

# DIGITAL TRANSFORMATION IN JOURNALISM AND NEWS MEDIA

Curriculum on how to use  
DRONES (IO3)

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## MODULE 4: TECHNICAL LABORATORY AND FLIGHT WORKSHOP (MECB)

Learning Units:	Unit 1: Drone components Unit 2: Drone Controller Unit 3: Flying a drone – Practical exercises
Total n. hours	10
Objectives	The main objectives of this module are to help the student understand the technical aspects of drones in both physical (the drone itself) as well as the technicalities while operating a drone. These objectives are: <ul style="list-style-type: none"> <li>• Understand the mechanical components that make up a drone</li> <li>• Understand how these components work</li> <li>• To understand the differences between different types of drones and which is best depending on the particular need</li> <li>• Understand well the use of the drone controller.</li> <li>• Practical exercises using a drone to gain confidence and control</li> </ul>
Target group	young people (18-30 years old) and interested stakeholders to learn using the DRONES in their lives and professions (journalists, bloggers, teachers and other trainers and educators, ecc)
Outcomes:	The main outcomes of this module are: <ul style="list-style-type: none"> <li>• A better general knowledge on the mechanical and electronic components of a drone</li> <li>• A better understanding of how a drone works.</li> <li>• Knowledge on how to use and operate a drone as well as perform basic manoeuvres</li> </ul>
• Knowledge	<ul style="list-style-type: none"> <li>• Explain the main components of a drone (mechanical and electronic)</li> <li>• Explain the main functions of the drone controller.</li> <li>• Understand how the drone controller effects the mechanical components of the drone.</li> <li>• Learn the basic flight manoeuvres of a drone</li> <li>• Practise these manoeuvres</li> </ul>
• Skills	<ul style="list-style-type: none"> <li>• Technical know-how of drone components (mechanical and electronic)</li> <li>• Use the controller in an efficient way</li> <li>• Learn flight manoeuvre terminology and how to apply them.</li> <li>• Safely control and perform basic flights using a drone</li> </ul>
• Attitudes	<ul style="list-style-type: none"> <li>• Compare different drones and drone components to choose the most suited one for the user's need</li> </ul>

	<ul style="list-style-type: none"> <li>• Perform basic maintenance on drone and safety checks</li> <li>• Safe flight and drone operation</li> </ul>
Method of training /learning	Group learning
Training material and tools needed	computer, internet, drone, camera, cones/markers for practical session
More information	Link to DRONES platforms – handbook, website
References	External resources/references you used while writing this.

# LEARNING UNITS

## UNIT 1

Title	<b>Drone components</b>
Aims	<ul style="list-style-type: none"> <li>• Explain the different types of drones</li> <li>• To learn about the mechanical and electronic components that make up a drone</li> <li>• To understand how different components effect the use and functionality of the drone</li> </ul>
Description of the activities	<p>This module will be a mix of both theoretical and practical.</p> <p>As a warmup exercise the teacher can ask the students the following questions:</p> <ul style="list-style-type: none"> <li>• Which are the main components of a drone?</li> <li>• Which type of drone is most common?</li> <li>• What makes drones so stable?</li> </ul> <p>Introductory video:  <a href="https://www.youtube.com/watch?v=w2itwFJCgFQ&amp;t=590s&amp;ab_channel=TED">https://www.youtube.com/watch?v=w2itwFJCgFQ&amp;t=590s&amp;ab_channel=TED</a></p> <p><b>Course Content:</b></p> <p>Main types of Drones:</p> <ul style="list-style-type: none"> <li>• Multi rotor drones</li> <li>• Fixed wing drones</li> <li>• Single rotor drones</li> <li>• Fixed wing hybrid VTOL</li> </ul> <p>These types of drones are explained, and then the students can have some time to discuss which drones are most suitable for the application of journalism.</p> <p>The main parts making up a drone are explained, these are:</p> <ul style="list-style-type: none"> <li>• Drone Motor (explain the different types)</li> <li>• Drone propellers (materials used and why)</li> <li>• Drone flight controller</li> <li>• GPS Module</li> <li>• Electronic Speed Controller (ESC)</li> <li>• Power port module</li> </ul>

	<ul style="list-style-type: none"> <li>• 3 Axis Gimbal (for drones with cameras)</li> <li>• Drone camera</li> <li>• Drone battery</li> <li>• Drone antennas</li> <li>• Downward ultrasonic obstacle avoidance sensor</li> <li>• Flight LED</li> <li>• Drone frame (which materials are used, pros and cons of using polymers and composites)</li> </ul> <p>To make the lesson more engaging for the students the teacher may do a demonstration of these components on an actual drone.</p> <p><b>Follow up:</b></p> <p>The teacher can assign each student to carry out research on one of the components and create a short presentation to share with the rest of the class.</p>
Resources	<p>Main types of Drones:</p> <ul style="list-style-type: none"> <li>• <a href="https://www.auav.com.au/articles/drone-types/">https://www.auav.com.au/articles/drone-types/</a></li> </ul> <p>Overview of drone components:</p> <ul style="list-style-type: none"> <li>• <a href="https://www.dronefly.com/the-anatomy-of-a-drone">https://www.dronefly.com/the-anatomy-of-a-drone</a></li> </ul> <p>Different types of drone motors:</p> <ul style="list-style-type: none"> <li>• <a href="https://dronenodes.com/drone-motors-brushless-guide/">https://dronenodes.com/drone-motors-brushless-guide/</a></li> </ul> <p>Types of Drone propellers:</p> <ul style="list-style-type: none"> <li>• <a href="https://dronesgator.com/how-to-choose-a-drone-propeller/">https://dronesgator.com/how-to-choose-a-drone-propeller/</a></li> </ul> <p>Drone flight controllers:</p> <ul style="list-style-type: none"> <li>• <a href="https://dronenodes.com/drone-flight-controller-fpv/">https://dronenodes.com/drone-flight-controller-fpv/</a></li> </ul> <p>Drone GPS modules:</p> <ul style="list-style-type: none"> <li>• <a href="https://www.droneblog.com/what-are-gps-drones-and-why-does-it-matter/">https://www.droneblog.com/what-are-gps-drones-and-why-does-it-matter/</a></li> </ul> <p>Drone ESC:</p> <ul style="list-style-type: none"> <li>• <a href="https://robu.in/how-to-choose-esc-for-your-quadcopter/">https://robu.in/how-to-choose-esc-for-your-quadcopter/</a></li> </ul> <p>3 Axis Gimbal (for drones with cameras)</p> <ul style="list-style-type: none"> <li>• <a href="https://www.thecoronawire.com/what-is-a-drone-gimbal-does-your-drone-need-one/">https://www.thecoronawire.com/what-is-a-drone-gimbal-does-your-drone-need-one/</a></li> </ul> <p>Drone camera</p> <ul style="list-style-type: none"> <li>• <a href="https://www.digitalcameraworld.com/buying-guides/the-10-best-camera-drones">https://www.digitalcameraworld.com/buying-guides/the-10-best-camera-drones</a></li> </ul>

	<p>Drone battery</p> <ul style="list-style-type: none"> <li>• <a href="https://www.tytorobotics.com/blogs/articles/a-guide-to-lithium-polymer-batteries-for-drones#:~:text=The%20most%20common%20batteries%20used,separated%20by%20a%20polymer%20electrolyte.">https://www.tytorobotics.com/blogs/articles/a-guide-to-lithium-polymer-batteries-for-drones#:~:text=The%20most%20common%20batteries%20used,separated%20by%20a%20polymer%20electrolyte.</a></li> </ul> <p>Drone antennas</p> <ul style="list-style-type: none"> <li>• <a href="https://www.cenos-platform.com/post/drone-antenna-types-simulation#:~:text=There%20are%20two%20main%20categories,polarized%20(CP)%20FPV%20antennas.&amp;text=The%20polarization%20of%20an%20antenna,the%20electric%20field%20it%20produces.">https://www.cenos-platform.com/post/drone-antenna-types-simulation#:~:text=There%20are%20two%20main%20categories,polarized%20(CP)%20FPV%20antennas.&amp;text=The%20polarization%20of%20an%20antenna,the%20electric%20field%20it%20produces.</a></li> </ul> <p>Downward ultrasonic obstacle avoidance sensor</p> <ul style="list-style-type: none"> <li>• <a href="https://www.youtube.com/watch?v=VgNxl44higU&amp;ab_channel=InformationServices">https://www.youtube.com/watch?v=VgNxl44higU&amp;ab_channel=InformationServices</a></li> </ul> <p>Flight LED</p> <ul style="list-style-type: none"> <li>• <a href="https://www.foxfury.com/complete-guide-to-drone-lights/">https://www.foxfury.com/complete-guide-to-drone-lights/</a></li> </ul> <p>Materials used in a drone:</p> <ul style="list-style-type: none"> <li>• <a href="https://www.thecoronawire.com/what-are-drones-made-of-detailed-guide-to-drone-anatomy/">https://www.thecoronawire.com/what-are-drones-made-of-detailed-guide-to-drone-anatomy/</a></li> </ul>
Evaluation	Assessment can be carried out by question sessions at the end of the presentations

## Unit 2

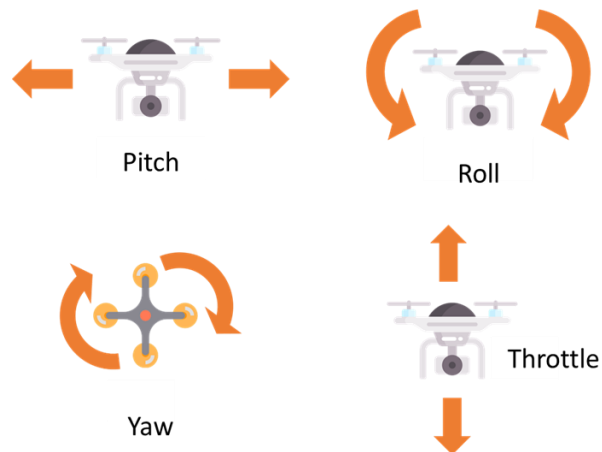
Title	<b>Drone controller</b>
Aims	<ul style="list-style-type: none"> <li>• Explain the different types of drone controllers</li> <li>• To understand the function of the standard buttons of a drone controller</li> <li>• To understand the different flight terminologies</li> </ul>
Description of the activities	<p>This module will be mostly theoretical.</p> <p>As a warmup exercise the teacher can ask the students the following questions:</p> <ul style="list-style-type: none"> <li>• Which flight terminologies are you familiar with?</li> <li>• Can you name some standard buttons on the controller?</li> </ul> <p>Introductory video:  <a href="https://www.youtube.com/watch?v=2DIFTkKrvzM&amp;ab_channel=MatthewwBrennan">https://www.youtube.com/watch?v=2DIFTkKrvzM&amp;ab_channel=MatthewwBrennan</a></p> <p><b>Course Content:</b></p> <p>The drones work by sending signals from the controller to the receiver inside the drone and this allows for wireless communication. The three main components responsible for this are:</p> <ul style="list-style-type: none"> <li>• Drone transmitters</li> <li>• Drone receivers</li> <li>• Flight controllers which are made up of:             <ul style="list-style-type: none"> <li>○ Accelerometers</li> <li>○ Magnetometers</li> <li>○ Gyroscopes</li> </ul> </li> <li>• Electronic speed controller (ESC)</li> </ul> <p>Technology used for drone communication:</p> <ul style="list-style-type: none"> <li>• Radio frequencies</li> <li>• Wifi</li> <li>• GPS</li> <li>• Satellite link</li> </ul>

Common buttons found in a drone controller:

- Joysticks
  - Left is used for yaw/throttle
  - Right is used for roll/pitch



The four basic flight movements:



**Follow up:**

The teacher can assign each student to carry out research on one of the topics in this module and create a short presentation to share with the rest of the class.

Resources

Drone controller:

- <https://www.droneblog.com/drone-controller/>



	<p>Drone transmitter</p> <ul style="list-style-type: none"> <li>• <a href="https://dronenodes.com/drone-transmitter-receiver-fpv/">https://dronenodes.com/drone-transmitter-receiver-fpv/</a></li> </ul> <p>Accelerometer</p> <ul style="list-style-type: none"> <li>• <a href="https://www.fierceelectronics.com/sensors/what-accelerometer">https://www.fierceelectronics.com/sensors/what-accelerometer</a></li> </ul> <p>Magnetometer</p> <ul style="list-style-type: none"> <li>• <a href="https://www.allaboutcircuits.com/technical-articles/what-is-a-magnetometer/">https://www.allaboutcircuits.com/technical-articles/what-is-a-magnetometer/</a></li> </ul> <p>Gyroscopes</p> <ul style="list-style-type: none"> <li>• <a href="https://www.elprocus.com/gyroscope-sensor/">https://www.elprocus.com/gyroscope-sensor/</a></li> </ul> <p>Radio frequency communication</p> <ul style="list-style-type: none"> <li>• <a href="https://www.engineersgarage.com/understanding-radio-frequency-communication/">https://www.engineersgarage.com/understanding-radio-frequency-communication/</a></li> </ul> <p>Wifi communication</p> <ul style="list-style-type: none"> <li>• <a href="https://www.cisco.com/c/en/us/products/wireless/what-is-wifi.html#~q-a">https://www.cisco.com/c/en/us/products/wireless/what-is-wifi.html#~q-a</a></li> </ul> <p>GPS</p> <ul style="list-style-type: none"> <li>• <a href="https://www.garmin.com/en-US/aboutgps/">https://www.garmin.com/en-US/aboutgps/</a></li> </ul> <p>Satellite link:</p> <ul style="list-style-type: none"> <li>• <a href="https://www.tutorialspoint.com/satellite_communication/satellite_communication_quick_guide.htm">https://www.tutorialspoint.com/satellite_communication/satellite_communication_quick_guide.htm</a></li> </ul>
Evaluation	Assessment can be carried out by question sessions at the end of the presentations

### Unit 3

Title	Flying a drone – Practical exercises
Aims	<ul style="list-style-type: none"> <li>• Learn pre-flight check when using a drone</li> <li>• Learn how to perform (in practice) basic manoeuvres using a drone</li> </ul>
Description of the activities	<p>This module will be both theoretical and practical</p> <p>As a warmup exercise the teacher can ask the students the following questions:</p> <ul style="list-style-type: none"> <li>• What pre flight checks can you think of?</li> <li>• Why are pre-flight checks important?</li> </ul> <p>Introductory video:  <a href="https://www.youtube.com/watch?v=PyZUrGNtvJs&amp;ab_channel=SPHEngineering-ControlYourDrones%21">https://www.youtube.com/watch?v=PyZUrGNtvJs&amp;ab_channel=SPHEngineering-ControlYourDrones%21</a></p> <p><b>Course Content:</b></p> <p>Before each flight there are a number of checks that one has to do on the drone, to ensure that the flight is as safe as possible. These checks include:</p> <ul style="list-style-type: none"> <li>• Physical check of the drone to make sure that the major components are secured and not damaged             <ul style="list-style-type: none"> <li>○ Battery: fully charged and secured</li> <li>○ Propellers: clean, turn smoothly and no sign of damage or vibration</li> <li>○ Frame: clean, no visible damage</li> <li>○ Motors: good working order and no debris. Check for any abnormal sound on startup</li> </ul> </li> <li>• Make sure that all the controls on the drone controller are working             <ul style="list-style-type: none"> <li>○ These have to be tested before flight and before gaining altitude</li> <li>○ Check that the GPS and RF connection is good</li> </ul> </li> <li>• Check that the camera and gimbal are secured and in good working order             <ul style="list-style-type: none"> <li>○ Camera fixed, lenses clean and clear</li> <li>○ Correct settings</li> </ul> </li> <li>• Ensure that all necessary documents and permits are in order (such as flight permit, insurance and license)</li> <li>• Check the weather and airspace, make sure that the drone will not be flown over people or animals not involved in the video/photo shoot</li> </ul>

- Keep a list of emergency contact numbers

These are the most important general points to be included in the pre-flight checklist. Students can then expand on each and discuss why it is important. Different makes and models of drones may require additional checks.

Practical training and competency test

### **Basic drone flight exercises**

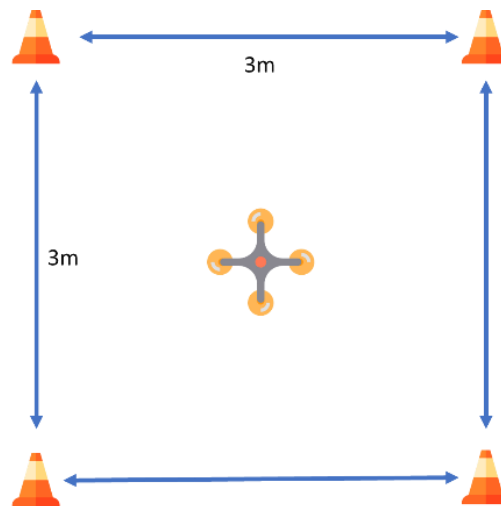
In this section different exercises will be suggested so that you will be able to gain confidence using your drone. For these exercises it is recommended that you use a set of cones or markers that can be placed on the ground and used as a reference. Before flight always make sure that a safe landing zone is set.

### **Take-off and landing**

These are the most basic exercises that the students should familiarise themselves with. Although most modern drones can perform these manoeuvres automatically it is always recommended that they are familiar with manual operation. To perform a manual take off manoeuvre increase the rotor speed and then when the rotors spool up increase the throttle by pushing the left joystick forward. To land the drone manually, reduce the throttle until the drone is close to the ground, then the drone can either land automatically or else the rotors can be switched off.

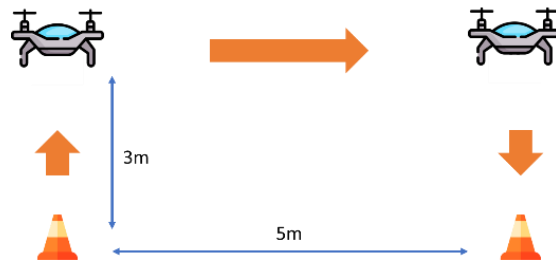
### Hovering

Place four markers approximately 3 metres apart in a square pattern and place the drone in the middle shown in the image below. After take-off try and keep the drone within this perimeter hovering at an altitude of 3 to five metres for about ten minutes. This task can be more challenging if there is a slight breeze.



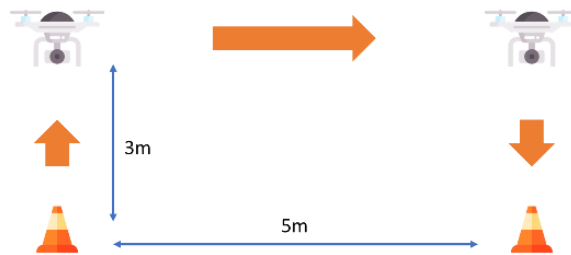
### Up, across, down

Place two markers 5 metres apart and put the drone next to one of them. Perform the take off manoeuvre and go up to an altitude of approximately 3 metres. Move sideways 5 metres over the next cone and then land the drone. During the flight the tail of the drone should be facing you as shown in the next image.



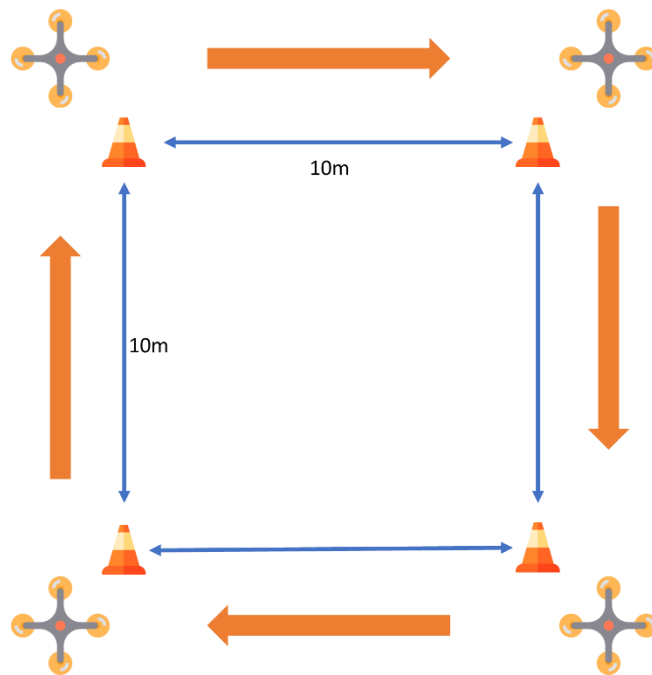
### Up, across, down - Sideways

Perform the previous exercise but this time the drone must be facing sideways. This is an off-axis movement as the perspective is different from the previous exercise. It is essential that you learn to master this technique as you will be using the controls in a different way.



### Flying in a square pattern

Position four cones 10 metres apart in a square pattern and place the drone next to one of them tail facing towards you. Take off at an altitude of around 5 metres and move off to the next cone. While hovering, turn the drone 90 degrees to face the next cone and fly towards it. Continue this until the drone is over the starting cone. This exercise will train your ability to fly the drone in different perspectives.



**Follow up:**

These exercises should be performed until the students are confident in their abilities. The final test can be based around these basic drills, but with a limited margin for error. It is recommended that the pre-flight checks are included in the test.

**Resources**

Pre-flight checklist:

<https://datamyte.com/drone-preflight-checklist/>

Flight training:

<https://droneflyingpro.com/drone-flying-practice-drills/>

Evaluation	Assessment can be carried out by the final test. This can be based around the basic drills in the final unit, but with a limited margin for error. It is recommended that the pre-flight checks are included in the test.

