

## Chino Valley Unified School District High School Course Description

A. CONTACTS	
<b>1. School/District Information:</b>	School/District: Chino Valley Unified School District Street Address: 5130 Riverside Dr., Chino, CA 91710 Phone: (909) 628-1201 Website: www.chino.k12.ca.us
<b>2. Course Contact:</b>	District Contact: Office of Secondary Curriculum and Instruction Position/Title: Director of Secondary Curriculum and Instruction Site: District Office Phone: (909) 628-1201 X1630
B. COVER PAGE - COURSE ID	
<b>1. Course Title:</b>	Introduction to Artificial Intelligence Honors
<b>2. Transcript Title/Abbreviation:</b>	Intro to AI H
<b>3. Transcript Course Code/Number:</b>	5E80
<b>4. Seeking Honors Distinction:</b>	Yes
<b>5. Subject Area/Category:</b>	Meets UC/CSU "g" elective: mathematics-computer science
<b>6. Grade Level(s):</b>	9-12
<b>7. Unit Value:</b>	5 units Semester Credit
<b>8. Course Previously Approved by UC:</b>	No
<b>9. Classified as a Career Technical Education Course:</b>	No
<b>10. Modeled after an UC-approved course:</b>	Yes
<b>11. Repeatable for Credit:</b>	No
<b>12. Date of Board Approval:</b>	April 21, 2022
<b>13. Brief Course Description:</b>	Introduction to Artificial Intelligence Honors is a semester course that empowers students through programming and problem-solving, to delve into the varied fields of Informatics like Artificial Intelligence, Data Mining/Analysis, and Social Computing. Uniting application-specific approaches in Cognitive Systems, Machine Learning, and Robotics, students explore creative applications of algorithms to a wide range of real-world challenges in math, science, language, and art. Projects in this course concentrate on developing interdisciplinary applications of information science, especially in its application of Artificial Intelligence, with a focus on the design and implementation of intelligent agents that perform tasks with some degree of autonomy.
<b>14. Prerequisites:</b>	None
<b>15. Context for Course:</b>	Aligned with the California K-12 Computer Science Standards, this course empowers students through programming and problem-solving to delve into the varied fields of Informatics like Artificial Intelligence. Students explore creative applications of algorithms to a wide range of real-world challenges in math, science, language, and art. Projects in this course concentrate on developing interdisciplinary applications, especially in its application of Artificial Intelligence with a focus on the design and implementation of intelligent agents that perform tasks with some degree of autonomy.
<b>16. History of Course Development:</b>	Informatics or "data science" and the use of Artificial Intelligence technologies is growing rapidly in our society. Just a few AI applications include self-driving cars, personal assistants, product recommendations, robotics, data analysis, and web searching. These applications involve self-learning systems that are trained based on massive amounts of data which usually includes intelligence based on algorithms.

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<b>17. Textbooks:</b>	<b>Suggested Text</b> Artificial Intelligence: A Modern Approach, Russell, Stuart and Norvig, Peter, Pearson Education, Limited 3rd Edition 2014, <a href="http://aima.cs.berkeley.edu/">http://aima.cs.berkeley.edu/</a> Think Python: How to Think Like a Computer Scientist, Downey, Allen B., Green Tea Press, Second Edition, <a href="http://greenteapress.com/wp/think-python-2e/">http://greenteapress.com/wp/think-python-2e/</a>
<b>18. Supplemental Instructional Materials:</b>	<b>Websites</b> Machine Learning Repository at University of California at Irvine (UCI), University of California at Irvine, <a href="http://archive.ics.uci.edu/ml/index.php">http://archive.ics.uci.edu/ml/index.php</a> IDLE is Python’s Integrated Development and Learning Environment, Python Software Foundation, <a href="https://docs.python.org/3.4/library/idle.html">https://docs.python.org/3.4/library/idle.html</a> Python Integrated Development Environment, JetBrains s.r.o., <a href="https://www.jetbrains.com/pycharm/">https://www.jetbrains.com/pycharm/</a> Google Colab, Google, <a href="https://colab.research.google.com/notebooks/welcome.ipynb">https://colab.research.google.com/notebooks/welcome.ipynb</a> Github, Github, Inc., <a href="https://github.com/">https://github.com/</a> Python, Python Software Foundation, <a href="https://www.python.org/">https://www.python.org/</a> TensorFlow – create machine learning models, TensorFlow, <a href="https://www.tensorflow.org/">https://www.tensorflow.org/</a> Keras, Keras, <a href="https://keras.io/">https://keras.io/</a> Matplotlib - Python 2D plotting library which produces publication quality figures, John Hunter, Darren Dale, Eric Firing, Michael Droettboom, Matplotlib development team; 2012 – 2018, <a href="https://matplotlib.org/">https://matplotlib.org/</a>

### C. COURSE CONTENT

**1. Course Purpose:**  
 Uniting application-specific approaches in Cognitive Systems, Machine Learning, and Robotics, students explore creative applications of algorithms to a wide range of real-world challenges in math, science, language, and art. Projects in this course concentrate on developing interdisciplinary applications of information science, especially in its application of Artificial Intelligence with a focus on the design and implementation of intelligent agents that perform tasks with some degree of autonomy.

- Students will acquire the fundamentals of programming in the Python Programming Language to facilitate developing applications capable of retrieving, searching, manipulating, analyzing, and displaying data
- Students gain competency and fluency with the vocabulary of algorithms, informatics, big data, and artificial intelligence through exposure to a variety of sources and diverse perspectives.
- Students will develop critical thinking, problem-solving, computational thinking, effective communication, and teamwork skills. Students will express their understanding of the legal, policy, and ethical factors through class discussion of a weekly topic, conducting research on a related topic, and a presentation of their research to the class.

**2. Course Outline:**

Unit 1: Introduction to Programming with Python

- Fundamentals of programming with Python
- Visualizing data in Python with charts, graphs, and tables
- Integrated Development Environments: IDLE, PyCharm, and Google Colab (Jupyter)

Unit 2: Algorithms

This unit explores the basics of algorithms and their relevance to our daily lives so students will gain the basic understanding the impact of a data-driven society.

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- What are the different types of algorithms? How do they work? How do they affect daily life? Are algorithms fair, discriminatory, racist, biased etc.?
- What regulations are currently in place? What are the social and ethical concerns of the use of automated algorithms in place of human judgment?

### Unit 3: Informatics – Machine Learning and Data Science

This unit explores data mining techniques, classification and prediction, evaluation and interpretations. Students extract knowledge from large datasets using the UCI Machine Learning Repository, TensorFlow, and Keras, and express data in visualizations using Matplotlib and NumPy.

### Unit 4: Artificial Intelligence

Describe models of intelligent behavior and what distinguishes humans from machines.

- History and Foundations
- Decisions using Algorithms
- Machine Learning Algorithms
- Benefits and dangers

## **3. Key Assignments:**

### Unit 1: Introduction to Programming with Python

- Game Design and Basic AI principles: Rock Paper Scissors (RPS)
- Game Design and Basic AI principles: Standard Card Games (BlackJack)
- Data Representation: 2D location mapping.

### Unit 2: Algorithms

- Students will develop a sorting algorithm and implement using Python
- Students select one of the algorithm types, conduct research, and create a 5–7-minute presentation

### Unit 3: Informatics – Machine Learning and Data Science

- Classification Lab: identification through a neural network of MNIST (handwritten numerals) and Fashion MNIST (clothing images) data sets.
- Regression Lab: calculation of future values based on Space Shuttle Launch Data and Automobile Average MPG (miles per gallon) Data.

### Unit 4: Artificial Intelligence

- Students will select and research a specific Artificial Intelligence - used in homes, healthcare, AI based games, manufacturing, self-driving cars, warfare, etc.
- Students will write a 5-7 page paper addressing the concepts in this unit.

## **4. Instructional Methods and/or Strategies:**

### Lectures

Course lectures focus on coverage of specific content and skills intended to develop student proficiency with computer science topics. Students are encouraged to ask questions throughout each lecture to provide clarification and explore subject matter topics in more detail.

### Individual Programming Projects

Students complete several individual software system models to demonstrate their mastery of first-semester programming skills.

### Team Programming Projects

Students collaborate in the requirements, design, prototyping, and implementation of complete software systems and demonstrate their ability to apply software lifecycle models and practical programming methodologies.

### Online Instructional Materials

A curated selection of videos and readings from artificial intelligence and informatics websites supplement the core materials presented in class.

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### Textbook Readings

Text selections and code excerpts from several textbooks are used as a reference to reinforce the major concepts covered in lectures. The course will also draw upon a variety of additional references and readings to supplement the topics available in the textbooks

### Guest Speakers

An industry professional focused on data science, artificial intelligence, and privacy will speak to the class.

### Quizzes

Weekly quizzes provide a snapshot of current student comprehension of current course topics and include a mix of questions including true/false, multiple-choice, short answer, and diagram.

### Class Participation

Students are responsible for promoting a logically leading course of questioning through each lecture.

### Lab Assignments

The most significant part of the course grade depends on the submission of completed projects and programs.

### Discussions

Class discussion of a weekly topic, conducting research on a related topic, and a presentation of their research to the class. A closed discussion forum will also be used and students are expected to demonstrate clear technical writing skills.

### Semester Project

The semester project unites all of the concepts in the course together, in a team-based creation of an artificial intelligence system using Python.

### **5. Assessment Including Methods and/or Tools:**

The evaluation of student progress and evaluation will be based on the following criteria outlined in Board Policy:

- Assessments: 60-75% of the final grade
- Assignments and class discussions: 25-40% of the final grade