DIGITAL TRANFORMATION 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 (3) Unit 2: Drone Controller (3) Unit 3: Flying a drone – Practical exercises (4)
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: • Understand the mechanical components that make up a drone • Understand how these components work • Understand the differences between different types of drones and which is best depending on the particular need • Understand well the use of the drone controller • Practical exercises using a drone to gain confidence and control
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)
Knowledge	• Explains the main components of a drone (mechanical and electronic) • Explains the main functions of the drone controller • Understands how the drone controller effects the mechanical components of the drone • Learns the basic flight manoeuvres of a drone • Lists the practical manoeuvres
• Skills	• Gives examples on the technical know-how of drone components (mechanical and electronic) • Gives instruction on how to use the controller in an efficient way • Lits the flight manoeuvre terminology and how to apply them • Gives examples on safely control and perform basic flights using a drone
• Attitudes	• Supports in showing capacity in omparing different drones and drone components to choose the most suited one for the user's need • Supports in showing capacity in performing basic maintenance on drone and safety checks

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	• Supports in showing capacity in safe flight and drone operation
Method of training /learning	Group learning, individual learning
Training material and tools needed	computer, internet, drone, camera, cones/markers for practical session
More information	Link to DRONES platforms – handbook, website https://drones-programme.web.app/ https://drones-programme.netlify.app/
References	Karanja, P. (2022) *How drone controllers work (explained for beginners)*, *Droneblog*. Available at: https://www.droneblog.com/drone-controller/ (Accessed: 18 February 2023). *Best practices	drones at duke*. Available at: https://drones.duke.edu/general-practice-things-to-know (Accessed: 19 February 2023). *Drone school Flight Exercises - Drone School*. Available at: http://canberragrammar.github.io/DroneSchool/course_materials/first_flight_exercises.html (Accessed: 19 February 2023). *Drone flying practice drills [beginner to pro]* (2021) *Drone Flying Pro*. Available at: https://droneflyingpro.com/drone-flying-practice-drills/ (Accessed: 19 February 2023).

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LEARNING UNITS

UNIT 1

Title	**Drone components**
Aims	• To understand the different types of drones • To understand t the mechanical and electronic components that make up a drone • To understand how different components effect the use and functionality of the drone
Description of the activities	This module will be a mix of both theoretical and practical. **PREPARATION** of the students **(30 minutes)** After introduction of the module objectives, participants are asked, as a warmup exercise, the following questions: • Which are the main components of a drone? • Which type of drone is most common? • What makes drones so stable? The trainer shows the following introductory video providing an overview of the unit contents: https://www.youtube.com/watch?v=w2itwFJCgFQ&t=590s&ab_channel=TED **IMPLEMENTATION (90 minutes)** The trainer shows the slides "Unit 1" to the following topics: a) Main types of Drones: • Multi rotor drones • Fixed wing drones • Single rotor drones • Fixed wing hybrid VTOL 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. b) The main parts making up a drone: • Drone Motor (explain the different types) • Drone propellers (materials used and why) • Drone flight controller • GPS Module

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	• Electronic Speed Controller (ESC) • Power port module • 3 Axis Gimbal (for drones with cameras) • Drone camera • Drone battery • Drone antennas • Downward ultrasonic obstacle avoidance sensor • Flight LED • Drone frame (which materials are used, pros and cons of using polymers and composites) The trainer to make the lesson more engaging for the students does a demonstration of these components on an actual drone. **FOLLOW-UP (60 minutes)** The teacher assigns each student to carry out research on one of the components and create a short presentation to share with the rest of the class.
Resources	Main types of Drones: • https://www.auav.com.au/articles/drone-types/ Overview of drone components: • https://www.dronefly.com/the-anatomy-of-a-drone Different types of drone motors: • https://dronenodes.com/drone-motors-brushless-guide/ Types of Drone propellers: • https://dronesgator.com/how-to-choose-a-drone-propeller/ Drone flight controllers: • https://dronenodes.com/drone-flight-controller-fpv/ Drone GPS modules: • https://www.droneblog.com/what-are-gps-drones-and-why-does-it-matter/ Drone ESC: • https://robu.in/how-to-choose-esc-for-your-quadcopter/ 3 Axis Gimbal (for drones with cameras) • https://www.thecoronawire.com/what-is-a-drone-gimbal-does-your-drone-need-one/ Drone camera • https://www.digitalcameraworld.com/buying-guides/the-10-best-camera-drones

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	Drone battery • 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. Drone antennas • https://www.cenos-platform.com/post/drone-antenna-types-simulation#:~:text=There%20are%20two%20main%20categories,polarized%20(CP)%20FPV%20antennas.&text=The%20polarization%20of%20an%20antenna,the%20electric%20field%20it%20produces. Downward ultrasonic obstacle avoidance sensor • https://www.youtube.com/watch?v=VgNxI44higU&ab_channel=InformationServices Flight LED • https://www.foxfury.com/complete-guide-to-drone-lights/ Materials used in a drone: • https://www.thecoronawire.com/what-are-drones-made-of-detailed-guide-to-drone-anatomy/
Evaluation	Assessment is carried out by question sessions at the end of the presentations. The quizzes are available on the platform.

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Unit 2

Title	**Drone controller**
Aims	• To understand the different types of drone controllers • To understand the function of the standard buttons of a drone controller • To understand the different flight terminologies

Description of the activities	This module will be mostly theoretical.
	PREPARATION of the students **(30 minutes)**
	
	As a warmup exercise the trainer asks the students the following questions:
	
	• Which flight terminologies are you familiar with?
	• Can you name some standard buttons on the controller?
	The trainer shows the following introductory video providing an overview of the unit contents:
	https://www.youtube.com/watch?v=2DIFTkKrvzM&ab_channel=MatthewwBrennan
	IMPLEMENTATION (90 minutes)
	The trainer shows the slides "Unit 2" related to:
	
	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:
	
	• Drone transmitters
	• Drone receivers
	• Flight controllers which are made up of:
	  ○ Accelerometers
	  ○ Magnetometers
	  ○ Gyroscopes
	• Electronic speed controller (ESC)
	
	Technology used for drone communication:
	• Radio frequencies
	• Wifi

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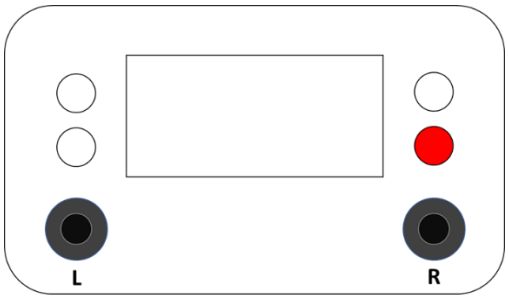
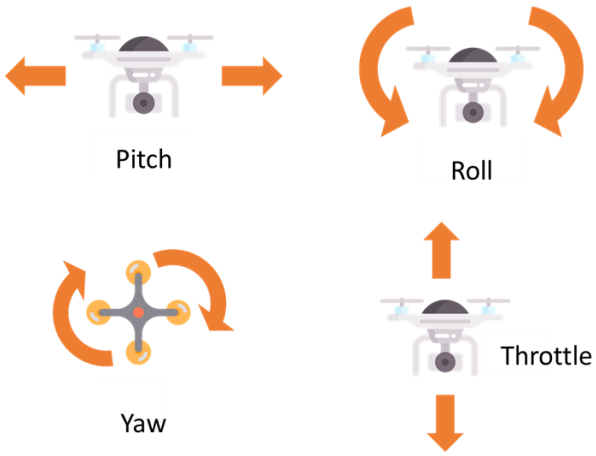
	• GPS • Satellite link Common buttons found in a drone controller: • Joysticks ○ Left is used for yaw/throttle ○ Right is used for roll/pitch  The four basic flight movements:  **FOLLOW-UP (60 minutes)** The teacher assigns each student to carry out research on one of the topics in this module and create a short presentation to share with the rest of the class.
Resources	Drone controller: • https://www.droneblog.com/drone-controller/ Drone transmitter

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	• https://dronenodes.com/drone-transmitter-receiver-fpv/ Accelerometer • https://www.fierceelectronics.com/sensors/what-accelerometer Magnetometer • https://www.allaboutcircuits.com/technical-articles/what-is-a-magnetometer/ Gyroscopes • https://www.elprocus.com/gyroscope-sensor/ Radio frequency communication • https://www.engineersgarage.com/understanding-radio-frequency-communication/ Wifi communication • https://www.cisco.com/c/en/us/products/wireless/what-is-wifi.html#~q-a GPS • https://www.garmin.com/en-US/aboutgps/ Satellite link: • https://www.tutorialspoint.com/satellite_communication/satellite_communication_quick_guide.htm
Evaluation	Assessment is carried out by question sessions at the end of the presentations. The quizzes are available on the platform.

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Unit 3

Title	Flying a drone – Practical exercises
Aims	• To learn pre-flight check when using a drone • To learn how to perform (in practice) basic manoeuvres using a drone

Description of the activities	This module will be both theoretical and practical
	
	PREPARATION **of the students** (30 minutes)
	
	As a warmup exercise the teacher can ask the students the following questions:
	
	• What pre- flight checks can you think of?
	• Why are pre-flight checks important?
	The trainer shows the following introductory video providing an overview of the unit contents:
	
	https://www.youtube.com/watch?v=PyZUrGNtvJs&ab_channel=SPHEngineering-ControlYourDrones%21
	
	IMPLEMENTATION (90 minutes)
	The trainer shows the slides "Unit 3" related to:
	
	Checks 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:
	• Physical check of the drone to make sure that the major components are secured and not damaged
	  ○ Battery: fully charged and secured
	  ○ Propellors: clean, turn smoothly and no sign of damage or vibration
	  ○ Frame: clean, no visible damage
	  ○ Motors: good working order and no debris. Check for any abnormal sound on startup
	• Make sure that all the controls on the drone controller are working
	  ○ These have to be tested before flight and before gaining altitude
	  ○ Check that the GPS and RF connection is good
	• Check that the camera and gimbal are secured and in good working order

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- Camera fixed, lenses clean and clear
- Correct settings

- Ensure that all necessary documents and permits are in order (such as flight permit, insurance and license)
- 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
- 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.

Then a Practical training and competency test on "**Basic drone flight exercises**" is developed by the trainer and suggested to the student to gain confidence in using a drone, on the following topics:

Before flight always make sure that a safe landing zone is set.

a) 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 the students are familiar with manual operation. To perform a manual take off manoeuvre, one must increase the rotor speed and then when the rotors spool up, the throttle is increased by pushing the left joystick forward. To land the drone manually, the throttle should be reduced until the drone is close to the ground, then the drone can either land automatically or else the rotors can be switched off.

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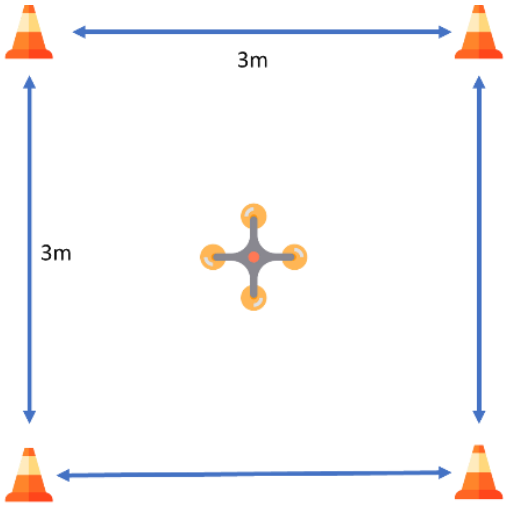
b) Hovering

Four markers should be placed approximately 3 metres apart in a square pattern and with the drone in the middle as shown in the image below. After take-off the student should try to 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.



c) Up, across, down

Two markers should be placed 5 metres apart and with the drone next to one of them. Then the take off manoeuvre should be performed and up to an altitude of approximately 3 metres. The drone should then be flown sideways 5 metres over the next cone and then land the drone. During the flight the tail of the drone should be facing the drone pilot as shown in the next image.

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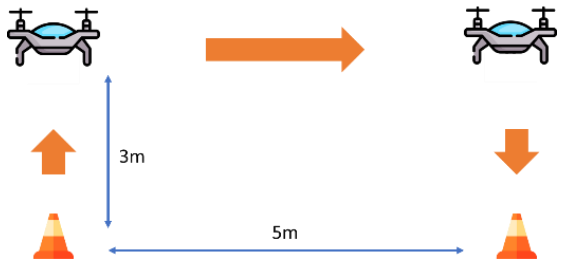
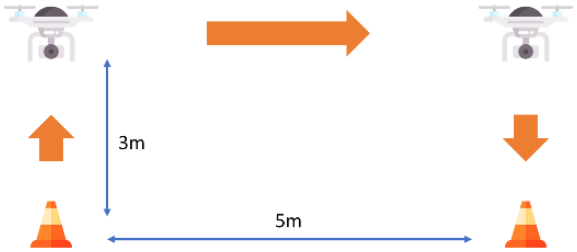


d) Up, across, down - Sideways

This is similar to previous exercise but this time the drone should be facing sideways. This is an off-axis movement as the perspective is different from the previous exercise. It is essential that the student learns to master this technique as it teaches them how to use the controls in a different way.



e) Flying in a square pattern

Four cones should be placed 10 metres apart in a square pattern and the drone placed next to one of them with the tail facing towards the student. After take off , the drone should be kept at an altitude of around 5 metres and flown off to the next cone. While hovering, the drone should be turned 90 degrees to face the next cone and then flown towards it. This procedure should be continued until the drone is over the starting cone. This exercise will train the student's ability to fly the drone in different perspectives.

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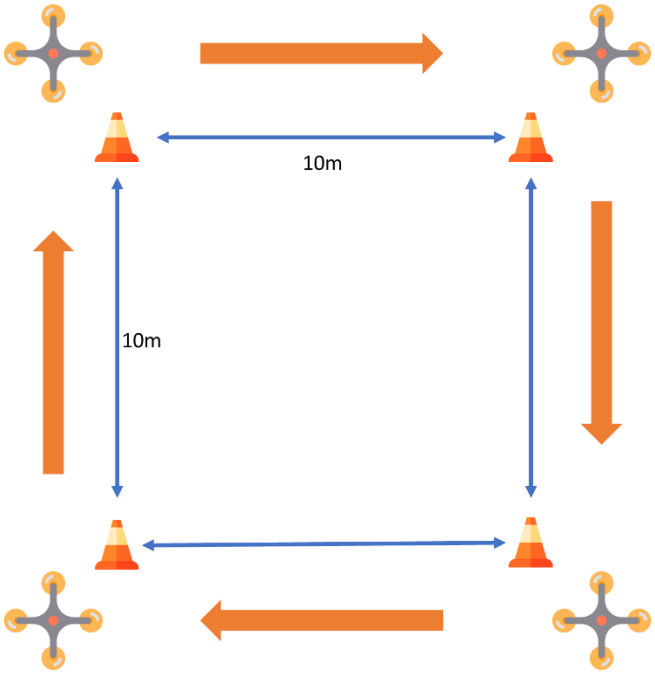

FOLLOW-UP (120 minutes)

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/

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Evaluation	Assessment is carried out by the final test. It is 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. Quizzes are available on the platform.

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