# Project Kratos
# Electronics QSTP

## Week 3 : Robotic Operating System (ROS)

This week we'll be learning about Robotic Operating System (ROS). ROS is not an actual OS like Windows, MacOS but instead is a middleware which helps you build and develop your robot applications and is completely open source. This video will give you a brief introduction of ROS.

**Setting up the Environment**

**1) Operating System** : You are recommended to get you systems dual booted with Ubuntu 18.04 only. Any other versions of Ubuntu are not recommended. Here is a guide which may help you out during the process of dual booting. There are other options like using a Virtual Machine or using WSL, but these might not provide you the best experience with ROS as Ubuntu does.
*Note : In case of any difficulties regarding dual booting any OS related doubts please PM us.*

**2) ROS** : Install ROS Melodic by following this official guide from ROSwiki.

**3) Terminator :** Terminator is an open source terminal emulator which provides you some extra features from the default terminal. You may install terminator by just executing the following command :

```
sudo apt-get install terminator
```

**4) Git :** Whenever you work on big projects efficient collaboration is very necessary. Git serves as a tool for collaboration and open source software development. If you haven't installed git on you systems, install it by executing the following command :

```
sudo apt-get install git
```

**Getting Started :**

Now that we have set up our environment, we are now ready to start learning ROS.

1) Complete the beginner level tutorials provided officially by ROSwiki.
2) *'Programming Robots with ROS : Morgan Quigley, Brian Gerkey'* is an excellent book to know the basics of ROS and get started with it. You are advised to read at least the first 4 chapters of this book along with the above mentioned tutorials to get a clear understanding. This book will be posted on Classroom and Whatsapp group.
3) Apart from these resources there are many tutorials available on youtube, you are free to refer to them too.

**Tasks for practice:**

1) Create a package with the name 'kratos' with the following packages as dependencies :
   i) rospy
   ii) roscpp
   iii) std_msgs
   iv) geometry_msgs
   v) nav_msgs
2) Write a publisher node which publishes a count on the topic '/count' from 1 to 20 and then resets back to 1 to count again. *(Hint: You may use the Int32 message in the std_msgs package)*
3) Write a node which subscribes to the above publisher node and prints the square of the number published, on the terminal.
4) Write two nodes which will publish random integers on topics `/random1` and `/random2` respectively. Write a third node which will subscribe to above two topics and publish the sum of squares of the values on topic `/random3.`

## Assignment

*NOTE : This week's assignment is divided into two parts. The first part (Part A) will consist of writing a report on the communication systems and the second part (Part B) will be based on ROS. Part A is released along with this doc, Part B will be released after the deadline of Part A i.e. on Thursday, May 28th.*

## Part A :

This is a list of some teams competing in URC who are :
AGH Space Systems
MRDT
Team Continuum
Cornell Mars Rover
ITU Rover Team
UWRT Robotics(Waterloo)
R3(Ryerson Rams Robotics)
SJSU Robotics
Team Anweshak
Team Rudra (SRM)

These teams have been very successful in their campaigns. What we want you to do is to search and find insights about their communication systems that they have used.

Prepare a compiled report on any six of the above mentioned teams about all the technical equipment that they have used and their features. Also, if you find any research papers, do include them in your findings. The more extensive the report, the better.

Your deadline is **27th May, 11:59pm**

Note 1: Submit the assignments before the due date. Any delay has to be notified with reasons. Punctuality is an essential part of the Kratos Team.

Note 2:  Most of you would be doing these things for the first time, so you are bound to get struck at some point and may get overwhelmed by the course content. We don't expect you to solve everything in the first try. You have a week. We highly encourage you to ask any doubt, however small or dumb you think it is. That is the only way by which you grow.  Your job here is to learn and our job is to help you.

Note 3: Any feedback regarding the course structure or the assignments, is very valuable. We are also students, just like you and we have a lot of scope for improvement.