Course Title: **Computational Methods using Python**
Course Lecturer: **Mr. Mayhew Steyn**
Course credits: **2**
Lecturer contact hours: 12
Tutorial/practical hours: 48

1) Course overview:
In this course we will cover the basics of Python, a few of its popular packages relavent to astronomy and general numerical methods used in science.

The course material will be delivered as online/pdf notes as well as videos for key concepts. A strong emphasis will be placed on the practical use of the methods learned, and this is where most of the time will be spent.

Live Q&As will be held 2 to 3 times a week to answer questions and to make demonstrations. These will be recorded and placed on Vula.

2) Course breakdown/syllabus:
- Use of the Python Standard Library:
  - Variables, operators, data types and data structures.
  - Control flow: If Statements and Loops
  - Functions
  - File input/output
- Scientific Python Packages:
  - Numpy (arrays, special functions, and random numbers)
  - Matplotlib (plotting)
  - Scipy (curve fitting, numerical algorithms)
  - Astropy (astronomy focused, dimensional analysis, image processing, etc)
- Numerical Methods:
  - Linear regression and curve fitting with Scipy
  - Solving ordinary-differential equations (Euler and Runge-Kutta methods)
  - Integration (midpoint, trapezoidal and Simpson`s rules)
  - Root finding (bisection, secant and Newton-Raphson methods)

3) Resources:
Course notes (website and PDF formats) and video content available on Vula.

4) Breakdown of practicals/tutorials:
Exercises will be provided to put the course material into practice. Weekly tutorials will also be used for formal assessment of this. As well as the tutorials, three projects will cover use of the numerical methods taught in the course material.

5) Additional skills to be developed during the course:
Python programming, scientific writing/reporting, numerical problem solving.

6) Assessment
- Tutorial submissions: 30%
- Project 1: 20%
- Project 2: 25%
- Project 3: 25%