

Course Assessment Document for CS 441

Departmental Outcomes

1. Proficiency in computational thinking
2. Ability to analyze systems at the three levels of computer science: theory, software, and hardware
3. Proficiency in the design and implementation of algorithms using multiple programming languages
4. Ability to apply computational thinking to a diverse set of problems and disciplines
5. Ability to communicate effectively and collaborate with others
6. Ability to adapt to new challenges and computational environments

Course Description

In this course, you will apply principles learned in Systems Biology I to a particular biological system. You will be working in an interdisciplinary team to complete a semester-long project focussing on one biological system and one or more mathematical models of this system. This will involve reading journal articles, designing and running numerical experiments, and analyzing results. Throughout the semester, you will be presenting challenges and results. The course will culminate in both a poster presentation and a comprehensive journal-article styled report and oral presentation.

Prerequisites: Computer Science 341

Rationale for prerequisites: This course is a continuation of CS341.

Desired Course Outcomes

- A. Literature search:** Students can search the published literature to find articles relevant to their research topic. They should be able to identify the most important articles.
- B. Expertise on one project:** Students will demonstrate an understanding of one biological system and the relevant mathematical models. They will demonstrate proficiency in at least one technique of model creation or analysis.
- C. Generating and analyzing results:** Students can ask relevant questions about their system and its model. They can write appropriate code to produce and analyze results.
- D. Communication and teamwork:** Students can perform their research within a team. Further, they can discuss their research with their classmates and present their results in both oral and written formats.

We will disseminate the desired course outcomes to students via the course web page, syllabus and in class.

Course Matrix

Outcome	Activities	Method of Assessment	Departmental Outcome
A	Lecture, Preliminary and ongoing literature searches and milestone reports	Evaluation of written and oral milestone reports	4, 6
B	Lecture, Ongoing research project	Evaluation of written and oral milestone reports	1, 2, 3, 4, 6
C	Lecture, Ongoing research project	Evaluation of written and oral milestone reports	1, 2, 3, 4, 6
D	Ongoing research project, milestone reports, class discussion	Evaluation of written and oral milestone reports and participation in class discussion	5

Grade Calibration Matrix

Outcome	Meaning of the grade A
A	Student can effectively navigate on-line journal article search engines and follow trails of references from article to article. The student will be able to identify articles that are cited the most often and understand why those articles are important to the field in general or to their project in particular. The student will demonstrate some discernment when choosing which articles to include in the project bibliography.
B	Student will demonstrate expert knowledge of their chosen system by clearly explaining what numerical models tell them about the system. The student will design numerical experiments that most clearly elucidate the biologically relevant features of the model(s).
C	Student will effectively design and implement code to run numerical experiments and to analyze the results. The student will be deliberate in his or her choice of methodology and will pursue lines of inquiry that go beyond “proof of concept.”
D	Student will contribute to the team’s work. The student will be able to communicate the topic of their research project and its results and challenges well enough that other students will be able to ask good follow-up questions. The student will be able to ask good follow-up questions about other students’ projects.

Outcome	Meaning of the grade B
A	Student can effectively navigate on-line journal article search engines and follow trails of references from article to article. The student will be able to identify articles that are cited the most often but may not understand why those articles are important to the field in general or to their project in particular. The student will lack discernment when choosing which articles to include in the project bibliography.
B	Student will demonstrate knowledge of their chosen system by explaining what numerical models tell them about the system. The student will design numerical experiments that reasonably elucidate the biologically relevant features of the model(s).
C	Student will effectively design and implement code to run numerical experiments and to analyze the results. The student’s results may be merely “proof of concept” rather than a complete set of results.
D	Student will contribute to the team’s work, but may do less than his or her share. The student will be able to communicate the topic of their research project and its results and challenges well enough that other students will be able to ask comprehension questions. The student will be able to ask comprehension questions about other students’ projects.

Outcome	Meaning of the grade C
A	Student can effectively navigate on-line journal article search engines and follow trails of references from article to article. The student will lack discernment when choosing which articles to include in the project bibliography.
B	Student will demonstrate some knowledge of their chosen system and will have some ability to explain what numerical models tell them about the system. The student will design numerical experiments, but they won't necessarily elucidate the biologically relevant features of the model(s).
C	Student will design and implement code to run numerical experiments, but may not have the sophistication to automate analysis of the results. The student's results will be merely "proof of concept."
D	Student will contribute to the team's work, but will do significantly less than his or her share. The student will communicate the topic of their research project and its results and challenges, but not well enough that other students will be able to ask any questions. The student may not be able to ask questions about other students' projects.

Outcome	Meaning of the grade D
A	Student will ineffectively navigate on-line journal article search engines and fail to follow trails of references from article to article. The student will lack discernment when choosing which articles to include in the project bibliography.
B	Student will demonstrate minimal knowledge of their chosen system. The student will design numerical experiments, but they will be incapable of revealing anything new about the system.
C	Student will be unable to effectively design and implement code to run numerical experiments or to analyze the results. They will write code and acquire results, but they will be laden with mistakes.
D	Student will contribute to the team's work, but will do far less than his or her share. The student will communicate the topic of their research project and its results and challenges, but not well enough that other students will be able to ask any questions. The student may not be able to ask questions about other students' projects.

A student who receives an F does not meet the criteria for a D or any higher grade.