

# CSIT 192: INTRODUCTION TO MACHINE LEARNING

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## 1. Course Information

**Subject**

CSIT - Computer Science/ Information Technology

**Course Number**

192

**School**

Science, Technology, Engineering, Mathematics

**Course Title**

Introduction to Machine Learning

## 2. Hours

**Semester Hours**

3

**Lecture**

3

**Lab**

0

**Practicum**

0

## 3. Catalog Description

**For display in the online catalog**

This course introduces the student to Machine Learning and how it is used in the development of Artificial Intelligence and other applications. The topics of data modeling, acquisition, and data exploration and why they are important for AI applications will be explained. The course will cover how to use the Python language with various libraries (NumPy, pandas, scikit-learn) and Machine Learning algorithms (supervised, semi-supervised, unsupervised, reinforcement) to solve real-world data science problems. The concepts of classification, regression, and clustering will be explored in conjunction with several Machine Learning algorithms such as k-Nearest Neighbors (KNN), Decision Trees and Linear Models. Open lab time required.

## 4. Requisites

**Prerequisites**

CSIT 191, CSIT 168, and MATH 156

## 5. Course Type

**Course Fee Code**

3

**Course Type for Perkins Reporting**

vocational (approved for Perkins funding)

## 6. Justification

**Describe the need for this course**

This is a required course for Computer Science, Associate in Applied Science with Artificial Intelligence Concentration. This course can also be used as an elective for any computer science and engineering programs. Students will master the concepts and applications of Machine Learning, study data modeling concepts and apply the fundamentals of Machine Learning algorithms to solve data science problems.

## 7. General Education

Will the college submit this course to the statewide General Education Coordinating Committee for approval as a course, which satisfies a general education requirement?

No

If the course does not satisfy a general education requirement, which of the following does it satisfy:

Program-specific requirement

## 8. Consistency with the Vision and Mission Statements, the Academic Master Plan, and the strategic initiatives of the College

Please describe how this course is consistent with Ocean County College's current Vision Statement, Mission Statement, Academic Master Plan, and the strategic initiatives of the College:

Add item	
1	Offer comprehensive educational programs that develop intentional learners of all ages and ensure the full assessment of student learning in these programs. (Mission Statement)
2	Foster educational innovation through effective teaching-learning strategies, designed to develop and nurture intentional learners who are informed and empowered. (Vision Statement)
3	Employ technology and learning outcomes assessment to ensure student success in an increasingly diverse and complex world. (Vision Statement)
4	Prepare students for entrance into the workforce and empower students through the mastery of intellectual and Practical Skills. (Academic Master Plan)
5	Challenge students to transfer information into knowledge and knowledge into action. (Academic Master Plan)

## 9. Related Courses at Other Institutions

### Transferability of Course

If not transferable to any institution, explain:

This is a required course for Computer Science, Associate in Applied Science with Artificial Intelligence Concentration. There is no known course for the schools listed here where transfer credit will be given.

## 10. Course Learning Outcomes

### Learning Outcomes

Students who successfully complete this course will be able to:	
CLO1	Explain what Machine Learning is and where it is used.
CLO2	Describe Data modeling, acquisition, and exploration and explain their importance in solving problems using Machine Learning.
CLO3	Demonstrate how to use the Python language and several libraries such as NumPy, pandas, and scikit-learn in the development of Machine Learning applications.
CLO4	Show how to apply the various types of Machine Learning including Supervised Learning, Unsupervised Learning and Reinforcement Learning and compare their advantages and disadvantages
CLO5	Examine the concepts of Classification, Regression, and Clustering and how they are used in Machine Learning.
CLO6	Apply various Machine Learning Supervised and Unsupervised algorithms such as k-Nearest Neighbors, Linear Models, Decision Trees, Support Vector Machines and Naïve Bayes Classifiers.
CLO7	Assess what a Neural Network is and how to use it to improve algorithm accuracy.

## 11. Topical Outline

(include as many themes/skills as needed)

	Major Themes/ Skills	Assignments (Recommended but not limited to)	Assessments (Recommended but not limited to)	Course Learning Outcome(s)
T01	Introduction to Machine Learning a) History of Machine Learning b) What exactly is Machine Learning and what type of problems can it solve. c) Machine Learning, trends and the future direction of the technology.	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CLO1
T02	Data Science Fundamentals a) Mathematical concepts relevant to Machine Learning: graphs, slope functions, probability, statistics, vectors and matrices b) Data and it's importance to Machine Learning c) Data Acquisition, Exploration and Modeling d) Data Import e) Data Visualization f) Data Interpretation	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CL01,CLO2, CLO3
T03	Python for Machine Learning a) Python's use in Machine Learning b) NumPy – Numerical Python arrays, functions c) Pandas - Python Data Analysis Library d) scikit-learn e) matplotlib f) Jupyter Notebooks	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CLO1-CLO7
T04	Machine Learning Problem Areas and Scope a) Supervised Learning, Classification, Regression b) Unsupervised Learning, Clustering c) Reinforcement Learning d) Review various algorithms functions and limitations e) Compare machine learning models	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CLO1, CLO2, CLO3, CLO4
T05	Machine Learning Algorithms a) k-Nearest Neighbors b) Linear Models c) Decision Trees d) Support Vector Machines e) Naïve Bayes Classifiers	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CL01, CLO3,CLO4, CLO5, CLO6
T06	Neural Networks a) The Human neural network b) Understanding how neural networks work c) Artificial neural networks d) Model outputs, Output visualization and validation	Reading assignments In-class demonstrations In-class exercises In-class discussion Presentations	Homework Exam	CL01,CLO3, CLO7

## 12. Methods of Instruction

In the structuring of this course, what major methods of instruction will be utilized?

- o Class lecture
- o Discussion
- o Demonstrations
- o Lab assignments
- o Programs and online presentations

## 13. General Education Goals Addressed by this Course (this section is to fulfill state requirements)

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**Technological Competency**

Yes

**Related Course Learning Outcome**

CLO1-CLO7

**Related Outline Component**

T01-T06

**Assessment of General Education Goal (Recommended but not limited to)**

Presentations  
Exams  
Homework

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**Information Literacy**

Yes

**Related Course Learning Outcome**

CLO1,CLO2,CLO5-CLO7

**Related Outline Component**

T01,T02,T05-T06

**Assessment of General Education Goal (Recommended but not limited to)**

Presentations  
Exams  
Homework

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**Independent/Critical Thinking**

Yes

**Related Course Learning Outcome**

CLO1-CLO7

**Related Outline Component**

T01-T06

**Assessment of General Education Goal (Recommended but not limited to)**

Presentations

Exams

Homework

**14. Needs****Instructional Materials (text etc.):**

Appropriate textbooks and/or open educational resources will be selected. Contact the department for current adoptions. Class notes, presentations, software and online materials.

**Technology Needs:**

College Portal and/or College Distance Learning Platform and/or Textbook or Instructor Website.

**Human Resource Needs (Presently Employed vs. New Faculty):**

Presently employed

**Facility Needs:**

Laboratory classrooms equipped with computer workstations, each configured to support AI applications. Podium computer similarly equipped plus the ability to present audio-video presentations to the class.

**Library needs:**

NA

**15. Grade Determinants**

The final grade in the course will be the cumulative grade based on the following letter grades or their numerical equivalents for the course assignments and examinations

**A: Excellent**

**B+: Very Good**

**B: Good**

**C+: Above Average**

**C: Average**

**D: Below Average**

**F: Failure**

**I: Incomplete**

**R: Audit**

For more detailed information on the Ocean County College grading system, please see Policy #5154.

**16. Board Approval****History of Board approval dates**

New course board approved: August 26, 2021