

BISC 466, Neuroimmunology
Units: 4 units
Spring 2024

Lecture: Wednesday from 11pm to 1:50 pm

Location: TBD

Instructor: Raffaella Ghittoni, PhD
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Course Description

This course will explore the complex interactions between the nervous and immune system. We will first define neuroimmunology in terms of functions and structures to help us understand the bases of such complex interactions. We will then focus on disorders that encompass both neuroscience and immunology. Select topics include autoimmunity, cancer, neurodevelopment as well as neuroimmunological treatments.

Learning Objectives

By the end of the course, students will be able to:

- 1) Illustrate basic knowledge on the components of the human nervous and immune system and describe cells, tissues and organs of both human immune and nervous system
- 2) Comprehend the mechanisms of action of the innate and adaptive immune response and their interaction with the nervous system.
- 3) Understand how the immune system and nervous system function together during development and disease.
- 4) Evaluate primary scientific literature by asynchronous readings and in class discussion of the assigned reading material.
- 5) Develop skills for communicating ideas, both orally and in writing.

Course Material

Class lectures meet 1 day a week for 3 hours. During those 3 hours we will have 60 minutes of lecture, followed by 110 minutes of in class discussion of both review articles and primary research articles. Article readings are posted on the syllabus and will also be made available on blackboard. Outside of class students will devote 9 hours per week to the course. These 9 hours per work include 5 hours of reading the 2 articles, 2 hours of studying for the exams, and 2 hours of working on their final group presentation. Additionally, starting week 12, students are responsible for reviewing other group presentations, as well

as the associated research article, prior to the date of such presentation. Each student will be responsible for preparing and asking at least 2 well thought out written questions of each presentation. These questions will be part of the active participation grade.

Prerequisite(s): BISC 120 or BISC 121 and BISC 220 or BISC221

Recommended Preparation: BISC 421 Neurobiology, BISC 450 Principles of Immunology

Student Group Presentations

During the semester students will have to organize in groups of two and select a research paper related to the topics discussed in class. Each group will be evaluated for critically presenting the paper in the discussion session and for participating as discussant during other group presentations. A cohesive PowerPoint presentation is expected. The total presentation should be about 30 minutes with 10 minutes for discussion and questions at the end. It will be important for student presenters to be able to answer questions from the instructor and other students. The students group presentations must be uploaded to the class google drive by Week 12, prior to class. This will allow students to review the presentations ahead of time and prepare any relevant questions for discussion after the presentations are delivered to the student audience. Any relevant references are required to be in the presentation. Please see the guidelines for the students' presentations below. Please see the rubric for both the group grade and the individual grade.

Active Participation

In class participation (75pts) will be assessed by students developing and asking questions based on that article readings. This also includes preparing and asking questions about other students' group presentations. Therefore each student must read the articles as well go over the student group presentations before coming to class.

Grading:

Assignment	Points	% of grade
Midterm 1	100	20
Midterm 2	100	20
Final exam	100	20
Group presentations	125	25
Active participation	75	15
TOTAL	500	100

Description and Assessment of Assignments

Exams. There will be 2 midterm exams during the semester and 1 final exam. Exams are 60 min long and consist of multiple choice, short answer, matching or fill-in-the-blank questions. Exams are NOT open book nor open notes. A student is not allowed to start an exam after the first student has left ANY exam room.

Tests and final exams are marked on a numerical basis and then converted to letter grades. All scores are posted in your GRADEBOOK unless noted. If you notice a mistake or missing score(s) in the gradebook, it is the student's responsibility to notify the course instructor as soon as possible.

Course Policies:

1) Exam dates are firm. There are no makeup exams in the course. Performance on the final may be prorated to substitute for a missing midterm exam, if an excuse considered valid by faculty is presented in a timely fashion. This means that the instructors may, at their discretion, permit the use of the student's performance on other exams in determining the missed exam grade. If your excuse is judged not to be valid, or you do not provide it within the allotted time, you will receive a score of zero for the missed exam. An acceptable written excuse or documentation must be provided to the faculty. The final exam will be administered only on the date and time set by the University.

2) Midterm exams will be returned to students by the professor during lectures. The final examination will not be returned but will be retained for one semester by the faculty.

3) Regrades: If you think an answer you have provided was graded incorrectly or if there is an arithmetic error, you may seek a regrade. You must provide a written explanation of why you think your answer was graded incorrectly. Regrade requests are to be submitted to your instructor. If a regrade is agreed upon, then the ENTIRE EXAMINATION may be subject to a regrade. Your grade may therefore go up, go down, or remain the same. Regrade requests must be received within one week of when the exam key is posted for midterms, or by the second week of classes the following semester for the final exam.

4) No special assignments for extra credit are permitted.

5) Academic integrity policies of the University will be strictly followed. Infractions can result in severe penalties. There may be assigned seating for exams. No student may be admitted to an exam after the first student has left the exam.

7) It may be necessary to make adjustments to the syllabus during the semester. Check the course website or class announcements on Blackboard for updates. Exam dates will not be changed.

8) Any questions or concerns regarding these policies should be addressed to the instructors.

Course Schedule:

Week	Topics Covered	Instructor	Articles prior to class
1	Course Introduction- Overview of the human Immune system. Cells and organs of the immune system.	Ghittoni/ Spence	Chapters 1 and 2 of the Abbas Cellular and molecular Immunology 11th edition https://www-clinicalkey-com.libproxy1.usc.edu/#!/content/book/3-s2.0-B97803237574850000162 https://www-clinicalkey-com.libproxy1.usc.edu/#!/content/book/3-s2.0-B9780323757485000028
2	Overview of the human Immune system – Innate and Adaptive response	Ghittoni	https://www.nature.com/articles/s41577-021-00652-6 https://www.cell.com/immunity/fulltext/S1074-7613(17)30235-2
3	INTRODUCTION OF IMMUNOLOGICAL NERVOUS SYSTEM	Spence	https://www-clinicalkey-com.libproxy1.usc.edu/#!/content/book/3-s2.0-B9780323396325000013
4	TBI	Spence	https://www.ncbi.nlm.nih.gov/books/NBK526047/ https://doi.org/10.1083/jcb.202103052
5	The immunological synapse -Glial Cells - Blood brain Barrier	Ghittoni	https://www.cell.com/immunity/fulltext/S1074-7613(22)00183-2 https://www.nature.com/articles/s41577-019-0247-z
6	MIDTERM I		
7	Multiple Sclerosis	Spence	https://www.nature.com/articles/s41577-022-00718-z https://www.nature.com/articles/s41577-021-00543-w Select Topic for Group Presentation
8	The inflammatory -mediated diseases Alzheimer Disease	Ghittoni	https://www-clinicalkey-com.libproxy1.usc.edu/#!/content/book/3-s2.0-B9780323353175000235?scrollTo=%23hl0001711 https://www-clinicalkey-com.libproxy1.usc.edu/#!/content/book/3-s2.0-B9780323353175000235?scrollTo=%23hl0001743

			https://www.science.org/doi/epdf/10.1126/science.aag2590
9	Parkinson Disease	Spence	https://www.nature.com/articles/s41577-022-00684-6 doi:10.1001/jama.2019.22360
10	MIDTERM II		
11	Microbiome, immune and nervous system	Ghittoni	https://www.cell.com/immunity/fulltext/S1074-7613(17)30227-3
12	Immunobased Treatment	Ghittoni	https://www.frontiersin.org/articles/10.3389/fneur.2021.654739/full Upload Student Group Presentations to Google Drive
13	Inflammation and Neural Repair	Spence	https://www.nature.com/articles/s41577-020-0387-1 https://doi.org/10.1111/j.1471-4159.2009.05886.x
14	Students Presentations	Ghittoni Spence	Review presentations and make questions
15	Students Presentations	Ghittoni Spence	Review presentations and make questions
	Final Examination, see Schedule of Classes		

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323) 442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

BISC 466- Neuroimmunology Students Presentation Guidelines

1 Pairs select a topic related to the course. Discuss with the instructor to have the topic approved Each student must present a different topic.

Communicate the selected topic by Week 7

Upload by week 12, prior to lecture, to the class google drive

2 Prepare a min **30 minutes + 10 min discussion** Powerpoint presentation. PLEASE NOTE: This activity is intended as a mini Lecture and NOT as a Journal Club.

3 Discuss the material with the instructor prior the day of the topic submission. Example of topics: An in-depth description of a cell type or tissue of the immune and nervous system, the role of Inflammation in affecting the nervous system, an epidemiological study on neuroimmunological pathologies, an autoimmune disease, a new therapy, a new diagnostic tool....., and if you are currently in a lab that works on a related project) etc etc.

4 Please AVOID similar or recurrent topics in the class. Please have a backup topic in case your proposed topic is too similar to another groups idea.

Content of the presentation

5 Introduction. General description of the topic. Define and describe the general aspect of the topic. Why is this topic relevant for the course?

6 Learning objectives

7 In case of presentation of a particular type of disease or pathology in general describe specific symptoms and signs (you can

describe it in general or present specific clinical case. Compare with the normal function of organ and tissue

8 Characteristic of the disease:

- a. frequency, (autosomal or sex linked, gender biased, age biased, endemic to certain population or geographical areas, related to lifestyle, habits or consumption of certain substances, etc....)
- b. morbidity and mortality (risk factor? How does it affect the patient? Is it mortal? Life expectancy? Modifiable and non-modifiable factor)
- c. Current used treatments (drugs, procedures like surgeries or other) Explain how those treatments work to cure the conditions (mechanisms) or ameliorate symptoms.
- d. Potential new treatments

9 If the topic includes a technique or a methodology, describe in depth how the techniques applied. The novelty aspects, the advancement compared to previous ones. Advantages and disadvantages.

10 Connection with topics presented in class are welcome

11 Conclusion/comments

12 Prepare 5 multiple choice questions based on the presented material to test your classmates understanding (do not share the key or keep it in a separate slides)

13 Select content information images, tables, animations and video or other visual material to support your topic description. Visual material can be original (you draw your own images and tables) or selected from textbook or review paper (papers cannot be older than 5 years). All material should be from reliable scientific sources. Video Material cannot take all the time of the presentation. In case of longer material please provide it in advance.

14 Provide references at the end of the presentation.

15 For each slide type summary notes in the note section

16 You will be evaluated for your lecture content and presentation style and for the ability to communicate, transfer knowledge of scientific material and engage, moderate and conduct a scientific discussion.

Group oral presentation counts 25% of the total course grade

Presentation Rubric - Group Grade - 75 points

	Excellent 25 pts	Good 20 pts	Fair 15 pts	Poor 10 pts	Incomplete 0 pts
Organization	<p>Excellent Presentation was very organized and was very easy to follow. Transitions between group members and content were well planned and executed cleanly.</p>	<p>Good Presentation was fairly organized and pretty followable. Transitions and content might have been slightly discontinuous but did not take away greatly from the overall presentation.</p>	<p>Fair Presentation was not clearly organized. Transitions between members were jumpy or awkward. Content seemed not cohesive.</p>	<p>Poor Presentation lacked organization. Poor transitions between group members individual parts. Presentation lacked order and very difficult to follow.</p>	<p>Incomplete N/A</p>
Content	<p>Excellent Group members had a stronghold on the content and content was thoroughly addressed. No mistakes were made with regard to content knowledge. References were properly cited.</p>	<p>Good Most of the group members have a solid understanding of the content. Content missing minor elements or contained minor errors. References not entirely correct.</p>	<p>Fair Group members had only a superficial understanding of content. Several mistakes were made concerning material. Improper references.</p>	<p>Poor Group members had little to no understanding of the content addressed in the presentation. No references</p>	<p>Incomplete N/A</p>

Visual	Excellent Visuals and design were gorgeous and meticulously created. Very effective.	Good Visuals and design used were somewhat effective, but weren't used consistently throughout the presentation.	Fair Visuals and design used did not support the content and organization. Random in consistency.	Poor No effort made into visual or design at all.	Incomplete N/A
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Presentation Rubric - Individual Grade - 50 points

	Excellent 25 pts	Good 20 pts	Fair 15 pts	Poor 10 pts	Incomplete 0 pts
Teamwork	Excellent The group worked very well with each other and the presentation work was shared equally among the group members. The transitions seemed well practiced.	Good The group worked well with each other and communicated well. Some members participated slightly more than others.	Fair Group communicated relatively well with a few lapses in the presentation; some students dominated the presentation and others did not participate much.	Poor Group did not work well together. There were obvious miscommunication and lapses in the presentation.	Incomplete N/A
Speaker	Excellent Speaker clearly has practiced their presentation. There are clear and concise objectives with their words. The speaker rarely used their notes.	Good Speaker has practiced their presentation but still relies somewhat on notes. Some minor mistakes. The speaker occasionally looked at notes.	Fair Speaker has put some effort into their words. Speaker relies on notes for some slides and transitions. Some mistakes are made.	Poor It appears to be very little practice. Heavy reliance on notes. Mistakes are common throughout the presentation.	Incomplete N/A