

Syllabus for BMIF 6310

In this course, students will be introduced to the algorithms and concepts fundamental to the field of bioinformatics. Students will benefit from prior exposure to coursework in computer science and molecular biology, but a limited review of relevant topics will be part of the class. Major sections of the class discuss the basics of biochemistry, the alignment of sequences, the assembly and annotation of genomes, the identification and structural interrogation of proteins, and the analysis of gene signaling.

Course Director:

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Course Materials:

Readings for the class as well as completed lectures will be available on the Brightspace course website. No textbook is required, though students may benefit from *Bioinformatics and Functional Genomics* (ISBN 9788126567683), *Introduction to Bioinformatics Algorithms* (ISBN 0262101068), *Systems Biology in Practice* (ISBN 978-3527310784), or *Practical Computing for Biologists* (<http://practicalcomputing.org/>).

Grading

Forty percent (40%) of the grade comes from weekly quizzes, while the other sixty percent stems from the proposal (20%), report (20%), and presentation (20%). Twelve brief quizzes will test each student's understanding of material presented in the previous classes. The lowest two quiz grades will be dropped for each student. Missed quizzes may be taken later only at the course director's discretion.

The research project, described in a separate section below, includes review, proposal, project summary, and presentation elements. In all four elements, students are encouraged to submit drafts prior to deadlines for feedback. Deadlines for the project include:

- 5:00 PM, Monday Oct. 21, 2019: Proposal due
- 5:00 PM, Friday Dec. 6, 2019: Report due
- In class, Dec. 9–13, 2019: Oral presentations held

A+	96.67 - 100.00	B+	86.67 - 89.99	C+	76.67 - 79.99
A	93.34 - 96.66	B	83.34 - 86.66	C	73.34 - 76.66
A-	90.00 - 93.33	B-	80.00 - 83.33	C-	70.00 - 73.33

Honor Code

Students are expected to work together in several contexts; the director anticipates that classmates will study together for quizzes, and students will submit drafts of proposals, reports, and presentation slides to other students or senior colleagues for constructive criticism. Collaboration, however, has key limits in the classroom:

- While quizzes are being conducted, each student must work independently and without reference to notes or other materials.

- Citations and appropriate quotation are required for text or figures taken from web resources or published work. For example, if a student uses an image from Wikipedia, the creator of the image should be included in a footnote or citation.
- Reviews, proposals, summaries, and presentations should acknowledge by name the contributors of key ideas, generally through Acknowledgments text.

Violation can range from a zero on the corresponding assignment to weightier potential penalties for repeat or egregious violations, ranging up to removal from BMIF 6310 and an appearance before graduate school ethical bodies.

Research Project Overview

Intent

The research project is designed to reinforce three essential skills for researchers: proposing research strategies, reporting experimental results, and presenting work to peers. The project proposal mimics the process by which new projects are “pitched” to funding agencies; in this case, you will attempt to convince the course director that your project is a feasible and meaningful way to apply bioinformatics to your work. If you have not written a proposal before, you are particularly likely to benefit from creating Specific Aims that describe your project in a coherent, concise, and above all concrete format. The oral presentation to your classmates should demonstrate that exposing your ideas to others helps you to frame your ideas differently and shape them by others’ feedback. Taken together, these three elements will exercise the basic skills needed for scientific communication. All written sections should use Helvetica or Times New Roman font at 11pt, single-spaced with 1” margins.

Scope

The literature review will familiarize you with your chosen project topic and help you to formulate a research plan. Reviews are due mid-semester. Any bioinformatics area covered *or to be covered* in the course can be considered. Refer to the calendar for acceptable topics. At least 20 relatively current references are expected and the length should not exceed 5 pages. The format here is more free form than the proposal but should still be clear and concise.

The proposal will follow the main format of a grant proposal. It will include three sections: Specific Aims, Background and Significance, and Research Plan. Specific Aims should never exceed a single page, and the Research Plan cannot be less than a single page. Include essential citations in the proposal. If needed, you may include clarifying (but not gratuitous) figures. The proposal is limited to six pages (excluding references). Projects undertaken by pairs of students should also include a “Delegation of Responsibility” section that specifies the contributions of each project member; this text is not included within the six page limit.

The project summary is intended to resemble the results and conclusions section of a scientific publication. The length should be roughly 1200 words, not including references or appendices. You are encouraged to include figures illustrating your results. Source code or large data sets are preferred in electronic form as supplementary material. The course director fully expects that many students will collaborate with other researchers in creating the project. It would be appropriate to report significant collaborations in an Acknowledgment section (not counting towards the total document word count).

The oral presentation is not structured as formally as the written elements. It should, however, emphasize methodology and results. Oral presentations from group projects are slightly longer than individual ones;

individual presentations are slated four per class period, while joint presentations are slated three per class period.

Project Grading

Please take advantage of the option to submit your proposal or report early to receive feedback. Only the last grade for these two assignments will be recorded in the grade book. You may submit your proposal or report up to two times before the due date for pre-grading feedback. Please submit your proposal or written report by the stated deadlines; a 10% score reduction will be applied to the grade for each day the proposal or report is late. Email server outages or blackouts are not acceptable excuses for late submissions except for *force majeure*. If you have constraints in the dates on which you can present your oral report, please volunteer for a particular day as early as possible.

Rubric

These are equally weighted elements employed in grading the four assignments:

Review

Content: Is the subject matter relevant to bioinformatics and are the various articles tied together in a coherent manner?

Completeness: Did you cover all relevant aspects of the chosen topic? Have you fully explained the current state of the chosen topic?

Clarity and conciseness: Did you convey the information in a way that is easy to grasp and succinct?

Proposal

Bioinformatic relevance: Does the proposed research depend critically upon computation for insights about biology?

Plan credibility: Have you established that you have a concrete plan of action?

Research significance: Do you demonstrate that the project is worth pursuing?

Format: Did you include all appropriate sections?

Language: Have you effectively used the English language?

Report

Project Summary and Oral Presentation

pertinence (summary): Do the results answer the questions you set out to ask in your proposal? If not explain the change in course.

Clarity and conciseness (summary): Did you convey the results in a way that is succinct and intelligible?

Time usage (presentation): Did you finish your presentation in the time allotted?

Clarity (presentation): Did you provide sufficient context for your audience to understand you?

Organization (presentation): Did you structure your talk to convey your message effectively?

Slides (presentation): Are the images you present effective in presenting your research?

Response (presentation): Did you field questions effectively?