



# Fundamental of Robotics Introduction





# The Module

This module will be delivered over the 10 teaching weeks as 3-hour lecture / lab-based sessions.

Lectures will take place **Fulton Lecture Room A** every **Wednesday** morning from 10:00 - 13:00.

## **Assessment:**

- Weekly Lab Tasks (10%)
- 2 Assignments (20% each)
- Exam (50%)



# My Expectations

- Read and accept the Student Code of Conduct for this module (more on this in a moment)
- Form a Working Group of 4 Students to complete Lab Tasks
- When you do not understand something please ask!
- Have FUN!



# Student Code of Conduct

As a student of CSC079 I will:

- listen to instructions provided by the lecturer and teaching assistants carefully.
- take care of all equipment provided (in particular the Laptops and LEGO Robotics Kits) during lectures and ensure that all parts and equipment are returned at the end of each lecture.
- ensure that I am signed-off each week by the lecturer or teaching assistants for each Lab Task.
- contribute and allow other students to contribute equally to all Lab Tasks by working as a team as part of my Working Group.
- contribute to lectures by asking and answering questions.
- attend all lectures (this course is a hands-on course; catching up on missed lectures is significantly difficult).
- **not** talk over other people (lecturer, teaching assistants, other students), giving them the opportunity to share their thoughts and ideas.

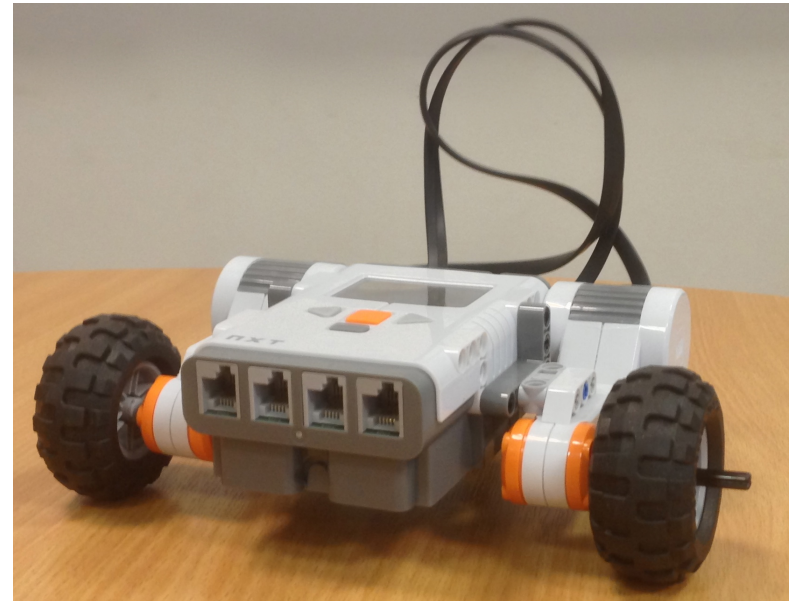


# The Mindstorms Robot

The LEGO Mindstorms NXT robot is a programmable kit which can be used to create many different robots.

The three main parts of the Mindstorms robot are:

- **The NXT** – You can think of this as the brain of the robot.
- **Servo Motors** – The motors give your robot the ability to move.
- **Sensors** – There is a range of sensors which the robot can use to learn about the world around the robot.



# The NXT

Being the “brain” of the robot, the NXT comes with several ports to connect the other components to.

- The ports labeled with **A**, **B** and **C** are used to connect the servo motors.
- The ports labeled with **1**, **2**, **3** and **4** are used to connect the sensors.
- There is also a **micro-USB port** to connect the NXT to a computer.

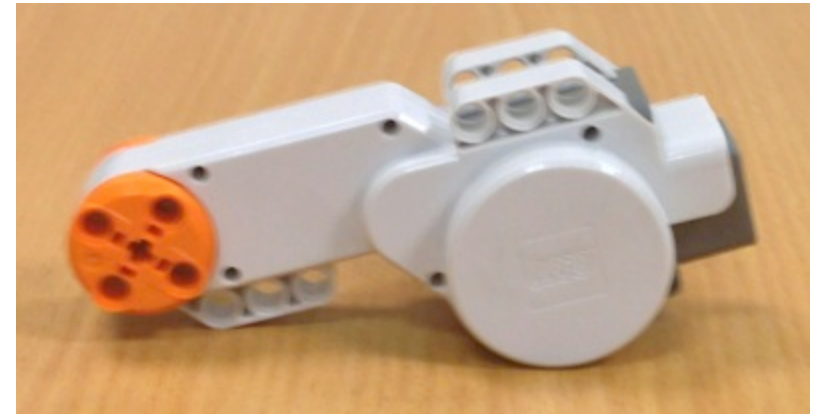




# Servo Motors

**The servo motors can be attached to a variety of different parts of the Mindstorms kit to create wheels (to move the robot), arms (to grab objects), etc.**

- Servo motors can also provide feedback to the NXT (similar to sensors) of how many rotations they have made.
- We will come back to the various sensors available later ...





# Lab Task 1 – Exercise 1

First we must build the robot we are going to be using over the next few lectures.

Using:



you are going to create ->





# If I was a robot, how would you instruct me to ...

A blue starburst shape with multiple points, containing the text "Walk Forward".

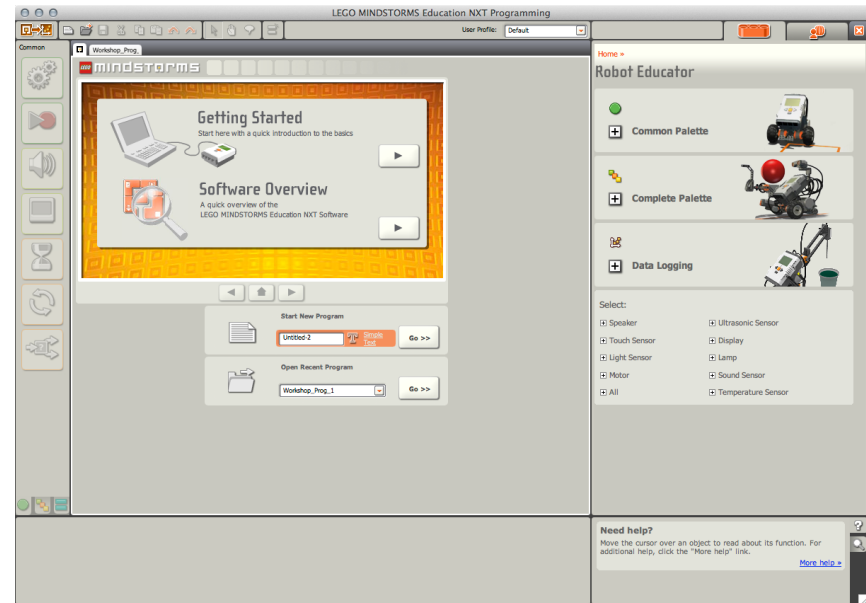
Walk Forward



# Mindstorms NXT Programming

**The LEGO Mindstorms NXT programming software is an all in one tool which allows you to write programs to control the LEGO Mindstorms robot.**

On opening the program, you should see a screen similar to the one on this slide.



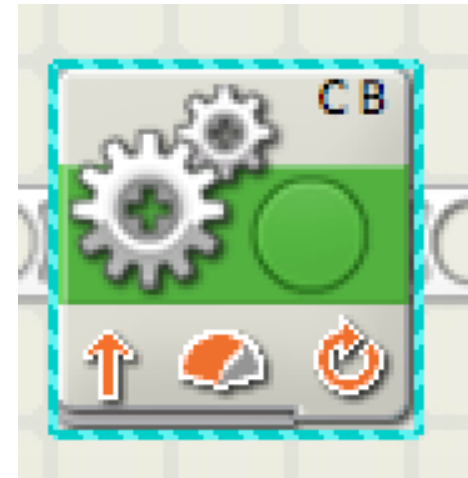
# Lab Task 1 – Exercise 2 & 3

Using the move block, complete the following tasks:

Program your robot to:

- Move forward for 3 seconds at a power of 50
- Move forward for 3 seconds at a power of 75
- Move forward for 3 rotations at a power of 50
- Move forward for 3 rotations at a power of 75

Measure the distance that your robot moves. Are the results as you expected? Explain your results.





# Lab Task 1 – Exercise 4

Here we explore how to turn your robot.

Using a series of experiments record the number of rotations to:

- Turn the robot  $360^\circ$
- Turn the robot  $180^\circ$ ,  $90^\circ$  and  $1^\circ$
- Turn the robot  $n^\circ$

