## 1. Subject Name: Let's Learn Python and Pygame

**2. Teacher**: Aj. Andrew Davison (ad@fivedots.coe.psu.ac.th)

**3. Teaching Period**: **15** two-hour classes; 10th Nov 2017 – 16th Feb 2018

Friday 15.00-17.00 (10 min breaks on 15.50-16.00)

### 4. Coordinator

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Department of Computer Engineering, Faculty of Engineering,
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### 5. Course Objectives

To introduce secondary school-level children to basic programming ideas using the Python programming language (version 3.x). Students will write small programs during each class, and run them using the Python IDLE system.

To introduce secondary school-level children to games programming using the Pygame library on top of Python. Students will write and modify small games programs coded in Python and the Pygame library.

### 6. Course Description

Python Topics: installing Python, variables, using modules, if-statements, loops, data structures (lists, tuple, dictionaries), functions.

Pygame Topics: installing Pygame, the Pygame game loop, drawing, user input (keyboard, mouse), animation, classes and objects, sprites, collisions, Pong game

### 7. Prerequisites

No previous knowledge of programming is required, although the students will need to know how to use a desktop computer.

**8. Teaching Method**: slide presentations, exercises. Teaching will be done in English. The slides and exercises are written in English.

### 9. Course Outline

| Week | Topics |
|------|--------|
| 1 | Why Python? Install Python 3.x; IDLE |
|   | Calculator-style maths, input and print your name |

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| | Load, run, save a program; Python docs |
| 1 & 2 | What is a variable? (Use 'tag' visuals) |
| | Get input using input() |
| | Basic types: integer, float, string. |
| 2 | What is a module? |
| | Using random, math, turtle; module docs |
| | Downloading extra modules: pyPI, pip. Brief look at EasyGui |
| 3 | If-statements: else, elif |
| | Conditionals, and, or, not. |
| 4 & 5 | Loops: counting and conditional; Turtle examples |
| | Conditional loops: times tables, non-termination, break, |
| | Game example: number-guessing |
| 5 | Lists: creating, printing, slices, changing, deleting searching |
| | Tuples; Dictionaries: building, accessing, changing, deleting. |
| | **Exercises 1 handed out**. |
| 6 | Functions: arguments, return |
| | Local and global variables. |
| | Functions for reusability, clarity, abstraction: draw a smiley |
| 7 | Midterm Exam |
| 8 | Starting Pygame. The game loop. |
| 9 | Pygame for drawing: lines, rectangles, circles, arcs, polygons, text, images |
| | **Exercises 2 handed out**. |
| 10 | User input: keyboard, mouse |
| 11 | Animation: bouncing ball |
| 12 | Classes and Objects. A little inheritance |
| 13 | Sprites and collision detection: bouncing ball again |
| 14 | The Pong game |
| | **Project Handed out** |
| 15 | Final Exam |

## 10. Assessment

- Two programming exercises (worth 20% of the final grade).
- A 2 hour midterm exam (30%).
- Project. Extend the Pong game (20%).
- A 2 hour final exam (30%).

## 11. Teaching Equipment

- White board / black board; a computer, preferably with Internet connection; a projector connected to the computer for showing slides.

- Each student (or small groups of students) should have a computer for doing exercises during the class. I assume the computer will be running a version of Windows and has a version of Python 3.x installed.

- In a later class, it would be good if the students could install Pygame for themselves (I will be explaining how), but this requires an Internet connection.

## 12. References

My slides, code examples, exercises, and related information are online at:

`http://fivedots.coe.psu.ac.th/Software.coe/PyYorSor/`

I will include URLs to good sources of information on the Web.

### Textbooks

- **Hello World:** Computer Programming for Kids and Other Beginners
  Warren and Carter Sande
  Manning, 2014, **2nd** ed. (https://www.manning.com/books/hello-world-second-edition)

  It is useful, but not required, reading. Make sure to obtain the second edition which includes more examples.

As far as I know, there is only one Python book written in Thai, but it's intended for university students.

### Other Optional Books of Interest

- **Python for Kids**
  Jason R. Briggs
  No Starch Press, 2013, 1st ed. (http://python-for-kids.com/)

- **Python Programming for Teens**
  Kenneth A. Lambert
  Cengage Learning, 2014. 1st ed.
  (http://home.wlu.edu/~lambertk/python/pythonforteens/)
  Despite the name, this is quite advanced.

- **Invent Your Own Computer Games with Python**
  Al Sweigart
  2010, 2nd ed. (http://inventwithpython.com)

  This book can be downloaded from the author's website for free. It's a bit advanced for new programmers. This could be used as the basis for a second course on programming

- **Program Arcade Games with Python and Pygame**

Paul Vincent Craven
Apress, 2016. 4th ed. (http://programarcadegames.com/)

All the chapters and code examples are online, along with videos, but the book is not free. The examples include quite advanced stuff such as a platform game, and programming concepts such as sorting and recursion.

- **Making Games with Python and Pygame**
  Al Sweigart
  2012, (http://inventwithpython.com/pygame/chapters/)

This book can be downloaded from the author's website for free. The code does not make use of Python classes.

Do not get this book confused with the author's other free text, "Invent Your Own Computer Games with Python" which does **not** use Pygame.

- **Beginning Python Game Development with Pygame**
  Harrison Kinsley and Will McGugan
  Apress, 2015, 2nd ed. (http://www.apress.com/9781484209714)

This book is an advanced introduction to Pygame, and includes four chapters on 3D games programming using OpenGL. The code  is available from their website.