

**BIO 6180/7180  
MEMBRANE BIOLOGY  
WINTER 2019**

Time:	Tuesday and Thursday 2:30 – 3:45 p.m.
Place:	403 State
Instructor:	Dr. Miriam L. Greenberg 4105 Biological Sciences Bldg. <a href="mailto:mgreenberg@wayne.edu">mgreenberg@wayne.edu</a> 577-5202
Office hours:	By appointment
Reading:	Papers from the literature <u><a href="http://www.grantcentral.com/">The Grant Application Writer's Workbook NIH new format</a></u> , authors Russell and Morrison <a href="http://www.grantcentral.com/">http://www.grantcentral.com/</a>

This course focuses on the basic concepts of membrane biology and on major unanswered questions in membrane research. The course is based primarily on reading current literature. Background reading for each topic will be taken from review articles in the literature, and original research papers will be discussed to highlight exciting current areas of research in the field. Classes will be devoted to analyzing the assigned readings, 1-2 papers per class. Students are expected to read all of the assigned papers and be prepared to discuss them in class. Individual students will be asked to discuss the experiments from each paper. Therefore, attendance is mandatory. Grades will be determined by class discussions and presentations (which count for half the grade) and by a writing assignment (half the grade). Graduate students (Bio 7180) will be expected to prepare a grant proposal in the style of an NIH grant application. Undergraduates (Bio 6180) will have a modified writing assignment, which will place greater emphasis on reviewing the literature and somewhat less emphasis on rigorous description of proposed experiments.

The level of this class is appropriate for graduate students and for undergraduate biology majors who have taken the following courses: Bio 2200 (Microbiology), 2600 (Cell Biology), 3070 (Genetics), 3100 (Biochemistry), and 4110 (Biotechnology and Molecular Biology).

**ANTICIPATED LEARNING OUTCOMES:**

- Outcome 1. Students will be familiar with the basic concepts of membrane biology and will be aware of the major unanswered questions in membrane research.
- Outcome 2. Students will be able to critically read and understand papers in the scientific literature pertinent to membrane biology.
- Outcome 3. Students will be able to design experiments that address important unanswered questions in the field of membrane biology.

**ACHIEVING LEARNING OUTCOMES 1 AND 2.** Undergraduates and graduate students have the same requirements for reading and discussing papers, and for mandatory attendance:

**ASSIGNED READING:** This course will primarily consist of reading current literature. Background reading for each topic will be taken mostly from review articles in the literature.

**DISCUSSION OF PAPERS:** Classes will be devoted to analyzing the assigned readings from the literature. Attendance is mandatory. Students are expected to read all of the required assignments and will be asked to discuss experiments from each paper. **These discussions will count for half of your grade.**

**ACHIEVING LEARNING OUTCOME 3.** Undergraduates and graduate students have different requirements for the research design section of the grant proposal:

**GRANT PROPOSAL:** Learning how to prepare a grant proposal serves several purposes. (1) It will teach you how to approach an area of research that interests you, and how to design experiments that address important questions pertaining to that research topic. (2) It will help to prepare you for pre-doctoral, post-doctoral, and principle investigator grant applications that are required of academic scientists. You will be expected to prepare a grant proposal in the style of an NIH grant application.

You must hand in each section by the deadline for that section. **All sections of the proposal must be typed and edited for proper English grammar, spelling, and syntax BEFORE you hand them in.**

**The grant proposal will count for half of your grade.** Failure to meet the individual deadlines will lower your grade. I will review as many drafts as you submit, but only the complete proposal will receive a grade. **When handing in a revision of a previous section or draft, you must include the previous draft containing my written comments.**

The Grant Application Writer's Workbook cited above has excellent and very detailed guidelines for each of the sections of the grant application that are required. In addition, I will provide you with a sample grant application that you may use as a reference.

## GRADING

### 1. DISCUSSION AND PRESENTATION OF ASSIGNED READING – half of the grade.

All students are expected to attend each class and to read all of the assigned papers. Thus, the grade for the discussion half of the course will be determined by attendance and the ability to discuss the paper in the context of specific questions that address:

- the rationale for doing the study
- the hypothesis tested
- the experimental approaches used
- the experimental findings
- the conclusion and impact of the study

### 2. GRANT PROPOSAL – half of the grade.

#### **BIO 7180 GRADUATE STUDENT REQUIREMENT:**

Specific Aims (1-page maximum). Include two aims.

Research Strategy

Significance

Innovation

Approach (for each aim)

Review of relevant literature and preliminary studies (if you have any)

Research design – experiments developed and described

Expected outcomes

Potential problems and alternative strategies

Impact – What will successful completion of your work make possible?

References. Complete list of references using endnote, *Journal of Cell Biology* format.

#### **Bio 6180 UNDERGRADUATE STUDENT REQUIREMENT:**

Specific Aims (1-page maximum). Include two aims.

Research Strategy

Significance

Innovation

Approach (for each aim)

Review of Relevant Literature

Research Design – outline of proposed experiments

Impact – What will successful completion of your work make possible?

References. Complete list of references in endnote format.

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SCHEDULE**

<u>DATE</u>	<u>TOPIC</u>
Tu 1/8	Course introduction
Th 1/10	Membrane structure – the fluid mosaic model
<b>Tu 1/15</b>	<b><i>Grant – Topic deadline</i></b>
Th 1/17	
Tu 1/22	Membrane lipids
<b>Th 1/24</b>	<b><i>Grant – Significance and innovation deadline</i></b>
Tu 1/29	<b>No class</b>
Th 1/31	<b>No class</b>
Tu 2/5	
Th 2/7	Membrane proteins
Tu 2/12	
<b>Th 2/14</b>	<b><i>Grant – Specific Aims deadline</i></b>
Tu 2/19	
Th 2/21	
Tu 2/26	
Th 2/28	Membrane – cytoskeleton interactions
Tu 3/5	
<b>Th 3/7</b>	<b><i>Grant – Approach Aim 1 deadline</i></b>
Tu 3/19	
Th 3/21	Lipid rafts
Tu 3/26	
<b>Th 3/28</b>	<b><i>Grant – Approach Aim 2 deadline</i></b>
Tu 4/2	Vesicle formation and trafficking
Th 4/4	
<b>Tu 4/9</b>	<b><i>Grant – List of references in Endnote format deadline</i></b>
Th 4/11	
Tu 4/16	Membrane shaping and bending/Organelle biogenesis/ Membranes and disease
<b>Th 4/18</b>	<b><i>Grant – Complete proposal due</i></b>