



Redesigning my teaching given the availability of AI tools

Professor Jonathan Roberts

School of Electrical Engineering & Robotics

Faculty of Engineering

Queensland University of Technology



ACKNOWLEDGEMENT OF TRADITIONAL OWNERS

QUT acknowledges the Turrbal and Yugara, as the First Nations owners of the lands where QUT now stands. We pay respect to their Elders, lores, customs and creation spirits. We recognise that these lands have always been places of teaching, research and learning.

QUT acknowledges the important role Aboriginal and Torres Strait Islander people play within the QUT community.

Expectations

Background



The unit I need to update

EGB346 Unmanned Aircraft Systems

Unmanned Aircraft Systems have become a useful and common tool for engineers. As a future professional engineer it is critical to understand technical, practical and regulatory issues around the design and operation of Unmanned Aircraft Systems. This unit introduces the key concepts and theory of Unmanned Aircraft Systems including mission design, airframes and propulsion, autopilots and sensors, ground stations and communications, and flight operations and risk management. You will work with a cross-functional team to design and develop an Unmanned Aircraft System based solution to a real-world problem.



- Approximately 65-70 students
- Groups of 3 students work together over the semester
- They *design* a solution to a real-world problem that would use a drone

TEQSA Provider ID PRV12079 Australian University | CRICOS No.00213J

Current (and approved) learning outcomes

1. Apply the theory and concepts of Unmanned Aircraft Systems to design as a team member, an overall solution to a real-world application at an introductory level.
2. Apply the theory and concepts of Unmanned Aircraft Systems to design sub-systems of an overall solution to a real-world application at an introductory level.
3. Apply and manage a risk-based approach to the operation of Unmanned Aircraft Systems in a real-world application scenario at an introductory level.
4. Demonstrate understanding and problem solving of Unmanned Aircraft System design choices at an introductory level.

My issue is assessment (reports...for now)

Assessment 1: Report 1 30%

Groups (of three students) will submit a report (15% group component, and 15% individual component) demonstrating a UAS mission analysis and design.

Assessment 2: Report 2 30%

Groups (of three students) will submit a report (includes a video) showing how their mission design will interact with an airspace environment by applying a risk based approach to the operation of unmanned aircraft systems.

Assessment 3: Examination (written) 40%

Invigilated examination with set questions and problems to assess your application of the principles of aircraft systems understanding in the context of unmanned aircraft systems, identification and analysis of the context and implications of unmanned systems in the airspace environment, and the application of a risk based approach to the operation of unmanned aircraft systems.

ID	Risk Item	Effect	Cause	Likelihood	Severity	Level of Concern	Action to Mitigate
1	Meeting Project Deadlines	Project Deliverables not met in a timely manner	Poor planning and execution	5	3	15	Buffer time between dependent actions, keep all team members aware of work that needs to be done
2	Aircraft fails to take off	Flight testing can't be performed	Payload is too heavy	1	3	3	Find objects to remove or replace and make payload lighter
3	Fabrication/ Implementation time runs long	Delay in meeting project deliverables, flight testing does not occur	Poor scheduling and execution	3	3	9	Begin build phase as soon as practical
4	Component must be redesigned/selected	Project runs behind schedule	Selected components not rigorously vetted	3	3	9	Early examination of components, ensure all needs are met
5	ArduPilot destroyed in crash	Cannot continue until ArduPilot is replaced	Aircraft crash	1	5	5	Hire an experienced pilot, ensure all subsystems respond as intended, do not fly in undesirable conditions
6	Wireless data transfer not working	Cannot communicate with or control any of the systems, cannot communicate from sensors to ground station GUI	Poor design and/or integration of RF/communications uplink/downlink	3	5	15	Thorough assessment and testing of various wireless communication systems
7	ArduPilot Code/GUI harder to modify than expected	Longer Lead time on working code, causes delays on other items.	Started learning the development environment of ArduPilot too late	1	3	3	Start working with ArduPilot development environment early to become proficient at making our own code
8	Components do not fit on airframe	Inability to perform flight tests	Lack of proper component documentation prior to airframe purchase	3	5	15	Select on-board critical components (servos, controllers) early in design process and select airframe accordingly
9	Induced failure cripples airframe stability	Airframe crashes in flight	Lack of proper analysis on the effects of fault	3	5	15	Research fault types and their propensity to critically destabilize an airframe. Analyze flight performance effects
10	Aircraft damaged when installing systems	Airframe repairs required, flight testing delayed	Rushed assembly process, little planning of airframe modification procedures	3	3	9	Plan modification procedures prior to actual implementation, allow adequate time for careful, thorough work

Lists




JO Please create me a list of 20 good uses of drones

 Sure! Here are 20 potential uses for drones:


1. Aerial Photography and Videography: Drones equipped with high-quality cameras can capture stunning aerial images and videos for various purposes, including real estate, tourism, and media production.
2. Search and Rescue Operations: Drones can be used to search for missing persons in remote areas, as they can cover large areas of terrain quickly and efficiently.
3. Agriculture: Drones can be used to monitor crops, collect data on soil conditions, and spray pesticides or fertilizers over fields.
4. Wildlife Conservation: Drones can help wildlife researchers gather data and monitor animal populations without disturbing them.
5. Disaster Management: Drones can be used to assess the damage caused by natural disasters such as hurricanes, earthquakes, and floods.
6. Infrastructure Inspection: Drones can inspect bridges, buildings, and other infrastructure for damage and maintenance needs.
7. Security: Drones can be used for surveillance purposes, helping to monitor crowds or detect intruders in secure locations.

Code

JO Please write me some Python code that will convert the date into all possible national date formats

 Sure, here's an example Python code that can convert a date into all possible national date formats using the `dateutil` library:  

python

 Copy code

```
from dateutil import tz
from dateutil.parser import parse

# Enter your date in ISO 8601 format
date = "2023-02-14"

# Parse the date string into a datetime object
dt = parse(date)

# Create a list of timezone names for all possible national date formats
tz_names = ['America/New_York', 'Europe/London', 'Europe/Paris', 'Asia/Tokyo']

# Loop through all timezones and print the date in the local format
for tz_name in tz_names:
```

These outputs are a good first draft

What do we need them to learn?

- They need to learn is how to go about designing solutions using drones – it's about the methods and not the outcomes
- The students in this unit think by designing, not by writing
- I should be assessing them on how well they have learned and demonstrated the process of design rather than the design itself
- They need to demonstrate that they follow a logical and well informed process when designing their proposed solution, and there is no good reason for them not to use AI tools

Where I am headed with my thinking

- I am trying to teach students how to design a solution to a real-world problem
- I hence do want them to use all tools available
- The report style assessment is a method of them communicating their design and rationale and so the style of the report maybe needs to change.
 - It might be a spoken report with an in-person interview or two?
 - Maybe more substantial use of the group created video?
- Issues then revolve around how this done and if there is teaching budget for this if it increases contact time for teaching staff

Final thoughts

Constraints

- My unit outline is locked in for Semester 2 and was approved last year
 - This is typical of most universities as this new need for agility and rapid change has not been there before
- Our teaching budgets are adjusted each year based on gradual change
 - Step changes in how we teach may have major budget impacts for our unis
 - What can we afford if more face-to-face teacher to student time is required?
- Group work motivation?
 - Maybe I can drop group work as the motivation for this unit was the volume of work was too much for a single student. That may no longer be the case.

Thanks for listening