**BMS 625: GENETICS**
**FALL 2017 SYLLABUS**

**3:30-4:45 Tues/Thurs**

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Text: Molecular Biology of the Gene, 7th Edition (ISBN-13: 978-0321762436)
By Watson, Baker, Bell, Gann, Levine & Losick

As this is a foundations course for the GSBSE Ph.D. program, students may have a broad range of background experience and training in molecular biology and/or genetics - from very little to advanced. The goal of this course is to provide a common foundation for students in the major principles of molecular genetics from which students can base more advanced studies.

**Course Overview:** It is expected that by the end of this course you will understand the major principles of molecular genetics and the underlying processes by which cells and organisms replicate, repair, read, and translate their genetic codes. You should achieve an advanced understanding of these topics that will allow you to read the primary research literature, understand the biological processes examined, and interpret the results in the larger context of molecular genetics.

**LECTURES:** There is a large amount of material to be covered in this course, with each lecture comprising single or multiple topics by itself. YOU ARE EXPECTED TO ATTEND ALL LECTURES, and are responsible for all material covered in lecture and in the assigned reading for discussions and question & answer sessions.

**BMS 625 Course Conference:** Will we have course conference abilities (Blackboard) for students where lecture materials will be posted.

**TEXTBOOK and ASSIGNED READINGS**: The text for the course is an excellent reference written by founding members of modern molecular biology and genetics. It has been recently revised (2014) and is as up-to-date as can be expected for such a rapidly advancing biological field. Chapter assignments include the whole chapter. It may seem like a lot of reading but much of this should be familiar, with more in-depth coverage than you have previously seen. Each chapter ends with a summary and questions that will reinforce the concepts. There is a very large amount of material covered in this course. Students are expected to have read the material **before** lecture; be prepared to listen, ask questions, and discuss the lecture material. In addition, each student should bring one specific question to class based on the current reading assignment that will then be discussed at the start of each lecture period.

Additional readings may be assigned that include primary literature, classic papers and current articles relevant to the lecture topics. Part of a lecture each week will be devoted to discussing this material. Your participation in these discussions will be part of your final grade.

**EXAMS:** There will be **no** exams in this course, however the homework assignment question sets, three essay assignments with summary presentations/discussions and class participation in question/answer discussions will allow multiple sources of feedback to gauge your understanding of the material.

**Homework Assignments**: There will be ten graded classroom/homework assignments during the term. These assignments will include questions directly from the textbook reading assignments and lecture materials discussed at the previous class period. **Late homework assignments will not be accepted**. Nor will there be a make-up homework assignment.

**Question for the day**: Each student will prepare a question based on the assigned reading for the day and one or more will be chosen for discussion at the start of the lecture period. These can include topics that were unclear to the student or may expand on the material to highlight new applications or discoveries from the literature.

**Essay Assignments**: Three short essay assignments focused on engineering applications or advancements that were necessary for the generation of novel molecular/biological insights or therapy development. Essays will focus on a single topic, going through the major gaps in our molecular/biological knowledge prior to this development, the history of the strategy to overcome the problem, the development and refinement of the strategy, advantages and disadvantages of competing strategies and future directions to address lingering technical or biological questions.

Essay 1: Engineering advancements (devices or techniques) necessary for reading direct DNA/RNA/epigenetic information or modifications to nucleic acids or their associated proteins in whole cell/tissue populations or at the single cell level.

Essay 2: Engineering advancements (devices or techniques) necessary for understanding 3D-nuclear genome architecture, including super resolution imaging of the physical genome or inferred 3D-architecture from long-range DNA-DNA, DNA-RNA or DNA-Protein interactions.

Essay 3: Engineering advancements (devices or techniques) necessary for genome modification / editing, transgenic/knockout modification of the genome or gene therapy development.

Essays will be 2-pages maximum (double-spaced, 1 inch margins, Times-12pt or Arial-11pt font) not including figures or bibliography. A structured bibliography should include the specific sources used and at least half of the references should come from the primary literature - not just review articles and Web summaries.

**Essay summary presentations and discussions**: On the due date of the essay, three to four students (chosen at the beginning of the semester) will present a 10-minute oral summary of their material to the class and lead a short discussion/question & answer session, and the remaining students will present a 3-minute lightning presentation/summary of their topic. Each student will give one long presentation and two lightning presentations over the course of the half-semester.

**Final Class Grade** will be based on the average of your essay grades and your homework assignments.

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|---|---|
| **Essay 1** | **250 pts** |
| **Essay 2** | **250 pts** |
| **Essay 3** | **250 pts** |
| **Class participation (discussions/question & answer)** | **250 pts** |
| **Classroom/Homework Assignments (10 each, 50 pts each)** | **500 pts** |
| **Total points** | **1500 pts** |

**Grade Scale (%)**

| | |
|---|---|
| **A = 93 – 100** | **C = 72 – 75.9** |
| **A- = 89 - 92.9** | **C- = 69 – 71.9** |
| **B+ = 86 – 88.9** | **D+ = 66 – 68.9** |
| **B = 82 – 85.9** | **D = 62 – 65.9** |
| **B- = 79 – 81.9** | **D- = 60 – 61.9** |
| **C+ = 76 – 78.9** | **F = below 60.00** |

**CONSIDERATION OF YOUR CLASSMATES:** Please do not talk during lectures – it disturbs the classmates near you. If you have a question, however, please ask! Cell phones and other electronic devices should be turned off during class. Computers may be used to take notes. If your activities are disruptive, you will be asked to leave the classroom.

**SNOW DAY POLICY**: In the event of cancellation of University classes due to inclement weather, we will condense the material from the cancelled class and present it with the material from the next scheduled class, most likely also condensed. You will be responsible for the material we were forced to leave out of the condensed lecture(s) through your readings of the textbook.

In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

**University of Maine administrative policy statements**

**Academic honesty:**
Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

**Students with disabilities:**
If you have a disability for which you may be requesting an accommodation, please contact Disabilities Services, 121 East Annex, 581-2319, as early as possible in the term.

**Course schedule disclaimer (disruption clause):**
In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

**Sexual violence policy:**
**Sexual discrimination reporting:** The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell any of your teachers about sexual discrimination involving members of the campus, **your teacher is required to report** this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

Behaviors that can be "sexual discrimination" include sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct, and gender discrimination. Therefore, all of these behaviors must be reported.

**Why do teachers have to report sexual discrimination?**
The university can better support students in trouble if we know about what is happening. Reporting also helps us to identify patterns that might arise– for example, if more than one victim reports having been assaulted or harassed by the same individual.

**What will happen to a student if a teacher reports?**
An employee from the Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity will reach out to you and offer support, resources, and information. You will be invited to meet with the employee to discuss the situation and the various options available to you.

If you have requested confidentiality, the University will weigh your request that no action be taken against the institution's obligation to provide a safe, nondiscriminatory environment for all students. If the University determines that it can maintain confidentiality, you must understand that the institution's ability to meaningfully investigate the incident and pursue disciplinary action, if warranted, may be limited. There are times when the University may not be able to honor a request for confidentiality because doing so would pose a risk to its ability to provide a safe, nondiscriminatory environment for everyone. If the University determines that it cannot maintain confidentiality, the University will advise you, prior to starting an investigation and, to the extent possible, will share information only with those responsible for handling the institution's response.

The University is committed to the well-being of all students and will take steps to protect all involved from retaliation or harm.

**If you want to talk in confidence** to someone about an experience of sexual discrimination, please contact these resources:

For *confidential resources on campus*: **Counseling Center: 207-581-1392** or **Cutler Health Center: at 207-581-4000**.
For *confidential resources off campus*: **Rape Response Services:** 1-800-310-0000 or **Spruce Run**: 1-800-863-9909.

**Other resources:** The resources listed below can offer support but may have to report the incident to others who can help:

For *support services on campus*: **Office of Sexual Assault & Violence Prevention: 207-581-1406**, **Office of Community Standards: 207-581-1409**, **University of Maine Police: 207-581-4040 or 911**. Or see the OSAVP website for a complete list of services at http://www.umaine.edu/osavp/

| Week | Tuesday | Thursday | Readings | Topic | Essay Assignment | Class Homework Assignments |
|---|---|---|---|---|---|---|
| 1 | Aug 29 | | Chapters 1, 2 & 7 | Mendelian inheritance, DNA as genetic material & classic molecular biology techniques | | - |
| | | Aug 31 | Chapters 8 & 9 | Genome structure, chromatin & the nucleosome, DNA replication | | Chapter 2 end of chapter (odd questions) |
| 2 | Sept 5 | | Chapters 10 & 11 | DNA mutation & repair, homologous recombination | | Chapter 8 end of chapter (odd questions) |
| | | Sept 7 | Chapters 13 & 14 | Transcription & RNA splicing | | Chapter 11 end of chapter (odd questions) |
| 3 | Sept 12 | | | Engineering Applications: DNA/RNA/Epigenome reading technologies and techniques | ASSIGNMENT 1 | Chapter 14 end of chapter (odd questions) |
| | | Sept 14 | Chapters 15 & 16 | Translation, the genetic code | | |
| 4 | Sept 19 | | Chapter 18 | Prokaryotic transcriptional regulation | | Chapter 16 end of chapter (odd questions) |
| | | Sept 21 | Chapter 19 | Eukaryotic transcriptional regulation | | Chapter 18 end of chapter (odd questions) |
| 5 | Sept 26 | | | Engineering Applications: Exploring 3D Genome Architecture | ASSIGNMENT 2 | Chapter 19 end of chapter (odd questions) |
| | | Sept 28 | Chapter 20 | Regulatory RNAs | | |
| 6 | Oct 3 | | Chapter 21 | Gene regulation in development & evolution | | Chapter 20 end of chapter (odd questions) |
| | | Oct 5 | Chapter 12 | Site-specific recombination and transposition | | Chapter 21 end of chapter (odd questions) |
| 7 | FALL BREAK | | | | | |
| | | Oct 12 | Chapter 22 & Appendix 1 | Systems biology, model organisms and genetic disease | | Chapter 12 end of chapter (odd questions) |
| 8 | Oct 17 | Oct 19 | | Engineering Applications: Genome Modification & Therapies | ASSIGNMENT 3 | - |