

The **BRAINWAVES** Club

Online: *Live and Interactive*

2018 Semester 2: Tronics-Online – Years 5, 6 and 7

10 am – 12 pm

Fee: \$268

Brainwaves Online is a club where small groups of students (up to 12) participate in interactive online sessions with their club leader. This program is intended to provide access to gifted students outside the metropolitan area who do not usually have access to gifted programs. The online platform allows instant sharing of screens, computer code, whiteboard drawings and video files, thus making for a highly engaging environment where members get plenty of one on one attention.

Tronics-Online

Technology is everywhere--entwined in almost every part of our culture. It affects how we live, work, play, and most importantly, how we learn. A good understanding of technology is key to our futures. This semester the Tronics will be taken beyond a superficial experience of technology. We'll explore the fundamentals of algorithmics, the 'mathematical thinking' behind programming which provides us with an opportunity to model and solve real world problems computationally. We will work with the **Micro:bit**, lock programming, Python and possibly even some Scratch. Importantly, we will learn skills that will allow us to tackle some real-world problems.

What you need:

- Computer/laptop
- Internet connection
- Headphones or speakers
- Notepad and pencil case
- Micro:bit*

11 August

Test Session

This will be an opportunity to test your equipment and internet connection before signing in to the first meeting on Saturday 18 August. You will be emailed connection instructions once enrolled.

18 August

Meeting 1: Introduction to Python

Focus: Coding Fundamentals, Inputs, Variables, Loops and If Statements

In this session we will introduce Python and start off by creating some variables (strings floats and integers), then proceeding to do some algebra and string operations. With the concept of variables under our belt, we will introduce loops and if statements to build a customized greeting program and to do some repeating mathematical operations (times tables and factorization). All the programs that we write will also be presented as flowcharts and we will have fun predicting the circumstances under which the programs will fail and then find ways to overcome these failings. This is called testing and debugging and it is a crucial part of writing good code.

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25 August

Meeting 2: Primes Factors and Functions

Focus: Prime number theory, mathematical operators in Python

The quest to find ever more prime numbers and the patterns involving primes dates back to the ancient Greeks. This classic problem of discovering primes is also relevant in computer science with applications that include encryption and cryptocurrencies. In this session we will learn how to factorise a number and therefore determine if that number is a prime number creating a step by step procedure to complete the task. Then we are going to systematize what we have just learned and put these steps in the form functions that produce lists of factors or prime numbers.

1 September

Meeting 3: Micro:bits and Microcontrollers

Focus: Micro:bit, Block programming, Python

In this session we are going to start off with an overview of microcontrollers which are small programmable computers that live inside calculators, cars, planes, fridges, toys and innumerable other devices. We will look into the future where millions of these devices will be connected together via 5G into the Internet of Things. Finally we will begin exploring the BBC micro:bit, a tiny microcontroller smaller than a credit card that has a capacity to measure all of the following: acceleration, magnetic field, temperature, light intensity and human touch. Our introduction will include programming counters, magic eight balls and games that measure reaction time and memory.

8 September

Meeting 4: Virus Outbreak

Focus: Micro:bit, block programming, Python, forces, accelerometer

In this session we will move beyond the basics and really tap into the sensing capabilities of the micro:bit. We will start by using the accelerometer to measure forces involved in activities like running, jumping, walking and rope skipping. We will use these forces to estimate energy consumption during exercise as well as impact on our bodies. After this we will have fun recreating something akin to an egg and spoon race. We will do this by setting a threshold on the accelerometer as well as a life bar. The goal of the race will be to get to the end with minimal impact on the Micro:bit (the smoothest ride possible).

About the club leader: Sanjin Dedić

Sanjin is a teacher and a robotics engineer with a background in product development. His main passion is presenting advanced programming and robotics in a way that can be embraced and understood by young people, especially primary school students. In doing so he hopes to inspire young and imaginative minds to join in creating the hi-tech world that is developing around us.

**A Micro:bit cost approximately \$25 and can be purchased online. For example, go to www.pakronics.com.au*