

CSCI 4463: Artificial Intelligence

Spring 2020: Syllabus

Instructor: Dr. Vincent Cicirello
E-mail: Use Blackboard e-mail for this course

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Office Hours: Monday/Wednesday 11:00am-12:15pm
Available other times by appointment; drop-ins welcome (if I'm there, I'd be happy to talk to you).

Course Time and Location: Monday, Wednesday, Friday: 2:10pm-3:25pm, G108

Minor in Behavioral Neuroscience: This course is an elective in the Behavioral Neuroscience Minor.

Q2: This course is a Q2 (Quantitative Reasoning Across the Disciplines). Course topics involve application of mathematics, especially discrete mathematics, such as but not limited to set theory, graphs, trees, logic, discrete probability, etc.

Course Description: A study of tools, techniques, and applications associated with intelligent computer systems. Topics include problem-solving methods, search algorithms, knowledge representation, heuristics, constraint satisfaction, and other software tools for developing AI applications.

Prerequisites: CSIS 3103, Data Structures and Algorithms I (grade of C or better)

Required Textbooks/Readings:

- (1) S. Russell and P. Norvig, *Artificial Intelligence: A Modern Approach, Third Edition*, 2010. ISBN: 0-13-604259-7
 - You must have the 3rd Edition. In the 20+ year history of this textbook, there have only been 3 editions, with extremely substantial changes in coverage from one edition to the next. Rare occurrence of a textbook where new editions are actually always meaningful (e.g., not the more common "let's reorder chapters to make more money").
 - Before buying a new copy (or a used copy from the Stockton bookstore for that matter), search online for a less expensive used copy. This is the most common textbook for courses on Artificial Intelligence (used in approximately 1350 universities worldwide in 110 countries). It is used by far more AI courses worldwide than all other AI textbooks combined, and is otherwise widely read outside of courses (e.g., it's been cited in well over 35000 journal articles, conference proceedings, and other books, it's the 4th most cited computer science publication of this century, and the 22nd most cited computer science publication overall). **In other words, there should be a huge supply of used copies available to purchase for less than college bookstore prices.**

Grading:

Exam 1 (in class)	25%
Exam 2 (take home: completed within Blackboard)	25%
Homework / Problem Sets / Programming Assignments	50%

Grading Scale:

A: at least 90.00	A-: at least 89.00	B+: at least 88.00
B: at least 80.00	B-: at least 79.00	C+: at least 78.00
C: at least 70.00	C-: at least 69.00	D+: at least 68.00
D: at least 60.00	D-: at least 59.00	F: less than 59.00

I reserve the right to adjust the scale at the very end of the semester. Such adjustments are rare, but will only be in your favor; and are highly unlikely to occur at the D-/F boundary. Note the 2 decimal places in the chart above (i.e., I do not round to the nearest whole number): e.g., unless I adjust the grade scale, an 89.99 is an A-, etc. If I adjust the scale, it is done using a semi-automated approach involving clustering (i.e., "automated" == a program I wrote suggests a new scale based on all of the grades of the class; "semi-" == if that program's output is crazy, I ignore it and leave the scale alone; and "clustering" == a statistical technique). I never simply add a constant number of points to everyone's overall course score.

Incomplete Policy: In general, no grades of incomplete will be given. The only exception to this rule is an institutionally documented medical emergency that necessitates your complete absence from Stockton for at least two continuous semester weeks. Additionally, you must be caught up on all work up to the point where your medical emergency began and currently in the "C" range or better overall at the point where the emergency began.

Academic Honesty: Please familiarize yourself with Stockton's policy on academic honesty. Each violation is penalized by a 0 on the relevant assignment/exam/etc, plus a 10 point penalty on your overall course grade. For example, if you have one violation, you'll have a 0 on that assignment or exam plus 10 points off your overall average, but if you have two violations, you'll have grades of 0 on the two assignments/exams/etc and 20 points off your overall average. Example violations include, but are not limited to: (a) any form of cheating on an exam or assignment, (b) passing off the work of another as your own (including other students, former students, code or problem solutions found on the Internet written by someone else, etc), (c) assisting someone in violating the academic honesty policy, (d) asking someone to assist you in cheating or other academic honesty violations (even if they refuse to help you cheat), etc. [Yes, I encountered that last one once in a General Studies course.]

Computer Science Program Student Learning Outcomes: This course supports the development of the following Computer Science Student Learning Outcomes and performance indicators:

- Outcome 1. An ability to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
 - a. Students will analyze a complex computing problem.
 - b. Students will apply principles of computing and other relevant disciplines to identify solutions to a complex computing problem.
- Outcome 2. An ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
 - a. Students will design a computing-based solution to meet a given set of computing requirements.
 - b. Students will implement a computing-based solution to meet a given set of computing requirements.
 - c. Students will evaluate a computing-based solution to meet a given set of computing requirements.
- Outcome 3. An ability to communicate effectively in a variety of professional contexts.
 - a. Students will write technical documentation of a computer-based system, process, component, or program.
- Outcome 6. An ability to apply computer science theory and software development fundamentals to produce computing-based solutions.
 - a. Students will apply computer science theory to produce computing-based solutions.
 - c. Students will evaluate the effects of alternative data representations and algorithms on the performance of computing-based solutions.

Course IDEA Objectives: The objectives of this course include:

- Gaining a basic understanding of the subject (terminology, methods, trends of the field of artificial intelligence with particular emphasis on computational intelligence, as well as the fundamental principles and theories of the field of artificial intelligence, focusing specifically on the theories underlying artificial intelligence search and problem solving strategies).
- Learning to apply the algorithms of the field of artificial intelligence to solving problems of real-world importance.
- Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course.
- Learning appropriate methods for collecting, analyzing, and interpreting numerical information.

Exams: The exams are not cumulative. Exam 1 is in class and closed book, and you are allowed 1 page of notes on standard letter sized paper (8.5" by 11"). You may use both sides of the paper for your notes. No other resources are allowed during Exam 1. Exam 2 is a take-home exam completed within Blackboard, so you are allowed your textbook and notes for exam 2.

Make-Up Exams: Make-up exams will not be given (i.e., missed exam = 0), with the following exceptions:

1. Medical excuse: Provide documentation the first class you return after the missed exam. I suggest providing the documentation to the Wellness Center who will then contact all of the instructors of your courses.
2. Other institutional excuses: Situations may arise related to Stockton that prevents you from being able to attend an exam. In most such cases, you should be aware of the conflict beforehand. Thus, I must be notified one week prior to the missed exam. Send me e-mail via Blackboard with the details of the planned absence, and provide written documentation (e.g., memo from sports coach, from faculty sponsoring a field trip, etc).
3. Based on University policy (<https://stockton.edu/policy-procedure/documents/procedures/2030.pdf>), if you are to be absent for a religious holiday on the date of an exam, you must notify me of that planned absence during the first 10 business days of the semester.

Homework / Problem Sets / Programming Assignments: Homework will consist of sets of problems related to course topics; and some will involve programming or use of some other AI related system. Unless otherwise indicated, homework is to be done individually. Programming assignments will either require Java, or in some cases give you the option of Java or Python 3 (Note: No assignments will be accepted if completed using Python 2. If you choose to use Python, it must be Python 3.x).

Due Dates: Depending on the nature of the homework assignment, they will either be due: (a) on paper at the beginning of a class session; or (b) electronically via Blackboard for assignments involving programming. Assignments (involving programming) that must be submitted electronically will be due by 11:59pm. Problem Sets can optionally be submitted electronically, but will be due by class time whether submitted on paper or electronic. Late assignments are penalized 25% if less than 24 hours late, 50% if less than 48 hours late, and 75% if less than 72 hours late. The first time an assignment is late (within 72 hours of deadline), the late penalty will be waived. **Assignments that are submitted more than 72 hours late receive a grade of 0.** These are calendar hours. E.g., if an assignment is due at classtime on Friday, then 72 hours late is classtime on Monday.

Topics Covered in Course: The following topics are covered in the course (not necessarily in this order):

- What is AI? Brief History of AI, and AI's Foundations (Chapter 1)
- Intelligent Agents: what they are, rational behavior, an agent's environment, structure of an agent (Chapter 2)
- Solving problems by searching: Uninformed Search (Chapter 3, sections 3.1—3.4)
- Solving problems by searching: Informed (or Heuristic) Search (Chapter 3, sections 3.5—3.7)
- Constraint Satisfaction (Chapter 6)
- Adversarial Search (i.e., Game Search) and Game Playing (Chapter 5)
- Local Search, including Hill Climbing, Simulated Annealing, Tabu Search (Chapter 4, section 4.1, plus additional supplemental content)
- Genetic algorithms and evolutionary computation (Chapter 4, section 4.1, plus additional supplemental content)
- Swarm Intelligence (not in book)
- Knowledge Representation (Chapter 7 and parts of Chapters 8 and 9)
- A Machine Learning related topic if there is time (specific topic to be determined)

Important Dates:

- **Exam 1:** March 9 and March 11: Exam 1 will be divided into two parts. Part 1 will be in class on Monday March 9 and Part 2 will be in class on Wednesday March 11.
- **Spring Break:** March 16, 18, 20: No classes, Spring Break.
- **Precepting Day:** Wednesday, April 8: No classes, Preceptorial Advising.
- **Exam 2:** Exam 2 is a take-home exam, completed within Blackboard. You will be limited to a maximum of 3 hours to complete the exam. You can choose your own 3 hours, starting no sooner than May 4, 12:01am, and ending no later than May 5, 11:59pm. The time constraints will be strictly enforced automatically by Blackboard. The purpose for the length of 3 hours is to deal with any technical issues that might come up (e.g., if you lose internet access in the middle). If that happens, log back into Blackboard right away and you can continue from where you left off. It is configured to allow you to continue, but the timer will keep running. I won't add time for you unless the technical problem lasted for an extended period of time, as I consider 1 hour of the 3 hours to serve that specific purpose. **WARNING: Do not try to take the exam on a phone's web browser.** The testing functionality of Blackboard does not work well on phone browsers. If you try taking the exam on a phone, and encounter technical difficulties (which you will), that is your own fault for ignoring this warning (i.e., you won't be given extra time, you won't be given an extra attempt at exam, etc---if necessary, I will have someone check the Blackboard logs for the OS and web browser you used to access the exam).