ISC3523: Integrative Biomedical Science, Spring 2018

Section 052A

Course Description

An introduction to biomedical science as the application of the natural sciences to medicine. Course content focuses on integration of biological and biochemical sciences, chemical and physical sciences, and social and behavioral sciences in the context of health. Course activities promote skills in problem-solving, critical analysis, and quantitative reasoning. 3 credits.

Class Meeting Times and Location

Mondays, period 6 (12:50-1:40 pm), and Wednesdays, periods 6-7 (12:50-2:45 pm). Class will meet in 222 Carr Hall except as indicated in the calendar.

Prereqs

BSC 2011 & (CHM 2211 or CHM 2213 or CHM 3217) & (PHY 2048 or PHY 2053 or PHY 2060) & (MAC 2311 or STA 2023) & (PSY 2012 or SYG 2000)

Coreqs2:45

(BCH 4024 or CHM 3218) & (PHY 2049 or PHY 2054 or PHY 2061)

Instructor

David Julian, Ph.D., Dept. of Biology
Pronouns: He/him

Faculty Mentors

- Kyle D. Allen, PhD, Associate Professor, Department of Biomedical Engineering
- Sara N. Burke, PhD, Assistant Professor, Department of Neuroscience
- Martin J. Cohn, PhD, Professor, Departments of Molecular Genetics & Microbiology, and Biology
- Sylvain Doré, PhD, Professor, Departments of Anesthesiology, Neurology, Psychiatry, Psychology, Pharmaceutics, and Neuroscience
- Hideko Kasahara, MD, PhD, Professor, Department of Physiology & Functional Genomics
- Habibeh Khoshbouei, PhD, Associate Professor, Departments of Neuroscience and Psychiatry
- Malcolm Maden, PhD, Professor, Department of Biology
- Jeffrey R. Martens, PhD, Professor and Chair, Department of Pharmacology & Therapeutics
- Edgardo Rodríguez, PhD, Assistant Professor, Department of Pharmacology & Therapeutics
- David Winchester, MD, Assistant Professor, Departments of Medicine and Radiology
- James Wynn, MD, Associate Professor, Departments of Neonatology, Experimental Medicine, and Pathology, Immunology & Laboratory Medicine

Student Hour

Mondays, Period 7 (1:55-2:45 pm) in 123 Bartram Hall

Course Rationale

This course is designed for junior and senior students who are pre-professional (e.g., pre-med, pre-dent, pre-vet, pre-pharm) or who intend to pursue graduate study in biomedically-related disciplines.

Modern biomedical science relies on researchers and clinicians being able to bridge the traditional disciplinary boundaries between the life sciences, the physical sciences, and the social and behavioral sciences. This course will help you build on and integrate the knowledge and skills you've already learned in your courses in general biology, general and organic chemistry, biochemistry, general physics, psychology, sociology, statistics and mathematics, in the critical analysis of hypotheses, objectives, methods, results and interpretations of current research on health and disease.

Course Objectives

1. Apply the process of scientific inquiry, and explain how scientific knowledge is discovered and validated.
2. Apply quantitative reasoning and appropriate mathematics to describe or explain biomedical phenomena.
3. Apply basic principles and applications of biology, chemistry, physics, and psychology to explain representative processes in living systems during health and disease.
4. Use critical analysis and reasoning skills in the assessment of current scientific research.

Course Textbook

There is no required textbook for this course. Weekly reading materials, typically from the primary medical literature, will be accessible online. Students may use any reliable reference for reviewing the foundational biology, chemistry, physics, and social and behavioral sciences content.

Materials and Supplies Fees

There are no additional fees for this course.

Course Structure

Content Overview

The course will generally emulate the "journal club" format that is an essential part of modern biomedical research. In almost all biomedical research groups (and in many other areas of scientific research), individuals meet regularly to discuss recent research papers or studies in a specific field. By attending a journal club in their own field, participants work together to critically evaluate published research from other research teams in their field, which also helps them stay current in their field. By attending journal clubs in different fields than their own, participants can broaden their knowledge and in many cases can contribute and gain key insights that result from their unique perspective.

The course will focus on a critical reading and analysis of 11 recently-published biomedical research papers. For each paper, a team of two students will be the lead presenters and discussion leaders for that paper. The discussion team will work with a faculty mentor to prepare the discussion and activities associated with the paper discussion. Each faculty mentor is an expert in the subject area of the paper. In most cases, the faculty mentor is the paper's first and/or senior author.

Discussion Papers

1. Winchester DE, Brandt J, Schmidt C, Allen B, Payton T, and Amsterdam EA. Diagnostic Yield of Routine Noninvasive Cardiovascular Testing in Low-Risk Acute Chest Pain Patients. *American Journal of Cardiology* 2015 Jul 15; 116(2):204-7. doi: 10.1016/j.amjcard.2015.03.058. Epub 2015 Apr 16. [Faculty mentor: **David Winchester**, MD]
2. Williams CL, Uytingco CR, Green WW, McIntyre JC, Ukhanov K, Zimmerman AD, Shively DT, Zhang L, Nishimura DY, Sheffield VC, and Martens JR. Gene Therapeutic Reversal of Peripheral Olfactory Impairment in Bardet-Biedl Syndrome. *Molecular Therapy* 2017 Apr 5; 25(4):904-916. doi: 10.1016/j.ymthe.2017.02.006. Epub 2017 Feb 22. [Faculty mentor: **Jeffrey Martens**, PhD]
3. Hernandez AR,… and Burke SN. The Antiepileptic Ketogenic Diet Alters Hippocampal Transporter Levels and Reduces Adiposity in Aged Rats. *The Journals of Gerontology: Series A*, 2017, glx193, https://doi.org/10.1093/gerona/glx193. [Faculty mentor: **Sara Burke**, PhD]
4. Yarmola EG, Shah Y, Arnold D, Dobson J, and Allen KD. Magnetic Capture of a Molecular Biomarker from Synovial Fluid in a Rat Model of Knee Osteoarthritis. *Annals of Biomedical Engineering*, 2016 April; 44(4): 1159–1169, DOI: 10.1007/s10439-015-1371-y. [Faculty mentor: **Kyle Allen**, PhD]
5. Leclerc JL,… and Doré S. Increased brain hemopexin levels improve outcomes after intracerebral hemorrhage. *Journal of Cerebral Blood Flow and Metabolism* 2016; doi: 10.1177/0271678X16679170. PMID: 27864463. [Faculty mentor: **Sylvain Doré** PhD]
6. Mendell JR, et al. Single-Dose Gene-Replacement Therapy for Spinal Muscular Atrophy. *New England Journal of Medicine* 2017; 377:1713-1722. DOI: 10.1056/NEJMoa1706198 [Faculty mentor: Edgardo **Rodríguez**, PhD]
7. Wynn JL *et al*. Neonatal CD71^{+} erythroid cells do not modify murine sepsis mortality. *Journal of Immunology* 2015 Aug 1; 195(3): 1064–1070, doi:10.4049/jimmunol.1500771 [Faculty mentor: **James Wynn**, MD]
8. Zheng Z and Cohn MJ (2011). Developmental basis of sexually dimorphic digit ratios. *Proceedings of the National Academies of Science* 2011; 108(39): 16289–16294, doi: 10.1073/pnas.1108312108 [Faculty mentor: **Martin Cohn**, PhD]
9. Sambo Danielle O,… and Khoshbouei H. The Sigma-1 receptor modulates the methamphetamine dysregulation of dopamine neurotransmission. *Nature Communications* 2017; 8: 2228 doi:10.1038/s41467-017-02087-x [Faculty mentor: **Habibeh Khoshbouei**, PhD]
10. Farkas JE, Freitas PD, Bryant DM, Whited JL, and Monaghan JR. Neuregulin-1 signaling is essential for nerve-dependent axolotl limb regeneration. *Development* 2016 Aug 1; 143(15):2724-31. doi: 10.1242/dev.133363. Epub 2016 Jun 17. PMID: 27317805. [Faculty mentor: **Malcolm Maden**, PhD]
11. Massengill MT, … and Kasahara H (2016). Acute heart failure with cardiomyocyte atrophy induced in adult mice by ablation of cardiac myosin light chain kinase. *Cardiovascular Research* 2016; 111, 34–43, doi:10.1093/cvr/cvw069. [Faculty mentor: **Hideko Kasahara**, MD, PhD]

Journal Club Discussion

Each journal club discussion of a paper will have seven components:

1. **First Mentor Meeting**. The first meeting with the faculty mentor is an opportunity for the discussion team to go over the paper to make sure the team understands the background, significance, experimental design, and basic results of the paper. This meeting will typically be during 6th period (12:50-1:40 pm) on a Monday, at least three weeks prior to the preview presentation (but note the

exceptions on the paper signup sheet and course schedule). The members of the discussion team should have gone over the paper on their own and as a team prior to the first faculty mentor meeting. Failure to confirm and show up prepared for this appointment will result in the student forfeiting all points for that discussion assignment.

2. **Second Mentor Meeting**. The second meeting with the faculty mentor is an opportunity for the discussion team to show the mentor their presentations and pre- and post-tests, and to go over any remaining details from the paper and research questions that resulted from the conclusions of the paper. This meeting will typically be on a Monday during 6th period, two weeks prior to the preview presentation (but note the exceptions on the paper signup sheet and course schedule). Failure to confirm and show up prepared for this appointment will result in the student forfeiting all points for that discussion assignment.

3. **Preview Presentation**. One week prior to the main discussion day for the paper, the discussion team will give a 20-minute "preview" of the discussion paper. This will help ensure that the rest of the class has the appropriate foundational knowledge to understand the methods and techniques described in the discussion paper. This presentation should include a review of key linkages between the research and *at least* three concepts from the science and mathematics courses that are prerequisites for this course. The discussion team will also create a one-page handout summarizing the key linkages (typically including diagrams), to be provided to the class at the start of the preview presentation. The specific linkages in the handout must not have been reviewed in any preceding preview presentations in the same semester. Team member 1 will give the preview presentation and be primarily responsible for creating the handout, but both team members are ultimately responsible for the content.

4. **Pre-Test**. On the main discussion day for the paper, and immediately prior to beginning the literature review and main discussion presentations, the class will take a 10-minute discussion pre-test. This will help evaluate whether the students in the class have achieved the appropriate level of preparation to participate in the discussion. The discussion pre-test will consist of multiple-choice or quantitative questions, and all questions must be at Bloom's Taxonomy level 1-2 (e.g., knowledge, comprehension). The discussion pre-test must use the pre-test template and be submitted electronically to the instructor at least one week prior to the main discussion day. Team member 1 will be primarily responsible for creating the pre-test and submitting it to the instructor, but both team members must approve the submitted version, and both team members are ultimately responsible for the content.

5. **Results Presentation**. Following the literature review presentation, the discussion team will give a 30 minute presentation summarizing the experimental design, methods, results, and conclusions of the discussion paper. Team member 2 will give the results presentation.

6. **Discussion**. All members of the class will participate in a discussion of the paper by asking questions, answering questions, and/or providing opinions. Team member 2 will be primarily responsible for guiding the discussion.

7. **Post-Test**. At the beginning of class one week after the main paper discussion, the class will take a 15-minute discussion post-test. This will consist of multiple-choice or quantitative questions, and all questions must be at Bloom's Taxonomy level 3-6 (e.g., application, analysis, synthesis, evaluation). The post-test must use the post-test template and be submitted electronically to the instructor no later than noon on the Wednesday following the main discussion day. Team member 1 will be primarily responsible for creating the post-test and submitting it to the instructor, but both team members must approve the submitted version, and both team members are ultimately responsible for the content.

Calendar

	Monday (period 6, 12:50-1:40 pm)		Wednesday (periods 6-7, 12:50-2:45 pm)		Saturday (9am-5pm)	
Wk	**Date**	**Activity**	**Date**	**Activity**	**Date**	**Activity**
1	Jan 08	Introduction and discussion paper assignments	Jan 10	Introduction to Reading Scientific Research Papers		
2	Jan 15	Holiday	Jan 17	Bloom's Taxonomy and Metacognition	Jan 20	"MCAT" Test 1 in CSE E235
3	Jan 22	Grp 1[1], 2[2], 4 first mentor mtg	Jan 24	Interpreting Scientific Research Papers and Leading Journal Club Discussions		
4	Jan 29	Grp 1, 2[2] second mentor mtg, Grp 3 first mentor mtg	Jan 31	Paper 1 Preview		
5	Feb 05	Grp 3, 4 second mentor mtg, Grp 5 first mentor mtg	Feb 07	Paper 1 Pre-Test, Paper 1 Discussion, Paper 2 Preview		
6	Feb 12	Grp 6 first mentor mtg	Feb 14	Paper 1 Post-test, Paper 2 Pre-Test, Paper 2 Discussion, Paper 3 Preview		
7	Feb 19	Grp 5 second mentor mtg	Feb 21	Paper 2 Post-test, Paper 3 Pre-Test, Paper 3 Discussion, Paper 4 Preview		
8	Feb 26	Grp 6 second mentor mtg, Grp 7, 9 first mentor mtg	Feb 28	Paper 3 Post-test, Paper 4 Pre-Test, Paper 4 Discussion, Paper 5 Preview		
	Mar 05	Spring Break	Mar 07	Spring Break		
9	Mar 12	Grp 7 second mentor mtg, Grp 8 first mentor mtg	Mar 14	Paper 4 Post-test, Paper 5 Pre-Test, Paper 5 Discussion, Paper 6 Preview		
10	Mar 19	Grp 8 second mentor mtg, Grp 11 first mentor mtg	Mar 21	Paper 5 post-test, Paper 6 Pre-Test, Paper 6 Discussion, Paper 7 Preview		
11	Mar 26	Grp 9 second mentor mtg, Grp 10[3] first mentor mtg	Mar 28	Paper 6 Post-test, Paper 7 Pre-Test, Paper 7 Discussion, Paper 8 Preview		
12	Apr 02	Grp 10[3] second mentor mtg	Apr 04	Paper 7 Post-test, Paper 8 Pre-Test, Paper 8 Discussion, Paper 9 Preview		
13	Apr 09	Grp 11 second mentor mtg	Apr 11	Paper 8 Post-test, Paper 9 Pre-Test, Paper 9 Discussion, Paper 10 Preview		
14	Apr 16	No class meeting	Apr 18	Paper 9 Post-test, Paper 10 Pre-Test, Paper 10 Discussion, Paper 11 Preview	April 21	"MCAT" Test 2 in CSE E235
15	Apr 23	No class meeting	Apr 25	Paper 10 Post-test, Paper 11 Pre-Test, Paper 11 Discussion,		
May 03, 9:00 AM: Paper 11 Post-Test. No other final exam.						

1. Grp 1 first me1ntor meeting is on Tuesday, January 23, at 3 PM.
2. Grp 2 first *and* second mentor meetings must be arranged via email with Dr. Martens (martensj@ufl.edu) and CC to Ms. Esparolini (eesparol@ufl.edu) by January 10.
3. Grp 10 first *and* second mentor meetings are during period 7.

Point Distribution

Assessment Type	Quantity	Points	Subtotal	Pct of Total
"MCAT" Test 1	1	15	15	3.75%
Pre-Tests	10	10	100	25.00%
Post-Tests	10	10	100	25.00%
Discussion participation	10	5	50	12.50%
Pre-Test Development	1	20	20	5.00%
Post-Test Development	1	20	20	5.00%
Presentation, Individual Score	1	50	50	12.50%
Presentation, Group Score	1	30	30	7.50%
"MCAT" Test 2	1	15	15	3.75%
Total			400	100%

Class Policies

Grade Distribution

Point Range (%)	Letter Grade	Point Range (%)	Letter Grade
93.33 or higher	A	73.33-76.65	C
90-93.32	A-	70-73.32	C-
86.66-89.99	B+	66.66-69.99	D+
83.33-86.65	B	63.33-66.65	D
80-83.32	B-	60-63.32	D-
76.66-79.99	C+	< 60	E

Grades will not be assigned by a curve, but the grade cutoffs may be adjusted downward. In other words, if your final point accumulation is 93.33%, then you are guaranteed to receive an A. This means there is no upper limit to the number of "A" grades that can be given out. More information on grades and grading policies is here: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Extra Credit

There will be no opportunities for extra credit.

Time Commitment

The UF College of Liberal Arts and Sciences assumes that you will devote 3-4 hours per week per credit-hour to each course during the regular fall and spring semesters. Because this course is 3 credits, you should therefore expect to devote 9-12 hours per week to this course, of which only 2-3 hours per week will be spent in class. Therefore, you are responsible for budgeting about 2/3 of the time you will spend on this course. If you find yourself spending more than 12 hours per week on average, discuss this with your course instructor to see if you can refine your work and study habits. If you find yourself spending less than 9 hours per week *on average*, you should recognize that you may have difficulty fully learning

and comprehending the material in this time, which will probably be reflected in poor performance on the various assessments and presentations, causing you to receive a lower overall course grade.

Communication

Use the Mail tool in Canvas to contact the instructor outside of class. If you use any other email tool, it may be filtered as spam or otherwise not be seen by your instructor.

Updates and changes to the course schedule, this syllabus, and any other aspects of the class content and structure will be communicated to you via announcements on the course e-Learning site. You are responsible for checking this site regularly for announcements.

Class Attendance, Make-Up, and Late Work

Class attendance is expected and students are expected to arrive on time. Excused absences are consistent with university policies in the undergraduate catalog and require appropriate documentation. Each *unexcused* absence will result in a 10% reduction of the total possible points in the final grade. Each late arrival will result in a 5% reduction of the total possible points in the final grade.

If you must miss class, or miss an assignment or exam due to an allowable, scheduled absence (for example, to participate in a sanctioned university function), you must notify the instructor during the first week of classes or immediately after the event is scheduled. If you miss a class, an assignment or exam due to an allowable but *unscheduled* and *unpredictable* absence (e.g., illness), you must contact the instructor as soon as possible. In the case of illness, you must provide a signed note from your primary care provider indicating that you were *unable to attend class or complete the assignment* on the day(s) in question. Makeup assignments and exams will be provided for students who miss an assignment or exam as the direct result of an allowable but unscheduled and unpredictable absence, as defined above. The composition and structure of the makeup assignment or exam will be at the discretion of the instructor.

Late work will not be accepted unless it is the direct result of an allowable but unscheduled and unpredictable absence, as defined above, at the discretion of the instructor.

Using Electronic Devices in Class

As a courtesy to your classmates, you are prohibited from making video or audio recordings of class discussions or presentations made by fellow students.

You may bring a laptop or tablet computer to class to take notes or access electronic course material, and there is no course policy against using such devices in class for other purposes. However, if the instructor perceives your activities to be a distraction to any other members of the class, you will be warned that you are being disruptive. Multiple disruptions will be considered grounds for the assignment of a failing grade.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations. These are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. The evaluation forms and summaries of prior evaluations are available to students at https://evaluations.ufl.edu/.

Class Demeanor

Students are expected to arrive to behave in class in a manner that is respectful to the instructor and to fellow students. Opinions held by other students should be respected in discussions. Students who behavior in a manner that is disrespectful or otherwise disruptive will be asked to leave the class. Multiple occurrences will result in the assignment of failing grade.

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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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.

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, 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.

Counseling and Wellness Center

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