EC4.402: Introduction to UAV Design: Assignment II

- *Total 20 marks (14+3+3).*
- *Answer all the questions.*
- *Due date: April 22, 2021.*
- *Assume any data if found missing and mention your assumption in the answer.*
- *MATLAB, PYTHON programming can be used (no need to submit the codes). But need to show equations and results for 1 iteration of design.*

Q.1) Design a fixed-wing UAV used for crop health monitoring meeting the following specifications.

a) Endurance =60 min.
b) Area of operation = 3 Km radius.
c) Max speed = 20 m/s.
d) Flying altitude = 100 m from ground.
e) Climb and descent rates = 5 m/s.

The following aspects of conceptual design phase must be elaborated:
i) CONOPS (1 mark)
ii) Requirement specifications (1 mark)
iii) Market survey (minimum of 2 UAVs) (1 mark)
iv) Airfoil selection, sizing (wing, horizontal tail, vertical tail, control surfaces) (6 marks)
v) Component identification (1 mark)
vi) Analysis (2 marks)
vii) Optimize the design for maximizing the range while meeting the rest of the specifications. (2 marks)

Q.2) Compute the range of pressure sensor used to measure airspeed varying from 10 m/s - 50 m/s. (3 marks)

Q.3) Compute the performance of the following airfoils using XFLR software for a Reynolds number of 5,00,000. (3 marks)
i) E360
ii) S5020
iii) E387
iV) NACA2412

Parameters to be considered are C_l, $\frac{C_l}{C_d}$, C_m.