COURSE PLAN
5643 UAV SYSTEMS I
Department of Aerospace Information Engineering,
KONKUK UNIVERSITY

Instructor: Prof. Agus Budiyono

The course presents the fundamentals of modelling the dynamics of rotorcraft-based Unmanned Aerial Vehicle systems. Upon finishing the course, the students are expected to have a good understanding of key dynamic characteristics of RUAVs. The course is emphasizes the importance of an accurate yet simple enough model to be practical for control design and analysis.

Schedule :

Time	Day	Room
13:30 – 15:00	Tuesday	386
15:00 – 16:30	Thursday	566

Week	Topics	Contents
1	Introduction to RUAVs	Introduction to Rotorcraft-based Unmanned Aerial Vehicles: mission, operation and design specification
2	Dynamics of RUAVs	Dynamics of Rotorcraft-based Unmanned Aerial Vehicles ▪ Approach to dynamics modelling ▪ First principle versus system identification
3	Dynamics of RUAVs	Euler-Newton equations of motion
4	Dynamics of RUAVs	Forces and moments of helicopter: main rotor, tail rotor, vertical tail fin, horizontal tail
5	Trim conditions and stability derivatives	Trim conditions: ▪ Hover ▪ Cruise
6	Trim conditions and stability derivatives	Linearization of equation of motion and principle of small perturbation
7	Trim conditions and stability derivatives	Methods for calculation of stability derivatives: stability derivatives during hover and cruise
8		**Mid Term Exam**
9	Stability analysis	Stability analysis of small scale helicopter
10	Stability analysis	Longitudinal equations of motion: drag, lift and moment equations
11	Stability analysis	Lateral directional equations of motion: side force and rolling/yawing moment equations
12	Element of control	Classical control design: description of proportional

	design	derivative controller, simulation of classical controller
13	Element of control design	Introduction to Modern control: Optimal control vs Algebraic Approach
14	Element of control design	Squared-Coefficient Diagram Method (s-CDM) for Hover Control
15	Future directions RUAV control	Aggressive maneuvering, hybrid approach to modelling and control
		Final Exam

Grading system:

Term Paper	40%
Mid-term exam	30%
Finals	30%

The term paper assignment is designed to help the students with their graduate research. Topics will be provided by the instructor in the early phase of the course.

References:

1. Mettler, B. (2003): Identification modeling and characteristics of miniature rotorcraft, Kluwer Academic Publisher
2. Prouty, R. W. (1986) : Helicopter performance, stability and control, PWS Publishers, Boston
3. Tischler, M. B. and Remple, R. K. (2006) : Aircraft and Rotorcraft system Identification, AIAA Education Series.