CSCI 4463: Artificial Intelligence
Spring 2025 Syllabus

Instructor: Dr. Vincent A. Cicirello **Office:** G116
E-mail (course related): Use course Blackboard Course Messages tool. **Phone (office):** x3526
E-mail (other than this course): See campus directory for address.

Hybrid Course: The course is offered in the **Hybrid** modality. This means that the course is partially face-to-face, and partially online.

- **Online (1/3):** The online portion of the course is part of 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 (2/3):** During the weekly, in-person portion of the course, we will: (a) cover additional topics; (b) answer the questions that you have about the course topics; (c) get additional assistance on the assignments; (d) work on parts of assignments; (e) review for exams; and (f) take exams.

IMPORTANT: Although the course meets only 2.5 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 1.5 hours per week for viewing the video lectures (see first bullet-point above). If you treat this as a 2.5-credit course and skip the video lectures, you probably won't do well.

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 (G108) / Wednesdays (F212), 11:20am-12:35pm.

Office Hours:

- Wednesdays 12:45pm – 2:00pm (G116)
- Other times (on campus in G116) on Mondays/Wednesdays by appointment.
- Other times (virtual via Zoom) on Tuesdays/Thursdays by appointment.
- You can also just drop by my office, and if I'm there I'm happy to assist you.

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 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 1/3 of the class sessions.

Grading:	Homework Assignments	50%
	Exams (3)	50%

Grading Scale:

A: at least 90.00	A-: at least 89.50	B+: at least 89.00
B: at least 80.00	B-: at least 79.50	C+: at least 79.00
C: at least 70.00	D: at least 60.00	F: less than 60.00

Note: The chart above deliberately does not include C-, D+, or D-. Those grades are not used in this course. **Another note:** 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 C/D or D/F boundaries. 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. What is clustering? For a non-technical explanation, consider the hypothetical question, "Are the grades of this student, who is currently in the B range, more like the grades of the A students, more like the grades of the rest of the B students, or somewhere in between the two?" Clustering may take a student in the B range from the scale above (at least 80.00), and either keep them in the B range if their grades are more like the rest of the B students, or bump them all the way up to the A range if their grades are more like the A students, or bump them partially up to either B+ or A- if they are somewhere in between.

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 algorithms from 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.

Generative A.I. Prohibited: I know how ironic this policy is for this course. However, given that the objectives of the course are to learn about how to develop A.I. systems, using Generative A.I. to complete assignments would defeat those learning objectives. You don't want to just learn to use A.I. You want to learn to build A.I. Thus, generative artificial intelligence (AI) programs, such as ChatGPT, GitHub Copilot, and other similar systems, may **not** be used for any work or assignments required in this course. Although you will undoubtedly need to use such tools in your future careers, it is important that you develop your programming skills and problem solving skills so that you can later effectively use such tools to enhance your productivity. Copilot, ChatGPT, etc often produce solutions that are buggy, only partially correct, among other issues that one must address with their own programming skills. The use of generative AI programs defeats the programming requirements and critical thinking skills that are vital to achieving our learning outcomes. Submission of partial or complete work from generative AI programs is not permitted and will be treated as an Academic Honesty violation, and handled in accordance with the course Academic Honesty procedure (see below) as well as Stockton's Student Academic Honesty Procedure and handled in accordance with these Procedures.

Academic Honesty: Please familiarize yourself with Stockton's Student Academic Honesty Procedure. 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, code generated by generative A.I. such as but not limited to ChatGPT, GitHub Copilot, 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 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 22	Course Overview, Intro to AI	
January 27	Intelligent Agents	
January 29	Intelligent Agents	Homework 1
February 3	Uninformed Search	
February 5	Uninformed Search	Homework 2
February 10	Heuristic Search	
February 12	Heuristic Search	Homework 3
February 17	Heuristic Search	
February 19	Robot Motion Planning	
February 24	Robot Motion Planning	Homework 5
February 26	Review for Exam 1	
March 3	**Exam 1:** Intro AI, Agents, Uninformed Search, Heuristic Search, Robot Motion Planning	
March 5	Constraint Satisfaction	Homework **4** (Mar 7)
March 10	**SPRING BREAK: NO CLASS**	
March 12	**SPRING BREAK: NO CLASS**	
March 17	Constraint Satisfaction	Homework 6
March 19	Game Search	
March 24	Game Search	Homework 8
March 26	Review for Exam 2	
March 31	**Exam 2:** Constraint Satisfaction, and Game Search	
April 2	**PRECEPTING DAY: NO CLASS**	Homework **7** (April 4)
April 7	Local Search; and Stochastic Sampling Search	
April 9	Local Search; and Stochastic Sampling Search	Homework 9
April 14	Evolutionary Computation	
April 16	Evolutionary Computation	Homework 10
April 21	Evolutionary Computation	
April 23	Review for Exam 3	Homework 11
April 28	**Exam 3:** Local Search, Stochastic Sampling Search, Evolutionary Computation	
April 30	Topic to be announced later	
	No course meeting during finals week, but last assignment is due on May 7 (must be on time, no late waivers, late=0 for this one).	Homework 12 (May 7)