Subject:	CIS
Course Number:	181
Descriptive Title:	Artificial Intelligence (AI) Fundamentals
Division:	Business
Department:	Computer Information Systems
Course Disciplines:	Computer Information Systems
Catalog Description:	This course is a survey of artificial intelligence (AI) where students explore different technologies utilizing concepts and skills widely accepted for AI and digital competency. Classification algorithms, supervised vs. unsupervised learning, data preparation, and training/using learning models for predictions are presented.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	CIS 13 or equivalent experience
Enrollment Limitation:	
Hours Lecture (per week):	2
Hours Laboratory (per week):	3
Outside Study Hours:	4
Total Course Hours:	90
Course Units:	3
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	
Transfer UC:	Yes
Effective Date:	
General Education ECC:	
Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	
Term:	
Other:	
CalGETC:	

Term:	
Other:	
Student Learning Outcomes:	At the end of this course, students will be able to: 1. Describe and apply fundamental concepts of artificial intelligence, including machine learning, natural language processing, and computer vision, to analyze and solve practical problems using Python-based tools. 2. Collect, prepare, and evaluate data sets to train and test machine learning models, and interpret model performance metrics such as accuracy, precision, and recall to make data-informed decisions. 3. Identify and evaluate ethical, legal, and social implications of AI systems, including issues of bias, transparency, and algorithmic fairness, and propose strategies for responsible AI deployment.
Course Objectives:	1. Analyze the evolution, core concepts, and applications of artificial intelligence and machine learning, including the AI project cycle and distinctions between supervised and unsupervised learning. 2. Evaluate the ethical, legal, and social implications of AI systems, applying concepts such as algorithmic fairness, privacy, and responsible implementation to real-world case studies. 3. Collect, prepare, and visualize data from various sources to support model training, demonstrating the ability to transform raw data into meaningful insights. 4. Design and implement basic machine learning models—such as decision trees, support vector machines, and neural networks—using Python to classify or predict outcomes. 5. Interpret computer vision processes by applying image segmentation, object detection, and recognition techniques to analyze visual data. 6. Develop and test natural language processing solutions, including sentiment analysis and simple chatbot prototypes that demonstrate text or speech understanding. 7. Assess the principles of robotics and autonomous systems by examining how sensing, navigation, reinforcement learning, and human–robot interaction contribute to intelligent behavior.
Major Topics:	**LECTURE TOPICS (36 Hours Total)** **I. Introduction to Artificial Intelligence (3 hours, Lecture)** A. Definition, scope, and historical context of AI B. Major disciplines – machine learning, NLP, computer vision, robotics C. Applications of AI in society, business, and daily life D. Ethical and economic implications of AI 1. Bias and fairness 2. Automation and workforce impact **II. The AI Project Cycle and Digital Literacy (3 hours, Lecture)** A. AI project life cycle: problem definition, data collection, modeling, evaluation B. Human-centered and ethical design principles C. Digital literacy and collaboration tools for AI development

1. Data ethics and information security
2. Curating and verifying information sources

III. Data Fundamentals and Visualization (3 hours, Lecture)

A. Data types and sources (structured, unstructured, IoT)
B. Data collection, cleaning, and transformation
C. Data visualization and interpretation
D. Understanding bias and representation in datasets

IV. Introduction to Machine Learning (3 hours, Lecture)

A. Supervised vs. unsupervised learning
B. Classification and regression models
C. Training, testing, and validation processes
D. Performance metrics (accuracy, recall, precision, F1 score)

V. Applied Machine Learning (3 hours, Lecture)

A. Decision trees, KNN, and support vector machines
B. Feature selection and engineering
C. Model optimization and hyperparameter tuning
D. Comparing model performance

VI. Neural Networks and Deep Learning (3 hours, Lecture)

A. Structure of artificial neurons and layers
B. Activation functions and backpropagation
C. Convolutional and recurrent networks overview
D. Frameworks: TensorFlow and Keras

VII. Natural Language Processing (3 hours, Lecture)

A. Fundamentals of NLP: tokenization, stemming, sentiment analysis
B. Machine translation and text classification
C. Chatbots and generative AI
D. Ethical issues in NLP (bias, misinformation)

VIII. Computer Vision (3 hours, Lecture)

A. Image representation and preprocessing
B. Object detection and image classification
C. Facial recognition, surveillance, and privacy concerns

IX. Robotics and Reinforcement Learning (3 hours, Lecture)

A. Robotic sensing, manipulation, and navigation
B. Reinforcement learning: agents, states, rewards, actions
C. Path planning and autonomous decision-making

X. AI Ethics and Governance (3 hours, Lecture)

A. Algorithmic fairness, accountability, and transparency
B. Legal frameworks, policies, and responsible AI practices
C. Case studies of AI misuse and governance challenges

XI. AI in Practice and Emerging Trends (3 hours, Lecture)

A. AI in industry sectors: business, healthcare, education, cybersecurity
B. Cloud-based AI platforms (AWS, Azure, Google AI)
C. Generative AI and large language models

XII. Capstone AI Project (3 hours, Lecture)

A. Project planning and proposal
B. Integration of AI techniques and ethical reflection
C. Presentation and evaluation of final results

LABORATORY TOPICS (54 Hours Total)

I. Orientation to AI Tools and Applications (4 hours, Lab)

A. Explore AI demos and real-world applications
B. Discuss social and economic implications of automation

II. AI Project Cycle and Collaboration Labs (4 hours, Lab)

A. Configure Google Colab, Kaggle, and data environments
B. Collaborate using shared notebooks and datasets

III. Data Fundamentals and Visualization Labs (4 hours, Lab)

A. Import, clean, and analyze data with pandas and NumPy
B. Visualize data using matplotlib or Seaborn

IV. Introductory Machine Learning Labs (4 hours, Lab)

A. Build and train basic classifiers (logistic regression, decision tree)
B. Evaluate performance and create visual reports

V. Applied Machine Learning Labs (4 hours, Lab)

A. Compare KNN, SVM, and decision tree models
B. Tune hyperparameters and analyze confusion matrices

VI. Neural Networks and Deep Learning Labs (5 hours, Lab)

A. Implement and train a neural network using Keras
B. Visualize learning curves and test model generalization

VII. Natural Language Processing Labs (5 hours, Lab)

	A. Tokenize and clean text data B. Perform sentiment analysis and build a simple chatbot **VIII. Computer Vision Labs (5 hours, Lab)** A. Apply image classification using pretrained CNN models B. Evaluate model accuracy and discuss limitations **IX. Robotics and Reinforcement Learning Labs (5 hours, Lab)** A. Simulate reinforcement learning in Python (e.g., OpenAI Gym) B. Experiment with reward tuning and policy performance **X. AI Ethics and Responsible Design Labs (4 hours, Lab)** A. Investigate real-world cases of bias in AI systems B. Develop an ethical risk mitigation plan **XI. AI in Practice and Cloud Labs (4 hours, Lab)** A. Use cloud-based APIs (AWS Rekognition, Google Vision, Azure AI) B. Build and deploy a simple AI-enabled application **XII. Capstone Project Labs (6 hours, Lab)** A. Develop, test, and refine final AI project (ML, NLP, or CV focus) B. Present findings through visuals, reports, and demonstrations
Total Lecture Hours:	36
Total Laboratory Hours:	54
Total Hours:	90
A.1. Primary Methods of Evaluation (Part 1 - CCN courses only):	
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	For this assignment, you'll apply your AI problem-solving skills by building and testing a supervised machine learning model using real-world data. Start by choosing a dataset from a public source such as Kaggle or the UCI Machine Learning Repository—something that addresses a real problem like spam detection, loan approval, or disease prediction. Use Python libraries such as pandas and NumPy to clean and prepare the data for analysis. Then, train at least two different models (for example, a Decision Tree and K-Nearest Neighbor) using scikit-learn. Evaluate and compare their performance using metrics like accuracy and precision, and use visualizations such as a confusion matrix to present your results. Your final submission should include a short written summary that explains your findings and discusses any data bias or ethical considerations you observed. Be sure to demonstrate clear reasoning, proper coding practices, and well-organized presentation of your results.

Critical Thinking Assignment 1:	In this assignment, you will examine how bias can arise in artificial intelligence systems and explore ways to address it responsibly. Begin by selecting a real-world example of algorithmic bias—such as facial recognition errors, biased hiring algorithms, or predictive policing systems. Research how bias was introduced into the system, whether through the data used, the labeling process, or the algorithm's design. Next, analyze the ethical and social consequences of the biased system, describing its impact on individuals, groups, or communities. Then, propose solutions to reduce or prevent such bias, such as improving data diversity, increasing transparency in algorithms, or establishing stronger oversight and accountability measures. Your analysis should be supported by at least two credible scholarly or industry sources. In your written summary, demonstrate critical thinking by connecting the technical causes of bias to their broader ethical and societal effects, and clearly explain how your proposed solutions address those issues.
Critical Thinking Assignment 2:	In this assignment, you will compare different machine learning algorithms to decide which one performs best for a specific problem. Using a dataset such as housing prices, spam detection, or customer churn, create at least two models (for example, a Decision Tree and a Logistic Regression) in Python with scikit-learn. Evaluate each model's performance using metrics like accuracy, recall, and precision, and explain which algorithm is better suited for your data and why. In your analysis, consider factors such as dataset size, feature quality, and computational efficiency. Finally, reflect on the trade-offs between accuracy, interpretability, and ethical concerns, such as bias or overfitting. Your written summary should clearly present your reasoning, use evidence from your data analysis, and demonstrate thoughtful consideration of both technical and ethical perspectives.
Other Evaluation Methods:	Class Performance, Laboratory Reports, Objective Exam, Performance Exams, Quizzes
If Other:	
Instructional Methods:	Demonstration, Discussion, Group Activities, Lab, Lecture, Multimedia presentations
If other:	
Work Outside of Class:	Problem solving activity, Required reading, Skill practice, Study, Written work (such as essay/composition/report/analysis/research)
If Other:	
Up-To-Date Representative Texts:	**Ertel, Wolfgang.** *Introduction to Artificial Intelligence.* 3rd Edition. Springer, 2023. https://link.springer.com/book/10.1007/978-3-658-43102-0. Licensed under CC BY 4.0.
Alternative Texts:	
Required Supplementary Readings:	
Other Required Materials:	
Requisite	
Category	
Requisite course:	

Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill(s). if applicable	
Requisite course:	CIS 13
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	**Identify and analyze existing and emerging technologies and their impact on organizations and society including computer, communication and information systems, privacy, security, crime, ethics, global relationships, and career opportunities.** CIS 13 - Identify and analyze existing and emerging technologies and their impact on organizations and society including computer, communication and information systems, privacy, security, crime, ethics, global relationships, and career opportunities.
Requisite Skill:	
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). if applicable	
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Hac Le
Date:	10/10/2025
Original Board Approval Date:	01/21/2026
Effective Term:	FA 2026