STATE UNIVERSITY OF NEW YORK

COLLEGE OF TECHNOLOGY

CANTON, NEW YORK

MASTER SYLLABUS

DATA 240, AI Fundamentals

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SCHOOL OF SCIENCE, HEALTH, & CRIMINAL JUSTICE

CYBERSECURITY DEPARTMENT

Spring 2024

A. **TITLE**:   **AI Fundamentals**

B. **COURSE NUMBER:** DATA 240

C. **CREDIT HOURS: 3**

D. **WRITING INTENSIVE COURSE**: n/a

E. **GER CATEGORY:** n/a

F. **SEMESTER(S) OFFERED:**   Fall and Spring

G. **COURSE DESCRIPTION:** This course introduces students to the foundational concepts of artificial intelligence (AI). It covers the history, basic principles, methodologies, and applications of AI. By the end of the course, students will have a solid understanding of AI's core concepts and its significance in today's technological landscape..

H. **PRE-REQUISITES/CO-REQUISITES:**

a. Pre-requisite(s): None

I. **STUDENT LEARNING OUTCOMES:**

Course Student Learning Outcome [SLO]	PSLO ()	GER	ISLO
a. Explain basics of AI			2. Critical Thinking [CA]
b. Explain theory of AI			2. Critical Thinking [CA]
c. Describe Basic Machine Learning Concepts			2. Critical Thinking [PS]
d. Describe Neural Networks and Deep Learning			2. Critical Thinking [PS]
e. Describe Natural Language Processing (NLP)			2. Critical Thinking [PS]

f. Explain Robotics and Vision			2. Critical Thinking [PS]
g. Describe Ethics in AI			2. Critical Thinking [PS]
h. List Future Trends in AI			2. Critical Thinking [PS]

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit./Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL],* *Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J.   **APPLIED LEARNING COMPONENT:**   Yes_____   No_X_____

If Yes, select one or more of the following categories:

Classroom/Lab___   Civic Engagement___

Internship___   Creative Works/Senior Project___

Clinical Practicum___   Research___

Practicum___   Entrepreneurship___

Service Learning___   (program, class, project)

Community Service___

K.   SUGGESTED TEXTS:

1. **"Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig.**
2. **"Artificial Intelligence: Foundations of Computational Agents" by David L. Poole and Alan K. Mackworth.**
3. **"Natural Language Processing in Action" by Hobson Lane, Cole Howard, and Hannes Hapke.**
4. **"Deep Learning in practice" by Mehdi Ghayoumi (Note: Title adjusted to match the author's other works)**

L.   REFERENCES: n/a

M.   EQUIPMENT: n/a

N.   GRADING METHOD: A-F

O.   SUGGESTED MEASUREMENT CRITERIA/METHODS:

- **Participation Assignments**
- **Challenge Assignments**
- **Quizzes**
- **Exams**

P.   DETAILED COURSE OUTLINE:

Week 1: Introduction to AI

- Overview of the course, syllabus, and expectations.
- Definition and history of AI, its importance in today's world.
- SLO: Students will analyze and evaluate the theory and practice in AI contexts, fostering critical thinking skills.

Week 2: Foundations of AI

- Logic, reasoning, and knowledge representation in AI.
- Introduction to search algorithms and problem-solving.
- SLO: Students will engage in critical analysis of foundational AI concepts, enhancing their critical thinking abilities.

Week 3: Basic Machine Learning Concepts

- Understanding supervised vs. unsupervised learning.
- Exploration of basic algorithms: Regression, Decision Trees, Clustering.
- SLO: Students will apply scientific methods to data analysis, developing problem-solving skills in machine learning.

Week 4: Neural Networks and Deep Learning

- Introduction to Neural Networks and their architecture.
- Activation functions, layers, backpropagation.
- Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs).

- SLO: Students will apply scientific principles to analyze and construct neural network models, advancing their critical thinking in deep learning.

Week 5: Natural Language Processing (NLP)

- Basics of NLP, including tokenization, lemmatization, and named entity recognition.
- Applications of NLP in chatbots and conversational AI.
- SLO: Students will apply data analysis techniques to NLP, enhancing their critical thinking in language processing.

Week 6: Robotics and Vision

- Fundamentals of robotics and computer vision.
- Techniques for image recognition and processing.
- SLO: Students will apply scientific knowledge to robotics and vision tasks, promoting critical thinking in visual data analysis.

Week 7: Ethics in AI

- Discussion on bias, fairness, transparency, and accountability in AI.
- Case studies on ethical dilemmas and decision-making in AI applications.
- SLO: Students will apply data analysis principles while considering ethical implications, fostering critical thinking about the societal impact of AI.

Week 8: Future Trends in AI

- Exploration of emerging technologies such as quantum computing and AI applications in various sectors.
- Predictions and implications for the future of AI.
- SLO: Students will apply scientific analysis to predict and evaluate future AI trends, developing critical thinking about AI's evolution.

Weeks 9-14: Project Development and Iteration

- Students will work on a comprehensive project that incorporates the concepts learned throughout the course.
- The project will involve problem-solving, application of AI techniques, and ethical considerations.
- SLO: Students will demonstrate their ability to apply scientific principles to a practical AI project, showcasing their critical thinking and problem-solving skills.

Week 15: Final Project Presentations and Course Wrap-Up

- Students will present their final projects, integrating knowledge from various AI domains.
- Group critiques and feedback sessions will reinforce the critical analysis and problem-solving skills developed.
- Review of key concepts and techniques learned throughout the course.

- Final exam preparation and course evaluations.
- SLO: Students will analyze and evaluate their own work and that of their peers, culminating in a demonstration of their critical thinking and data analysis skills.

Q. **<u>LABORATORY OUTLINE</u>:**

n/a