

## Module Outline

**Module Code** : RE2708  
**Module Title** : Computational Thinking and Programming for Real Estate  
**Semester** : Semester 1, Academic Year 2022/2023  
**Faculty** : NUS Business School  
**Department** : Real Estate

### Instructor(s)

Assistant Professor Cristian Badarinza ([bizcrba@nus.edu.sg](mailto:bizcrba@nus.edu.sg))

### Overview

This module introduces fundamental concepts in computational thinking and basic programming techniques (VBA and Python) to Real Estate (RE) students. It aims to strengthen students' quantitative skills and problem-solving capability necessary to lead the future of the real estate and urban planning industry. Topics covered include problem solving by computing, basic problem formulation and problem solving, program development, coding, testing and debugging, fundamental programming constructs, fundamental data structures, simple file processing, basic recursion, and basic data visualization techniques. Students will apply their skills to solve practical problems in real estate and urban planning.

### Learning Outcomes

Through this module, students will be able to:

- Formulate a practical problem into a programmable computational process.
- Understand how to decompose a problem into programming components such as input, output, and variable.
- Understand how to write Visual Basic for Applications codes to extend the functionality and replicability of the spreadsheet modelling.
- Be familiar with coding fundamentals such as variables, data types, operators, conditionals, loops, etc. Translate computational thinking into programming flow within Python/Jupyter Notebook environment.
- Understand and summarize a problem with visualization using Python.
- Be equipped with fundamental Python coding skills to deal effectively with big data.
- Be familiar with the efficient computational thinking process that integrates live code, equations, visualizations, and narrative text through the use of the Jupyter Notebook App.
- Develop real estate and urban planning models using Python.

### Module Prerequisite(s)

NIL

### Module Preclusion(s)

NIL

### General Guide & Reading

NIL

**Tentative Schedule & Outline**

Week/Dates	Lecture	Tutorial	Assignment #/ Due Dates	Learning Outcomes
<b>ORIENTATION WEEK 1 – 6 AUGUST 2022</b>				
<b>1 / Aug 8-12</b>	Introduction to Computational Thinking	Software installation		<ul style="list-style-type: none"> <li>- Map a practical problem into a programmable computational process.</li> <li>- Design process workflow.</li> <li>- Initiate VBA project.</li> </ul>
<b>2 / Aug 15-19</b>	User-defined functions in VBA I	Support session (Software)		<ul style="list-style-type: none"> <li>- Decompose a problem into programming components such as input, output, and data types.</li> </ul>
<b>3 / Aug 22-26</b>	User-defined functions in VBA II	Support session (Software)		<ul style="list-style-type: none"> <li>- Write VBA codes to extend the functionality and replicability of spreadsheet modelling.</li> </ul>
<b>4 / Aug 29-Sep 2</b>	Logical flow using subroutines		Quiz 1	<ul style="list-style-type: none"> <li>- Write sub-routines using variables, data types, operators, conditionals, and loops.</li> </ul>
<b>5 / Sep 5-9</b>	Application	Tutorial 1A		<ul style="list-style-type: none"> <li>- Implement solutions to financial calculation problems.</li> <li>- Design sensitivity analyses using automation techniques.</li> </ul>
<b>6 / Sep 12-16</b>	Fundamentals of Data Storage and Data Processing	Tutorial 1B	Individual Project Submission	<ul style="list-style-type: none"> <li>- Download, store and retrieve data sets.</li> <li>- Adapt data sets to the requirements of a given application.</li> <li>- Assess the efficiency of the data analysis process.</li> </ul>
<b>RECESS WEEK 17 – 25 SEPTEMBER 2022</b>				
<b>7 / Sep 26-Sep 30</b>	Fundamentals of Python			<ul style="list-style-type: none"> <li>- Translate computational thinking into programming workflows within the Python programming environment.</li> <li>- Integrate live code, equations, visualizations, and narrative text through the use of the Jupyter Notebook App.</li> </ul>

<b>8 / Oct 3-7</b>	PANDAS Module for Data analysis	Tutorial 2A		- Construct and analyse data frames.
<b>9 / Oct 10-14</b>	MATPLOTLIB Module for Visualization	Tutorial 2B	Quiz 2	- Summarize the solution to a given problem using visualization techniques.
<b>10 / Oct 17-21</b>	Application: Hedonic pricing regression	Tutorial 3A		- Estimate real estate valuation models.
<b>11 / Oct 24-Oct 28</b>	Application: DCF Model and Monte Carlo Simulation	Tutorial 3B	Quiz 3	- Calculate financial ratios for investment projects. - Run simulations using random number generators.
<b>12 / Oct 31-Nov 4</b>	Application: GIS	Tutorial 4A		- Develop spatial models for real estate and urban planning using Python.
<b>13 / Nov 7-11</b>	Application: Final Project and Final Review	Tutorial 4B	Group Project Submission	- Integrate all elements of the coding workflow into a functioning, flexible and replicable application.
<b>READING PERIOD 12 – 18 NOVEMBER 2022</b>				
<b>EXAMINATION PERIOD 19 NOVEMBER – 3 DECEMBER 2022</b>				

### Assessment

Assessment Components	Weightage
Individual Project	30%
Group Project	40%
3 Multiple-Choice Quizzes a 10% each	30%
<b>Total</b>	<b>100%</b>

### Academic Honesty & Plagiarism

Academic integrity and honesty are essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty at all times. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is “the practice of taking someone else’s work or ideas and passing them off as one’s own” (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is

being presented as entirely your own work. This is a minimum standard. In case of any doubt, you should consult your instructor.

**Additional guidance is available at:**

- <http://www.nus.edu.sg/registrar/administrative-policies-procedures/acceptance-record#NUSCodeofStudentConduct>
- <http://nus.edu.sg/osa/resources/code-of-student-conduct>

**About me**

I am an Assistant Professor at the National University of Singapore, a Research Fellow of the Institute of Real Estate Studies, and a Network Associate of the Centre for Economic Policy Research, London. My research interests are in the areas of real estate finance, household finance and financial economics. Previously, I have been a Postdoctoral Fellow at Saïd Business School, University of Oxford, a Research Assistant in the Monetary Policy Research Division of the European Central Bank in Frankfurt am Main. I have obtained a PhD and an MSc in Economics from Goethe University, Frankfurt am Main.