



GISAT 160

Problem Solving in Science and Technology

Syllabus - Spring 2007

Announcements: Welcome to GISAT 160 - Problem Solving in Science and Technology

Instructor Info:

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See link at left for office hours and other scheduling items

Course Description: This course examines issues in modern science and technology as a means to introduce, develop, and enhance critical thinking and problem solving skills. Our focus will be on issues dealing with computing and computing technologies and their impact on society. Current scientific and technological research and applications will be introduced to reinforce problem solving, instruction in systems thinking, and critical inquiry. The course provides opportunities for using both oral and written communication in a variety of learning activities.

Prerequisites: There are no prerequisites to this class.

[Links](#)

[Course
Schedule](#)

[Nancy Harris
Schedule](#)

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Policies](#)

Overall Objectives:

- Evaluate claims in terms of clarity, credibility, reliability, and accuracy;
- Demonstrate the ability to identify, analyze and generate claims, arguments, and positions;
- Identify and evaluate theses and conclusions, stated and unstated assumptions and supporting evidence and arguments; and
- Apply these skills to one's own work and the work of others.

General Policies for this class (See link at left for a full list of instructor policies):

- Much of this class will involve in-class activities. Participation in class (not just attendance) is mandatory.
- We may be discussing issues that are controversial to some. Always treat your colleagues in the classroom with respect.
- Missed or late work cannot be made up for credit, unless PRIOR arrangement is made and confirmed by me. Do not assume an e-mail explanation of your absence is sufficient...always get confirmation.
- You are responsible for any class lecture or activity material. See a colleague or see me during office hours for help with missed work.
- Office hours are a good way to get extra help with any material with which you feel a weakness. They are not the only time. I also use IM and e-mail to "converse" with students during off times.
- You will get the most out of this class by coming to class each day prepared with the day's reading or other assignments.
- Blackboard is where you will find class notes, grades, and all assignments posted.

Course Schedule: See link at the left for the course schedule. This schedule will be updated periodically to reflect adjustments based on class needs.

Course Requirements:

- Participate (not just attend) class each day and do assigned in-class activity.
- Complete all assignment **before** the start of class.
- Submit assigned papers, journals, and other activities on time.
- Participate in assigned outside events (some choice permitted).
- Take both exams, the midterm and the final.

Textbook and Required Material

Material will be posted on Blackboard, put on reserve in the CISAT library, or handed out in class. There is no textbook to purchase for this class.

Each student will need a journal for some in-class and homework activities. These journals should be small spiral notebooks or small composition (black and white cover) books. Put your name and section # on the cover. Bring these to class each day.

Reference books (that will be placed on reserve at appropriate times) include:

Fisher, Alec. Critical Thinking An Introduction. Cambridge University Press, 2001

Johnson, Carolyn. Using Internet Primary Sources to Teach Critical Thinking Skills in the Sciences. Libraries Unlimited, 2003
and more...

Grading

In-class participation	20%
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Assignments 1/2 for required assignments 1/2 for initiative options	25%
Research paper	15%
Mid term exam	20%
Final exam	20%

My grade ranges follow a traditional 10 point scale. For example, an A is anything from 90 - 100, B is 80 - 89.999, F is less than 60. +/- grades may be awarded within those ranges for high or low performance.

Course organization: This course is loosely organized into three primary areas of study. They are:

Critical Reasoning/Logic - Students learn basic practical critical reasoning skills and methods primarily through the analysis of language in scientific and technological articles, and how this approach to thinking is central to application in science and technology. Woven throughout this section will be the use of problem solving skills treated more formally later.

- Clarity of writing, ambiguity and vagueness, accuracy, detail, specificity, authorial intent
- Analysis of arguments
- Constructing arguments

Evaluating Non-Print Media - This section will apply critical reasoning skills to examine non-print media, focusing especially on the web. Students will learn how to evaluate web sites for legitimacy and appropriate use in other academic work. Video, audio, and other related media will be explored.

- Web "information"
- Evaluating advertising claims
- Evaluating lectures, radio and other audio information
- Exploring public "persona" on the web including chat, blogs, and facebook entries.

Problem Solving Techniques and Problem Solving with Technology - This section will include a formal treatment of problem solving techniques and explore the use of computers in solving problems. Differentiation between the kinds of problems computers can solve and those they cannot solve will be explored. Problem solving techniques will also be woven throughout the other two sections.

Problem solving techniques include:

- Structured problem solving
- Algorithm development
- Brainstorming
- Writing as thinking
- Free writing
- Reflection
- Modeling and Simulation
- Decision trees

Problem solving and technology will also include:

- What is information vs. data?
- How does one use data to form conclusions?
- Data storage, usage, safety.

Students with Disabilities: If you are a student with a documented disability, who will be requesting accommodations in my class, please make sure you are registered with the Office of Disability Services, Wilson Hall, Room 107 (568-6705) and provide me with a copy of your Access Plan letter outlining your accommodations. I will be glad to meet with you privately during my office hours to discuss your special needs. The sooner you can do this, the better I can assist you in meeting your learning goals in this course.

Student Responsibility: Student are responsible for adding and dropping courses via e-campus. The last day to add a course for the Spring 2007 semester is Thursday, xx, 2007 (signatures required after xxx). The last day to drop a course for the Spring 2007 semester with a "W" grade is Thursday, xxx. I do not give "WP" or "WF" grades to students requesting a drop after the deadline.

Religious Observance: Students who are unable to attend class due to religious observance may request deadline extensions BEFORE the expected absence. I will do my best to accommodate your special circumstances.

Honor Code: All work turned in for credit must adhere to the [JMU honor code](#) provisions. Most work done outside of class will be individual assignments. Assignments on which you may collaborate with others will be identified as such in the assignment. Proper citation of references is required on all written work. If you have any question about application of the honor code to work in this class, please see the instructor before turning such work in for credit.

For clarification of these and other instructor policies please refer to the [policies link](#).

[Department of Computer
Science](#)

[Nancy Harris
Home Page](#)

[Current Classes
Link](#)



GISAT160 Spring 2007 Schedule

Sections x & y - Professor Harris

Welcome to GISAT 160.

- [Part 1: Critical Reasoning/Logic](#)
- [Part 2: Evaluating Other Media](#)
- [Part 3: Problem Solving and Technology](#)

Week	General Topic	Assignments Due	Reading
<i>Part 1: Critical Reasoning / Logic - print media</i>			
1	But don't we already know how to think? Introduction to critical reasoning and problem solving. What is critical thinking? What is an argument?	Reflection exercise	
2	Evaluating arguments - Structure, language, content, perspective	Short exercises - Id conclusion reasons. Id structure	
3	Evaluating arguments - Logic, reaching a conclusion, deductive reasoning vs "intuition", faulty logic	Short exercises	
4	Close reading - Putting it together	Bill Joy or Television article	

5	Close reading cont. - Writing arguments, Applying critical thinking to your own writing	Pay for Priority articles Media free assignment
6	Writing arguments - First exam	Write an argument from a list of topics.

Part II: Evaluating Other Media

7	Evaluating web sources - primary vs secondary; using web sources Separating fact from fiction on the web Evaluating advertising - print, TV, web	Compare and contrast selected web sites.
8	Evaluating spoken arguments - learning to listen critically Evaluating statistics - display format, meaning	Will use an assigned lecture.
9	Web safety - Let's be careful out there! Blogs, chats, facebook, information sharing Whose network is it anyway?	Students self-evaluate their "public" personas. Where are they? What information is conveyed to viewers.

Part III: Problem Solving Techniques and Technology

9	Linear problem solving Implementing a solution - Algorithmic thinking What kinds of problems can be solved with "technology"?
10	Understand the process, not just the answer Looking for patterns and repetition
11	Problem solving cont
12	Systems thinking
13	What is data? And how do I use it? Drawing conclusions

14

Data continued - Faulty "data" conclusions.

15

Unassigned for overflow of other topics

FINAL EXAM

Algorithm Group Exercise 1:

Names:

Given a piece of plain paper, write the instructions for making a paper airplane (you may choose the style). Assume your audience can read and follow basic instructions (such as fold the piece of paper in half). Be careful about ambiguous instructions.

Algorithm Group Exercise 2:

Names:

Given a phone book, write the algorithm for finding a list of businesses that provide a particular service. In designing your algorithm, be sure that you account for cases where the type of service or business might not be listed where you expect (ie. lawyers) as well as ones that do, such as Upholsterers, and ones that have subheadings, like Computers.

Algorithm Group Exercise 3:

Names:

Given a set of Lego™ blocks, write an algorithm for separating the blocks by color, then organizing the blocks in ascending order of size. (P.S. Please return all of the Lego blocks or my son will be very upset.) Develop your algorithm using one set of blocks and then try it with the second set and adjust accordingly. Testing groups should also test both sets. (Note: you will need to include some definition of size, since in some cases, the size might not be obvious. You may use any definition you choose for size.)

Algorithm Group Exercise 4:

Names:

Given a deck of cards that is not complete, write the instructions for discovering which card is missing. You may assume that your audience understands cards, suits, and values.

<http://www.pcworld.com/news/article/0,aid,124558,00.asp>

Article from PC World about the proposal by some communication providers to prioritize packets over the internet based on payments made by businesses and other web content providers.

<http://www.commoncause.org/siteapps/advocacy/index.aspx?c=dkLNK1MQIwG&b=1372975&action=5382&template=x.ascx>

Common Cause is an organization that seeks to make "...government more accountable to the people." Quote from the Common Cause website.

<http://www.washingtonpost.com/wp-dyn/content/article/2005/11/30/AR2005113002109.html>

Washington Post report about an interview with William Smith of Bell South. His perspective

<http://www.cdt.org/speech/net-neutrality/20060106searcey-schatz.pdf>

Center for Democracy and Technology.

Applying Close Reading Criteria to Advertising – Claims and Arguments

Review the ad or web site 3 times. On the first time through, record your initial impression (see step 1). On the second and third time through, read all of the questions and respond after the third review.

1. What is your first impression of the ad? What was it selling and did it seem effective effective?
2. Who is behind or responsible for the ad? Or in other words, who is the seller?
3. Who is the target audience? What images or language do they use to appeal to that audience? Are these images and language effective?
4. Who might be “offended” by the ad? In other words, is there someone who is directed away from the product or position? What images might be offensive and to whom? Do you think this was intentional or unintentional?
5. Does the ad make any fact based claims (provide evidence that their product or point of view is correct)? If so what are they? Can these be researched and are these true?
6. Does the ad make any implied claims? What are these claims and what do they use to support them?

Possible activities/assignments for GISAT160

Week 1 – 3 and ongoing

Short pieces – From Critical Thinking, An Introduction – Use during the first two to three weeks to look at structure/language. In class and homework.

Week 3 - 4

Use Bill Joy and Television for a more comprehensive critical reading assignment. Use Carl Sagan Baloney Detection kit article.

Week 4

Use the items from the Pay for Priority internet controversy to look at different sides of the same argument. Read different perspectives and in class have students take one side or another. Objective is to practice empathy skills and quiet argumentation (as well as practice finding the conclusion and rationale for both arguments).

Week 5/6

From some controversial topic in computing/technology such as:

- Government requesting phone records from phone providers
- Cell phones not allowed in the NYC public school system
- Government entities making records accessible on the internet
- VA state law that schools provide information about incoming students to law enforcement

students will research and write a “position paper” arguing for one side of the issue. As a followup exercise, students will review their papers for the characteristics of a good argument and will share their writing with another student who will perform the same evaluation.

Week 7

Given several web sites dealing with the same issue, have students compare and contrast the sites. Is one site more believable than the other? Why? Why not?

Apply critical thinking to an ad. Could be for a new technology or an upgrade to a new technology (think Blue Man Group or the PC/Mac ads)? Apply the modified close reading checklist to the ad.

Week 8

Sometime during the first 8 weeks, assign either a lecture on campus. Have some followup questions (like Taz’s initiative reports). Use this and other short examples during class.

Week 9

Most students have a public web “persona”, blogs, chat rooms, facebook. Have them evaluate those personae. What information is available to “predators”? What do they

reveal about themselves to other viewers (parents, employers, grad schools)? What is true and what is fiction?

Week 10

Use “non-computer” algorithm problems to demonstrate and practice linear problem solving and problem solving steps. See algorithms w/o computer. Will be adapted to be more of a problem solving approach.

Other problem solving techniques – borrow from other GISAT sections.

Week 12

Systems thinking – Two examples to explore with the class

1. NYC public schools have banned cell phones in the schools.
2. Grove City University issues laptop computers to all of its incoming students.
3. Others?

Week 13/14

Data vs information. How do we use data for both good and evil. Explore statistics, extracting meaning from data. Databases and queries. Given “data” what questions can we answer...which questions can we not answer.