Biology 404 Course Syllabus
Nuclear Structure and Function

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Course Description:

In 1910 Nobel Prize winner Santiago Ramon y Cajal published his treatise on the structure of the nucleus at the light microscopic level. Now a hundred years later the structures he drew so precisely are the studied intensively using state of the art imaging, biochemical and molecular tools. The study of the cell nucleus provides an amazing bridge between the architectural aspects of cell biology and the functional/molecular understanding of gene expression and genomes. This course uses these links to apply the fundamental knowledge students learned in 300 level courses in cell biology or genetics to the microcosm of the nucleus, in order to build on the concepts and skills covered in the pre-requisite courses. Specifically, the course uses current primary and secondary literature to broaden student’s scientific knowledge and skill set across four main topics, the nuclear periphery, nuclear transport, chromatin, and nuclear bodies. Beyond the specific content, this course emphasizes the building of skills in content comprehension, productive scientific discussion, refined oral presentation, and scientific writing. Furthermore the accompanying lab applies basic cellular and molecular laboratory techniques to the study of the nucleus, with an emphasis on experimental design, interpretation of results and presentation of new research.

Pre-requisites

C- or better in Bio 302 Cell and Molecular Biology OR Bio303 Molecular Genetics and Heredity

Course Structure:

Lecture: MWF 10:30-11:30
Hoyt 150

Laboratory: R 2:00PM – 5:00PM
Hoyt 343

Office Hours: Monday (Patterson 314) and Wednesday (Hoyt 222) 1-2:30 PM and by appointment. Simply email, call or ask me for a time that will work for you. The sole purpose of making an appointment is that I want to be sure that I will be in my office at the time you can meet with me.

Required:
1. Composition-style, quad-lined laboratory notebook (NOT carbon copy)
2. Frequent visits to the Bio 404 coursepage on D2L
Course Outcomes:

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

1. Demonstrate comprehension of cell and molecular biology as it relates to the structure and function of the nucleus.
2. Demonstrate improved understanding of primary scientific literature as it relates to the molecular basis of disease through content comprehension, productive discussion, and scientific writing.
3. Apply basic cellular and molecular laboratory techniques to the study of the nucleus.
4. Demonstrate qualitative and quantitative reasoning skills required for scientific inquiry, experimental design, and problem solving.
5. Present established and new scientific data to their peers in a comprehensible and analytical manner.
6. Place new scientific discoveries into the existing operational and theoretical framework.

Assignments:

Primary and Secondary Literature These assignments serve course outcomes 1, 2 and 5. The “textbook” is a series of secondary articles of diverse topics in nuclear biology written by experts in the field. These secondary literature sources will be supplemented by reading several primary journal articles. You are expected to read the secondary articles before the lecture for each topic and the primary articles before a journal club session. All required reading will be posted on the D2L course page. You will be involved in the use of these readings at several levels as listed below:

Lecture sessions: Lecture content will be based solely on literature sources. It is expected that you read the provided review paper for each lecture in advance of class so that you can participate in a meaningful discussion of the content. Supplemental papers may be used in lecture in such cases the relevant content from these sources will be provided in the lecture slides notes.

Work it out Wednesday (well mostly on Wednesdays): In these sessions the instructor will introduce methods and data from research articles related to the most recent lecture. Students will work in small groups to interpret data and work out how that data fits into the larger models that have been discussed in class.

Journal club sessions In these sessions students will present and discuss new primary literature in the field of study covered in the previous two class periods. For example, if we spend two days learning the general mechanism of RNA export from the nucleus, the third class will be spent discussing one or two papers that discuss novel findings such as a new model for export or proteins that were recently discovered to play a role in RNA export. Depending on course enrollment students will present one or more articles throughout the semester. Journal club presenter format guidelines and grading criteria will be discussed in class. The instructor will present the first journal club as an example.

Journal club post-quiz At the end of each journal club session that week’s presenter will distribute a 10-point quiz that covers the methods, results and outcomes of the paper to the rest of the class. The presenter will also provide the instructor with an answer key for that quiz on the day of the presentation. The remaining students in the class must complete the quiz outside of class and the quiz will be due to the instructor the NEXT class period. The goal of these quizzes is to assess the student’s understanding of the article based on both the article itself and the presentation given by the presenter.
Laboratory  These assignments serve course outcomes 3, 4, and 5.
Your participation in laboratory exercises will be graded in several ways:

Lab quizzes: These quizzes are intended to ascertain your knowledge and understanding of the techniques you are performing in the laboratory. They will occur at some point during the laboratory period during an incubation period during the protocol that is being performed.

Lab notebooks: It is expected that you keep an up to date laboratory notebook, adding new information as soon as it is collected. A separate document containing the specific guidelines for the contents of your lab notebook will be provided. In order to insure you keep your notebook up to date they will be collected at the end of most laboratory sessions to be checked for completeness, and returned the following class period. Final lab notebook grades will be determined at the end of the semester, based on scores from individual collection dates.

Laboratory summaries: At the conclusion of each lab module your entire laboratory group will turn in a single document that includes summation of methods, presentation of results and answers to questions related to both the methods and outcomes of the experiments. The specific content to be included in these documents will be discussed when appropriate in each module. These worksheets will be due one to two weeks after the lab meeting roundtable session for that module. Due dates are indicated on the course schedule.

Research Project: Nuclear Bodies
This assignment serves course outcomes 1, 5 and 6.
Over the course of the semester each student will work in stages to research a nuclear body that has not yet been well characterized. The student will use a range of literature and database sources. A supplementary document will be provided detailing the stages and point values associated with this project.

Exams. This assignment serves course outcomes 1 and 6.
Unit Exams
There will be four 100-point exams throughout the semester. Exams will be held during the laboratory session, but will not last 3 hours. Exam questions will include a range of question types such as multiple choice, short answer and matching to assess basic concepts, essay questions covering both theories and complex pathways, and data interpretation to assess both conceptual knowledge and critical thinking skills. Each of these exams will include the material from the most recently covered content, including concepts from lectures, work it out Wednesdays AND journal clubs.

Final Exam
The final exam consists of two parts, each worth 50 points. 1) Creation of a detailed poster illustrating all of the concepts covered throughout the semester. 2) A twenty-minute oral exam in which the student explains their poster to the instructor.

In class participation: This assignment serves course outcomes 1, 2, and 6.
In addition to participating during the discussion of primary literature and lab meeting roundtables you are expected to participate in all class activities and speak up and ask questions when you have them during lecture, lab, and article discussions!
**Course Grading:**

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<tbody>
<tr>
<td>Exams (100 pts each)</td>
<td>500</td>
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<tr>
<td>Research Project</td>
<td>175</td>
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<tr>
<td>Participation</td>
<td>50</td>
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<td>Lab summaries (2; 20 pts each)</td>
<td>40</td>
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<tr>
<td>Lab notebook</td>
<td>30</td>
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<td>Lab quizzes (number may vary; 5 pts each)</td>
<td>30</td>
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<td>Journal club presentation</td>
<td>75</td>
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<td>Journal club post quizzes (10; 10 pts each)</td>
<td>100</td>
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**TOTAL** 1000

**Attendance:** Attendance at all sessions (lecture, work-it-out, journal club, laboratory and exams is mandatory). Please identify any conflicts between these and college sponsored activities or events and report them to me at least one week in advance of the activity so that a make-up exercise can be arranged. The only excused absences for exams or labs are the ones stated in the Westminster catalog (college-sponsored activities; personal medical emergencies, etc.). Your exams are 50% of your final grade, and it is your responsibility to make sure you understand the material. If you miss a lecture, you must find out what you missed and make sure you understand the content. If you need with any of the material – please ask. My door is always open.

**Academic integrity:** The issue of academic integrity is taken very seriously at Westminster. Students are expected to abide by the College Policy on Academic Integrity. The policy can be found at: http://www.westminster.edu/acad/pdf/undergraduate_catalog.pdf.

Academic integrity is particularly important when dealing with scientific writing. Written assignments must be the student’s own work. Quotes, data or ideas taken from another source must cite that source fully and correctly. I will be using turnitin.com to determine that your work is in fact your own. If you don’t understand how to do this, please ask. Work that is not the students own, i.e. copied from an external source, a classmate or class material will be considered plagiarized, and receive a score of zero. In addition, a written report will be sent to your academic advisor, and to the Dean. Note: plagiarism includes extensive, unnecessary quoting from another source, even if it is cited. More than one incident of plagiarism may result in failure of the course. If in doubt – ask.

A tentative schedule for the spring 2018 semester can be found on D2L.