
AML-2203 Advanced Python AI and ML Tools

Computer Studies

Course Number:	Co-Requisites:	Pre-Requisites:
AML-2203	N/A	AML-1104 or AML-1214
Prepared by:	Lambton College, Outline Creator	
Approved by:	Chris Slade, Dean International Education	
Approval Date:	Friday, June 4, 2021	
Approved for Academic Year:	2021-2022	
Credit Weight:	3.00	

Course Description

This course introduces advanced concepts of Python programming language. The theory part includes designing, implementing, and using APIs, and advanced modules for AI and ML. The laboratory portion is designed to provide students with the opportunity to work with a set of practical problems and the opportunity to apply their knowledge to real-life software application challenges.

Course Learning Outcomes/Course Objectives**1. Evaluate File and data set handling in Python (Recommended Module: scikit-learn, pandas)**

- 1.1 Discuss various format for data sets
- 1.2 Use Python to import various JSON and CSV files
- 1.3 Use Python to generate a random data set
- 1.4 Use Python modules to manipulate imported data and save them on disk

2. Evaluate database and Python interactions

- 2.1 Use Python modules to connect to a relational database
- 2.2 Use Python modules to interact with a relational database
- 2.3 Explore CRUD operations using Python and relational database
- 2.4 Use Python modules to connect to a non-relational database
- 2.5 Explore CRUD operations using Python and non-relational database

3. Evaluate vectors, matrices, and arrays in Python (Recommended Module: numpy)

- 3.1 Use Python modules to work with vectors

- 3.2 Use Python modules to work with matrices
- 3.3 Use Python modules to interact with elements of matrices
- 3.4 Use Python modules to interact with elements of arrays
- 3.5 Use Python modules to reshape arrays

4. Evaluate Python features for data transformation (Recommended Module: pandas)

- 4.1 Discuss the importance of data transformation
- 4.2 Use Python modules to work with data frames
- 4.3 Navigate through data frames and parse individual or group elements
- 4.4 Use Python modules to adjust data frames
- 4.5 Use Python modules to apply a function over all elements in a column
- 4.6 Discuss various interactions with data and data frames in Python

5. Analyze various ways to deal with numerical and categorical data in Python (Recommended Module: pandas, scikit-learn)

- 5.1 Discuss the differences between numerical and categorical data
- 5.2 Use Python modules to rescale a feature in numerical data sets
- 5.3 Discuss outliers and various ways to detect them
- 5.4 Use Python modules to discretize a feature
- 5.5 Use Python modules to cluster observations
- 5.6 Use Python modules to address missing values
- 5.7 Use Python modules to encode nominal categorical values
- 5.8 Use Python modules to encode ordinal categorical values

6. Evaluate various ways to deal with textual data in Python (Recommended Module: NLTK, scikit-learn)

- 6.1 Discuss textual data and their characteristics
- 6.2 Use Python modules to clean textual data
- 6.3 Use Python modules to parse and clean HTML documents
- 6.4 Use Python modules to remove punctuation and stopwords
- 6.5 Use Python modules for textual data tokenization
- 6.6 Discuss the process of text mining and stemming
- 6.7 Discuss and use Python modules to encode textual data as bag of words
- 6.8 Discuss the concept of TF/IDF scoring in Python

7. Evaluate Python modules to work with images (Recommended Module: OpenCV, matplotlib)

- 7.1 Discuss image data and their characteristics
- 7.2 Use Python modules to load images

- 7.3 Use Python modules to resize image
- 7.4 Use Python modules to crop images
- 7.5 Use Python modules to save images

8. Describe the concept of dimensionality reduction (Recommended Module: scikit-learn)

- 8.1 Discuss the need for dimensionality reduction
- 8.2 Explore various approaches to dimensionality reduction
- 8.3 Use Python modules to achieve dimensionality reduction by using feature extraction

9. Implement linear regression in Python (Recommended Module: scikit-learn)

- 9.1 Discuss the importance of linear regression
- 9.2 Use Python modules to implement linear regression

10. Discuss the use of Python in visualizing data (Recommended Module: (Matplotlib, Plotly))

- 10.1 Use Python modules to visualize data sets
- 10.2 Use Python modules to visualize linear regression

Relationship to Vocational Learning Outcomes

This course provides the opportunity for you to achieve the following Program Vocational Learning Outcomes (VLO) which will be taught and evaluated at an taught (T), assessed (A) or culminating performance (CP) level:

AIMT - Artificial Intelligence & Machine Learning

- VLO 1 Collect, manipulate and mine data sets to meet organizational need. (T, A)
- VLO 3 Design and apply data models that meet the needs of a specific operational/business process. (T, A)
- VLO 4 Develop software applications to manipulate data sets, correlate information and produce reports. (T, A)
- VLO 5 Design and present data visualizations to communicate information to business stakeholders (T, A)

DSMM - Big Data Analytics

- VLO 2 Recommend different systems and network architectures, artificial intelligence and data storage technologies to support data analytics and Big Data. (T, A)
- VLO 4 Develop software applications, algorithms and artificial intelligence models to manipulate, correlate and reduce data sets and produce project documentation and reports. (T, A)
- VLO 10 Develop artificial intelligence solutions to support administration, decision-making, planning, risk management, logistics, manufacturing, smart devices and robotics. (T, A)
- VLO 11 Implement and evaluate Big Data science frameworks using software and hardware that adhere to corporate security policies, ethical standards and industry regulations. (T, A)

Learning Resources

Required:

Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning

Chris Albon

ISBN-13: 978-1491989388

366 pages

Release Date: 23 March 2018

Published by: O'Reilly Press

Supplemental:

- Personal Computer

Student Evaluation

Tests (40%):

- Midterm Test (20%)
- Final Exam (20%)

Assignments and Projects (60%):

- Assignment (20%)
- Final Term Project (40%)

Grade Scheme

The round off mathematical principle will be used. Percentages are converted to letter grades and grade points as follows:

Mark (%)	Grade	Grade Point	Mark (%)	Grade	Grade Point
94-100	A+	4.0	67-69	C+	2.3
87-93	A	3.7	63-66	C	2.0
80-86	A-	3.5	60-62	C-	1.7
77-79	B+	3.2	50-59	D	1.0
73-76	B	3.0	0-49	F	0.0
70-72	B-	2.7			

Prior Learning Assessment and Recognition

Students who wish to apply for prior learning assessment and recognition (PLAR) need to demonstrate competency at a post-secondary level in all of the course learning requirements outlined above. Evidence of learning achievement for PLAR candidates includes:

- Not Applicable: Post-graduate course

Course Related Information

This is a project and discussion-based learning course consisting of a variety of teaching environments. All course

work is completed according to the syllabus. Students should take careful notes as not all material can be found in the textbook or handout materials. Attendance is expected and necessary to be successful.

College Related Information

Academic Integrity

Lambton College is committed to high ethical standards in all academic activities within the College, including research, reporting and learning assessment (e.g. tests, lab reports, essays).

The cornerstone of academic integrity and professional reputation is principled conduct. All scholastic and academic activity must be free of all forms of academic dishonesty, including copying, plagiarism and cheating.

Lambton College will not tolerate any academic dishonesty, a position reflected in Lambton College policies. Students should be familiar with the Students Rights and Responsibilities Policy, located at lambtoncollege.ca. The policy states details concerning academic dishonesty and the penalties for dishonesty and unethical conduct.

Questions regarding this policy, or requests for additional clarification, should be directed to the Lambton College Student Success Department.

Students with Disabilities

If you are a student with a disability please identify your needs to the professor and/or the Accessibility Centre so that support services can be arranged for you. You can do this by making an appointment at the Accessibility Centre or by arranging a personal interview with the professor to discuss your needs.

Student Rights and Responsibility Policy

Acceptable behaviour in class is established by the instructor and is expected of all students. Any form of misbehaviour, harassment or violence will not be tolerated. Action will be taken as outlined in Lambton College policy.

Date of Withdrawal without Academic Penalty

Please consult the Academic Regulations and Registrar's published dates.

Waiver of Responsibility

Every attempt has been made to ensure the accuracy of this information as of the date of publication. The content may be modified, without notice, as deemed appropriate by the College.

Students should note policies may differ depending on the location of course offering. Please refer to campus location specific policies:

LAMBTON COLLEGE POLICIES – applicable to all Lambton College students.

- Student Rights & Responsibilities & Discipline policy (2000-5-1)
- Test & Exam Writing Protocol (2000-1-6)
- Evaluation of Students (2000-1-3)
- (<https://www.lambtoncollege.ca/custom/Pages/Policies/Policies.aspx>)

CESTAR COLLEGE:

- https://www.lambtoncollege.ca/Programs/International/Lambton_in_Toronto/Student_Policies/

QUEENS COLLEGE:

- https://www.lambtoncollege.ca/Programs/International/Lambton_in_Mississauga/Student_Policies/

Note: It is the student's responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.