**Lesson Plan**

**Course Code & Title :** ANL252 Python for Data Analytics

**Semester & Year :** July 2021

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| **Name of HoP :** Dr James Tan Swee Chuan  **Name of Associate Faculty :** Mr Lam Vee Tat  **Name of Course Coordinator :** Dr Alfred Koh Peng Yam |

**Special Instructions for Instructors**

1. Students will attempt **three** graded online quizzes, and each of the quizzes will happen in the week before the first, third, and fifth Face-to-Face sessions. Sometime before the semester starts, the students will be given the exact date of the first quiz. Make sure you inform the students as well during the first F2F session.

**Seminar Sessions: 1**

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| **Topics to be Covered** | **Learning Outcomes to be Achieved\*** | **Summary and Discussion of Key Concepts, Theories, Principles** | **Class Activities to Enhance Learning** |
| Pre-Course Quiz (2%) | SU 1-2 |  | Post announcements on Canvas:   1. complete PCQ 1 before the first F2F session |
| Study Unit 1:  Introduction to Python Programming | 1. Execute Python from the PowerShell command line and run Python scripts written in Atom text editor 2. Solve problems using Python scripts with appropriate variable names, types and operations 3. Print output using formatted strings, format() method and escape sequences 4. Create user input and use it to implement appropriate operations 5. Compose appropriate Boolean expressions for given data scenarios 6. Use while-loop and for-loop correctly, and execute breaks when desired | 1: Python Programming Environment  2: Basic Arithmetic and Variables  3: Print and Input  4: Conditional Logic Control  5: Loops | Provide outline of assessment schedule  Access e-learning material: Study Unit 1 and Textbook Exercises 0 ~ 1, 4, 6 ~ 7, 9 ~12, 27 ~ 30, 32 ~ 33 and recommended online readings  Seminars: discussion and activities to reinforce students’ understanding |

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| **Usage of case** | |
| 1. Do you use any case in the seminar? | ~~Yes~~ / No |
| 1. If your answer for question (1) is ‘Yes’, please specify the case use. |  |

**Seminar Sessions: 2**

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| **Topics to be Covered** | **Learning Outcomes to be Achieved\*** | **Summary and Discussion of Key Concepts, Theories, Principles.** | **Class Activities to Enhance Learning** |
| Study Unit 2: Data Types and Functions | 1. Create, use, and perform operations on 3 compound built-in data types: tuples, lists and dictionaries 2. Use the Python built-in functions and their associated methods 3. Create user-defined functions for application to programming tasks 4. Explain the concepts of packages and modules, and how Python manages and imports packages and modules 5. Solve problems using appropriate Python standard libraries | 6: Tuples, Lists, Dictionaries  7: Integrated Methods and Functions  8: User-defined Functions  9: Modules, Packages and Libraries | Asks students to form their GBA groups.  Access e-learning material: Study Unit 2 and Textbook Exercises 18, 19, 21, 32, 34, 38, 39 and recommended online readings.  Seminars: discussion and activities to reinforce students’ understanding |
| Pre-Class Quiz 1(2%) | SU 2 |  |  |

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| **Usage of case** | |
| 1. Do you use any case in the seminar? | ~~Yes~~ / No |
| 1. If your answer for question (1) is ‘Yes’, please specify the case use. |  |

**Seminar Sessions: 3**

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| **Topics to be Covered** | **Learning Outcomes to be Achieved\*** | **Summary and Discussion of Key Concepts, Theories, Principles.** | **Class Activities to Enhance Learning** |
| Study Unit 3: Arrays and Plots | 1. Installing, starting and working with JupyerLab correctly 2. Use NumPy arrays, Numpy vectorized operations, and subset NumPy arrays using index or Boolean mask 3. Examine and explain the basic NumPy array attributes 4. Apply NumPy functions for statistics and random sampling 5. Create plots using matplotlib.pyplot and use functions for customization | 10: Introduction to JupyterLab  11: Array Management with NumPy  12: Plotting with Matplotlib | Access e-learning material: Recommended online readings and open-access videos.  Seminars: discussion and activities to reinforce students’ understanding |
| TMA (18%) | SU 1 and SU2. |  |  |

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| **Usage of case** | |
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**Seminar Sessions: 4**

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| **Topics to be Covered** | **Learning Outcomes to be Achieved\*** | **Summary and Discussion of Key Concepts, Theories, Principles.** | **Class Activities to Enhance Learning** |
| Study Unit 4: Data Management | 1. Import datasets into DataFrames using Pandas 2. Apply indexing, sorting and selection to DataFrames 3. Understand when to apply each type of merging for DataFrames 4. Identify, locate, and replace missing values and outliers in DataFrames 5. Modify DataFrames using operations such as log-transforming, discretizing, and standardizing | 13: Pandas  14: Data Import and Selection  15: Operations on DataFrames  16: Missing Data and Outliers  17: Data Modification | Access e-learning material: Study Unit 4, recommended online readings and open-access videos.  Seminars: Illustrate the requisite functions in Pandas using car sales program, which loads the dataset “car\_model.csv”. |
| Pre-Class Quiz 2 (2%) | SU 5-6 |  |  |

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| **Usage of case** | |
| 1. Do you use any case in the seminar? | ~~Yes~~ / No |
| 1. If your answer for question (1) is ‘Yes’, please specify the case use. |  |

**Seminar Sessions: 5**

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| **Topics to be Covered** | **Learning Outcomes to be Achieved\*** | **Summary and Discussion of Key Concepts, Theories, Principles.** | **Class Activities to Enhance Learning** |
| Study Unit 5: Data Analytics in Python | 1. Install and import Scikit-Learn to process data and apply analytics models 2. Implement the various data processing steps for different types of variables (e.g., numeric and categorical) 3. Understand the importance of creating training and test datasets to validate analytics models 4. Implement, explore and evaluate the K-means clustering model 5. Implement, explore and evaluate the decision tree model | 18: Scikit-Learn  19: Data Preparation  20: Clustering  21: Decision Trees | Access e-learning material: Study Unit 5, recommended online readings and open-access videos.  Seminars: Illustrate the requisite functions in Scikit-Learn using car sales program, which loads the dataset “car\_model.csv”. |
| GBA (20%) |  |  |  |

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| **Usage of case** | |
| 1. Do you use any case in the seminar? | ~~Yes~~ / No |
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**Seminar Sessions: 6**

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| **Topics to be Covered** | **Learning Outcomes to be Achieved\*** | **Summary and Discussion of Key Concepts, Theories, Principles.** | **Class Activities to Enhance Learning** |
| Study Unit 6: Basic SQL in Python | 1. Understand SQL’s role for managing databases and apply SQLite3 in Python for managing databases 2. Select, sort and filter data 3. Understand the different ways of joining tables and when to use each way 4. Group data by attributes 5. Edit data using operations (e.g., update, delete, insert records) | 22: SQL and SQLite3  23: Data Query  24: Joining Tables  25: Grouping Data  26: Editing Data | Note: Spend half of the seminar to reinforce the materials and address the knowledge gaps from Study Unit 5. Study Unit 6 is listed for completeness in programming.  Access e-learning material: Study Unit 6, recommended online readings and open-access videos.  Seminars: Illustrate the requisite functions in SQL using simulated dataset “car\_model.csv”. |
| ECA (50%)  Participation (6%) |  |  | 30% of the participation marks awarded for full attendance; marks are pro-rated for less than full attendance. Remaining 70% of the participation marks awarded for forum participation. |

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\***Some Learning Outcomes may be left to students for self-study if you feel no further discussion or class activities are needed to reinforce students’ understanding of the subject matter.**