**NATIONAL UNIVERSITY OF SINGAPORE**

**NUS Business School**

**Department of Analytics & Operations**

**DAO2702 Programming for Business Analytics**

**Session**: Special Term 2, 2019/2020

**Description**:

This module is an introductory course to business analytics and data science. It covers basic Python programming and preliminary statistics, with a great emphasis on addressing practical business problems and real datasets.

data science is an interdisciplinary field that requires business insights and expertise, proficiency in programming, as well as a strong background in mathematics and statistics. Therefore, lectures and tutorials in this semester would focus on trainings in the following perspectives:

* Python programming and Pythonic coding styles
* Analytical and visualization packages
* Math and statistics
* Practical business insights and problem solving skills

**Objective**:

With the training of programming, statistics, and business insights, students are supposed to gain a big picture of business analytics, and enhance their skills in using software tools and practical problem-solving.

**Syllabus**:

1. Basics of Python programming
	1. Data structures and flow control
	2. Functions and packages
2. Data analysis with Python
	1. Analytical tools: NumPy, SciPy, Pandas
	2. Data visualization: Matplotlib
	3. Data collection and cleaning
3. Statistical inference
	1. Sampling and inference
	2. Confidence intervals
	3. Hypothesis testing
4. Linear regression
	1. Model assumptions and interpretations
	2. Categorical variables and modelling nonlinearity
	3. Missing values and outliers
	4. Forecast

**Learning Content**:

*Week 1.*
**Course Overview
Introduction to Programming and Business Analytics**
**Data types and control flow I**
**Control flow II and strings**

*Week 2.*
**Built-in compound data types**
**Tutorial 1: Time conversion by Python (Variables, data types, and basic arithmetic operations)**
**Tutorial 2: Bisection algorithm (Loops, bisection algorithm, and basic probability theory)**
**Tutorial 3: Calculations for discrete distributions (Python lists and dictionaries)**

*Week 3.*
**Functions, modules, and packages**
**Data Panel and data visualization**
**Tutorial 4: Classification by K-nearest-neighbours algorithm**

**Tutorial 5: Visualization of the Pokemon data (Data visualization techniques)**

*Week 4.*
**Facts from Data**

**Confidence intervals and hypothesis testing**
**Tutorial 6: Portfolio with stocks and bonds (Probability theory and risk analysis)**

**Tutorial 7: Adult persistence of head-turning asymmetry (Confidence interval and hypothesis testing with Python)**

*Week 5.*
**Linear Regression for explanatory modelling**

*Week 6.*

**Tutorial 8: Sales and advertisement budgets (simple linear regression and multiple regression)**

**Tutorial 9: Hourly wages data (Categorical variables and nonlinear terms)**

**Linear Regression for explanatory modeling**

**Learning Outcomes**

Through this course, students would strengthen their skills in

1. Programming in Python;
2. Basic statistics;
3. Practical business insights.

After learning this module, students should be able to apply Python in managing, visualizing data and draw conclusions from real-world datasets via statistical models.

**Prerequisites**:

DAO1704 Decision Analytics using Spreadsheets

**Assessment**:

**Continuous Assessment**:

Class Participation 15%

* Contributions on forum discussion

Group Project 25%

* Team work
* Analysing real-world dataset with Python
* An eight-page report
* A formal 10-minute presentation

**Final Examination**: 50%

* Open book
* Two hours
* Coding test

**Reference Books**:

Python programming:

* Python crash course, by Eric Matthes
* Python for data analysis, by Wes Mckinney
* Data science from scratch, by Joel Grus
* The hitchhiker’s guide to Python, by Kenneth Reitz and Tanya Schlusser
* Python data science handbook, by Jake VanderPlas

Statistics:

* Introductory statistics, by Neil A. Weiss
* Introductory econometrics, by Jeffrey M. Wooldridge
* An introduction to statistical learning, by Trevor Hastie et al.

**Modular Credit**: **4**

**Study Level**: **Basic**