

Artificial Intelligence using Python

Code AE-342	Credit Hours 2-1
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COURSE DESCRIPTION:

This course explores the concepts and algorithms at the foundation of modern artificial intelligence, diving into the ideas that give rise to technologies like game-playing engines, handwriting recognition, and machine translation. Through hands-on projects, students gain exposure to the theory and hands-on advanced programming in Python language with focus on advance AI libraries for data visualization, data processing, computer vision and machine learning.

By course's end, students emerge with experience in libraries for machine learning as well as knowledge of artificial intelligence principles that enable them to design intelligent systems of their own. Students will also be able to complete Google AI certification after taking this course.

TEXT AND MATERIAL

Text Book (S):

1. Starting out with Python, Latest Available Edition, Tony Gaddis.
2. Python for Data Analysis: Data Wrangling with Pandas, Numpy, and Jupyter Latest Available Edition, Wes Mc Kinney
3. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig, Latest Available Edition

Reference Material:

1. Google AI Kaggle Learn online course
2. Python resource material
(<https://education.python.org/resources/resource/list>)

PREREQUISITE:

Fundamentals to Programming

ASSESSMENT SYSTEM FOR THEORY

Quizzes	15%
Assignments	10%
Projects	15%
Mid Terms	25%
ESE	35%

ASSESSMENT SYSTEM FOR LAB

Lab Assignment	80%
End Term Exam	20%

TOPICS and LABS COVERED:

Module / Chapter	Topic
Week 1	<ul style="list-style-type: none">• Introduction to AI
Lab No:1	<ul style="list-style-type: none">• Python revision. Environments: Anaconda, Jupiter, PyCharm, Spyder, VS code
Week 2	<ul style="list-style-type: none">• Introduction to Python programming for AI
Lab No:2	<ul style="list-style-type: none">• Python Revision: Data types, Conditions, Boolean, Loops, Strings
Week 3	<ul style="list-style-type: none">• Functions and structured data
Lab No:3	<ul style="list-style-type: none">• Defining functions and data type handling for string, tuples, lists and dictionaries
Week 4	<ul style="list-style-type: none">• Testing, debugging and exception handling
Lab No: 4	<ul style="list-style-type: none">• Black box and glass box testing, finding bugs in program, introducing expectations
Week 5	<ul style="list-style-type: none">• Classes and object oriented programming
Lab No: 5	<ul style="list-style-type: none">• Designing programming's using Abstract data types.
Week: 6	<ul style="list-style-type: none">• Concepts of inheritance
Lab No: 6	<ul style="list-style-type: none">• Multiple level inheritance, substitution principle
Week: 7	<ul style="list-style-type: none">• Introduction to algorithmic complexity

Lab No: 7	<ul style="list-style-type: none"> • Constant complexity, logarithmic complexity, linear complexity, polynomial complexity, exponential complexity, comparison of classes
Week 8	<ul style="list-style-type: none"> • Designing search and sort algorithms
Lab No: 8	<ul style="list-style-type: none"> • Linear search, binary search, merge sort,
Week 9	<ul style="list-style-type: none"> • Stochastic programming
Lab No: 9	<ul style="list-style-type: none"> • Inferential statistics and simulation, distributions, hashing and collisions
Week 10	<ul style="list-style-type: none"> • Data Visualization and Spyder
Lab No: 10	<ul style="list-style-type: none"> • Advanced Python libraries: Pandas, Matplot lib, Numpy. Pylab
Week 11	<ul style="list-style-type: none"> • Understanding experimental data and graph optimization problems
Lab No 11	<ul style="list-style-type: none"> • Linear regression and exponential regression
Week 12	<ul style="list-style-type: none"> • Data Processing with Machine Learning
Lab No: 12	<ul style="list-style-type: none"> • Knapsack and graph optimization problems
Week 13	<ul style="list-style-type: none"> • Classification and Cross Validation
Lab No: 13	<ul style="list-style-type: none"> • Open cv and Scikit Learn Library
Week 14	<ul style="list-style-type: none"> • Feature Engineering I
Lab No: 14	<ul style="list-style-type: none"> • Creating Features, K-Means
Week 15	<ul style="list-style-type: none"> • Feature Engineering II
Lab No: 15	<ul style="list-style-type: none"> • Principal Component Analysis (PCA)
Week 16	<ul style="list-style-type: none"> • Introduction to Neural Network
Lab No: 16	<ul style="list-style-type: none"> • Two Layered Neural Network Implementation