CSCI 4463: Artificial Intelligence
Spring 2023 Syllabus (Hybrid)

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E-mail (other than this course): See campus directory for address.

Masks Required in this Class: Per Stockton's current COVID policy (as of the writing of this syllabus), faculty may require masks to be worn in classes. If Stockton's policy changes, we'll adjust the course mask policy for consistency as needed. For now, masks must be worn during class. The information desk in the Campus Center, as well as the library, has masks freely available if you forget to bring one.

Hybrid Course: The course is offered in the **Hybrid** modality. This means that the course is partially face-to-face, and partially online.
- **Online Portion of Course:** The online portion of the course is actually the "lecture" portion of the course, and consists of videos on all of the course topics. You are expected to view these in time to complete the associated assignments, and exams; and for preparation for the in person portion of the course. One of the benefits of conducting the lectures asynchronously online is that you can choose to rewatch parts as needed for review. An additional benefit is that if you are sick or otherwise have an emergency that requires your absence, you can view the lecture at the time that you choose.
- **Face-to-Face Portion of Course:** During the weekly, in-person portion of the course, we will: (a) answer the questions that you have about the course topics; (b) get additional assistance on the assignments; (c) work on parts of assignments; (d) review for exams; and (e) take exams.

IMPORTANT: Although the course meets only 2 hours per week in person, **this is a 4-credit course**. In addition to time outside of class completing homework assignments, reviewing for exams, etc., you have the additional 2 hours per week for viewing the video lectures (see first bullet-point above). If you treat this as a 2-credit course and skip the video lectures, you will almost certainly fail.

Course Time and Location: Attendance during the face-to-face portion of the course is **required**, and it meets the following days/times and in the following locations:
- Mondays, 3:35pm-5:25pm, D027.

Office Hours:
- Mondays/Wednesdays, 12:45pm-2:00pm, G116 **[Mask required]**
- Other days/times by appointment

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: CSCI 3103: Data Structures & Algorithms I (C or better)

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.

Required Textbook:
- Artificial Intelligence: A Modern Approach, 4th, 2020, (S Russell & P Norvig), ISBN: 9780134610993. **You MUST have the 4ᵗʰ Edition.** The 3rd edition is old. The 4ᵗʰ Edition is the first update in over 10 years.

List of Course Topics (with relevant textbook chapters, etc):
- Introduction to A.I. (Chapter 1)
- Intelligent Agents (Chapter 2)
- Uninformed Search (Chapter 3: Sections 3.1, 3.2, 3.3, 3.4)
- Heuristic (or Informed) Search (Chapter 3: Sections 3.5, 3.6)
- Robot Motion Planning (Chapter 26: Section 26.5, pages 938-955)
- Constraint Satisfaction Problems (Chapter 6)
- Game Search (Chapter 5)
- Local Search (Chapter 4: Section 4.1, plus more coverage in videos/notes not in the textbook)
- Stochastic Sampling Search (Not in textbook)
- Evolutionary Computation (Mostly not in textbook, some minimal coverage in Section 4.1.4, but covered in much greater detail in course videos and notes posted in Blackboard).

Course Content: Course lectures are within Blackboard. The **"Topics (Videos and Notes)"** page is where you will find all of the course topics. For each topic, I recorded several videos, as well as have provided in note form any PowerPoint slides I used during the videos. If you don't watch the videos, then you won't do well in the course. Not watching the videos would be equivalent to not attending half of the class sessions.

Grading: Homework Assignments   50%
                         Exam 1   25%
                         Exam 2   25%

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 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.

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.

Stockton Computer Science 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.

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.]

Exams: The exams are not explicitly cumulative, although many concepts covered in the course build on earlier topics. **You are allowed to use one page (standard letter-size paper, 8.5in by 11in), double-sided, paper notes only during the exams.** You are not allowed to use any other resources during exams (no electronic devices other than the lab computer on which you are taking the exam). During the exams, the lab computers will be restricted so that the only thing you can access is Blackboard via a web browser. Other devices (including calculators) are not allowed. Textbooks, and other books, are also not allowed. You are, however, allowed two blank letter-sized paper pages for scrap paper during the exams, in case you need to work through something by hand.

Make-Up Exams: Make-up exams will not be given (i.e., missed exam = 0), with the following exceptions:
1. Medical excuse: Provide documentation, preferably to the Wellness Center who will then contact all of the instructors of your courses.
2. 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 Assignments: Homework will consist of sets of problems related to course topics; and some will involve programming. Unless otherwise indicated, homework is to be done individually. There are a small number of assignments where small teams are allowed, and those assignments explicitly indicate the size of teams that are allowed. Homework that involves programming will either require Java specifically (e.g., if I'm giving you code that is in Java), or in some other cases you will have 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). Most of the homework assignments will include problems, exercises, and review questions related to the course topics. These must all be done independently.

- **Paper then Scan**: I strongly suggest that problems involving math or where you need to show a diagram of some type are done on paper and then scanned to submit in Blackboard. It will probably take you less time to do it that way, then to try to format math in Word or some other word processing software, or to use some drawing software to draw the relevant diagram.
- **Phone PDF Scanner Apps**: If you don't have a scanner, there are some good (and free) apps available for phones that use your phone camera to scan a document as a pdf (including multipage documents). One such app that I have personally used on Android is "Office Lens" from Microsoft. It is free and even has no ads (some of the other free aps have ads).
- **Programming**: For assignments involving programming just submit the source code and anything else specified on the assignment page.

Due Dates: Homework Assignments are due in Blackboard by 11:59pm on the dates due (dates found in Blackboard on the assignment pages). Late assignments are penalized as follows: (a) 25% off if late by no more than 24 hours, (b) 50% off if late by no more than 48 hours, (c) 75% off if late by no more than 72 hours, and (d) a grade of 0 if late by more than 72 hours. The first time a homework assignment is late (within 72 hours), the late penalty is waived.

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.

Timeline: The following chart indicates approximately where you should be in terms of viewing the video lectures throughout the semester. You should use this as a plan for when to complete viewing of the video lectures. The 3rd column also lists when assignments are due (11:59pm on the deadlines).

Homework Assignment Numbering: The homework assignments are numbered in the order that I think you should start working on them, and not in the order when they are due. Homework assignments 4, 7, and 12 all involve programming and are more involved than the other assignments.

Date	Topic (Use as Guide to Plan Video Lecture Viewing)	Assignments Due
January 23	Course Overview, Intro to AI	
January 30	Intelligent Agents	Homework 1
February 6	Uninformed Search	Homework 2
February 13	Heuristic Search	Homework 3
February 20	Robot Motion Planning	Homework 5
February 27	Constraint Satisfaction	Homework 6
March 6	**Exam 1:** Intro AI, Agents, Uninformed Search, Heuristic Search, Robot Motion Planning, Constraint Satisfaction	Homework **4** (Mar 10)
March 13	**NO CLASS: Spring Break**	
March 20	Game Search	Homework 8
March 27	Local Search	Homework **7** (Mar 29)
April 3	Stochastic Sampling Search	Homework 9
April 10	Evolutionary Computation	Homework 10
April 17	Evolutionary Computation	Homework 11
April 24	**Exam 2 (last in-person meeting):** Game Search, Local Search, Stochastic Sampling Search, Evolutionary Computation	
May 1	**No course meeting during finals week, but last assignment is due on May 1 (must be on time, no late waivers, late=0 for this one).**	Homework 12 (May 1)