Planetary Hall, Room 122

Course Description:
This course is designed to provide an introduction to physiology, but from an engineering viewpoint. The first part of the course will focus on homeostasis, the biophysical properties of cells and cellular communication. After developing familiarity with these concepts, the remainder of the course concentrates on understanding organs, physiological systems (cardiovascular, musculoskeletal, respiratory, renal and nervous) and processes where engineering has a significant role.

Course Objectives:
After successful completion of this course the student will be able to (1) define homeostasis and physiological feedback, (2) describe the mechanics of ventilation and sodium reabsorption, (3) explain the physical basis of blood flow and regulation of overall circulatory function, (4) apply the Nernst Equation and electrical circuits to describe ion flow through cell membranes and (5) summarize the organization of sensory systems and the process of muscle contraction.

Homework and Grading Policies:
Homework assignments will be posted (on Blackboard via myMason) on Wednesdays and will be due the following Wednesday at the beginning of the class. Homework sent by e-mail will not be accepted. Late homework will be accepted with a 10% reduction in grade for each class
period they are late by. However, once a homework assignment is discussed in class or the solution is posted, submissions will no longer be accepted. There will be 6 homework assignments for the semester.

Total Grade:  
- 20% Homework  
- 5% Participation  
- 20% Exam I  
- 20% Exam II  
- 35% Cumulative Final Exam

Participation will be assessed with in class demonstrations and discussions. Exams will be closed book and notes and contain questions concerning assigned reading, lecture material, homework problems, and class discussions. No makeup homework, quiz or exam will be given without a valid excuse deemed justified by the instructor (see below).

**Extra Credit:**
Each exam will have a quantitatively challenging extra credit problem worth 5 points (2 problems for a total of 10 points on the final exam). In addition, throughout the semester questions may be raised in class beyond the scope of the presented material. Each student will have the opportunity to voluntarily research and present the answer to one of these questions at the next class (note: source for the answer must be provided). A successful presentation will result in 5 extra points towards the lowest exam grade (this does not include the final exam).

**Grading Scale:**

<table>
<thead>
<tr>
<th>Course Grade</th>
<th>Percent Value</th>
<th>Course Grade</th>
<th>Percent Value</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>100-94</td>
<td>C+</td>
<td>79.9-77</td>
</tr>
<tr>
<td>A-</td>
<td>93.9-90</td>
<td>C</td>
<td>76.9-74</td>
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<tr>
<td>B+</td>
<td>89.9-87</td>
<td>C-</td>
<td>73.9-70</td>
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<tr>
<td>B</td>
<td>86.9-84</td>
<td>D</td>
<td>69.9-60</td>
</tr>
<tr>
<td>B-</td>
<td>83.9-80</td>
<td>F</td>
<td>59.9-00</td>
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Note that values will not be rounded up.

**Attendance and Participation:**
Your attendance and engagement are crucial for meeting this course’s objectives. Without a valid excuse deemed justified by the instructor, you are expected to be on time and to attend all sessions. A valid excuse (with proper documentation) includes, but is not limited to: illness, death in the family, or personal crisis. Notification must be given before class begins. The classroom door will close at 9 AM.

**Academic Courtesy:**
You may address me as Dr. Joiner. There will be no food or music during class.

**Cell Phone and iPod Policy**
Turn off and put away cell phones and iPods upon entering the class.

**Academic Integrity Code**

**Dishonesty in Examinations and Homework**
Dishonesty or cheating in examinations is the use of inappropriate or unauthorized materials, information, or study aids in a test. Unless the instructor directs otherwise, an examination is assumed to be solely a student’s own work. No communication is allowed among students either through voice, written, electronic, or any other form of transmission, nor are students permitted to consult books, papers, study aids or notes without explicit permission. Dishonesty
in examination includes but is not confined to copying from another’s paper, giving or receiving unauthorized assistance, failing to hand in the exam at the end of the class period, using electronic devices and/or modified clothing/personal items to obtain unauthorized assistance, obtaining unauthorized advance knowledge of questions on an examination, and using mechanical or marking devices or procedures on scratch paper or machine-graded examinations. Dishonesty or cheating on homework includes but is not confined to plagiarism from another’s paper or from an outside source. Dishonesty or cheating on an examination or homework assignment will result in a grade of zero.

The complete policy of academic integrity for George Mason University can be found at the Office for Academic Integrity website: http://academicintegrity.gmu.edu/

**Students with Disabilities:**
If you qualify for accommodations because of a disability, please notify me with a letter from the Office of Disability Services so that I can make arrangements to address your needs.

**Advice for Success:**
1. Attend class every time. Consistent regular attendance is essential for success in this course; attendance is directly correlated to your final grade. Skipping class will lower your grade.
2. Read the syllabus. Be aware of the current assignments and exams.
3. If you are having trouble form a study group and find a tutor through the tutor referral service (http://caps.gmu.edu/learningservices/tutorreferral.php). Either or both will improve your grade.
4. In addition, if you are having trouble, please talk to me. I may have suggestions for your success. Many students seek help too late in the term.

<table>
<thead>
<tr>
<th>Date</th>
<th>Class Number</th>
<th>Reading</th>
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<tbody>
<tr>
<td><strong>Week 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08/29/16</td>
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<td>Course introduction</td>
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<tr>
<td>08/31/16</td>
<td>1</td>
<td>Cells: homeostasis, feedback</td>
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<tr>
<td><strong>Week 2</strong></td>
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<tr>
<td>09/05/16</td>
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<td>Labor Day-No Class</td>
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<tr>
<td>09/07/16</td>
<td>2</td>
<td>Cells: ions, transport, and osmotic equilibrium</td>
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<td><strong>Week 3</strong></td>
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<tr>
<td>09/12/16</td>
<td>3</td>
<td>Cells: ionic equilibrium and the membrane circuit</td>
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<tr>
<td>09/14/16</td>
<td>4</td>
<td>Cells: biological electrical signals</td>
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<td><strong>Week 4</strong></td>
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<td>09/19/16</td>
<td>5</td>
<td>Cells: inter-cellular communication</td>
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<td>09/21/16</td>
<td>6</td>
<td>Nervous system: organization, general principles</td>
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<td><strong>Week 5</strong></td>
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<tr>
<td>09/26/16</td>
<td>7</td>
<td>Nervous system: somatosensory</td>
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<td>09/28/16</td>
<td>8</td>
<td>Nervous system: vision</td>
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<tr>
<td><strong>Week 6</strong></td>
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<tr>
<td>10/03/16</td>
<td>9</td>
<td>Nervous system: auditory</td>
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<tr>
<td>10/05/16</td>
<td>10</td>
<td>Nervous system: vestibular</td>
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</tbody>
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The instructor reserves the right to make any changes in the course he determines academically advisable. Changes will be announced in class. It is your responsibility to keep up with any changed policies.
WAVES: Wellness, Alcohol and Violence Education and Services
WAVES promotes wellness within the Mason community through health education, alcohol/drug assessment and education, and violence awareness, prevention and sexual assault response. We help students make healthy, safe choices and encourage lifelong, thoughtful healthy decision-making through individualized support, creative programming, and evidence-based education and outreach.

WAVES office 703-993-9999
SUB I, Suite 3200
24-Hour Sexual and Intimate Partner Violence Crisis Line 703-380-1434
waves.gmu.edu

- 703-360-7273 (Fairfax County Office for Women and Domestic and Sexual Violence Services 25 hotline)
- 703- 228-4848 (Arlington County Domestic Violence Services Hotline)
- 703-368-4141 (Prince William County Sexual Assault Victims Advocacy Services (SAVAS) hotline)
- 1-800-838-8238 (Virginia Family Violence and Sexual Assault Hotline)
- 1-800-656-HOPE (Rape, Abuse and Incest National Network) https://ohl.rainn.org/online/

CAPS: Counseling and Psychological Services
Counseling and Psychological Services (CAPS) provides a wide range of free confidential services to students, faculty, and staff. Services are provided by a staff of professional clinical psychologists, social workers, counselors, learning specialists, and psychiatric providers. CAPS individual and group counseling, workshops, and outreach programs are designed to enhance students’ personal experience and academic performance. Visit us at caps.gmu.edu for additional resources.

- For consultation or emergency assistance during office hours call 703-993-2380.
- For assistance during non-office hours, call University Police at 703-993-4357.
- 703-527-4077 (CrisisLink)
- 1-800-273-8255 (National Suicide Prevention Lifeline)
- 1-877-838-2838 (Veterans' Crisis Hotline)

Student Health Services (SHS) — Provides confidential health care to enrolled students in emergency and non-emergency circumstances on the Fairfax, Arlington and Prince William campuses. If there is a medical emergency and Student Health Services (SHS) is closed, please contact the free after-hours nurse ((703) 993-2831), a hospital emergency room, an urgent care facility, or call 911.

SUB 1, Suite 2300
703-993-2831

University Police:
Emergency: 911 Non-Emergency: (703) 993-2810
Reporting a Crime (Crime Solvers Anonymous Tip Hot-Line): (703) 993-4111
Mason Police Website: http://police.gmu.edu/
Eric Heath, Chief of Police Phone: (703) 993-3840 E-mail: eheath2@gmu.edu