EAS309 Flight Dynamics and Control

Level: 3

Credit Units: 5 Credit Units

Language: ENGLISH

Presentation Pattern: EVERY JAN

Synopsis:

The course aims to provide students with an understanding of the principles of flight dynamics and the problems of controlling an aircraft in motion. In the first part, the equations of motion for a rigid body aircraft and the aerodynamics forces and moments are examined. Dynamic stability and response characteristics are defined along with the effects of structural flexibility upon the motion of an aircraft. Flying and handling qualities of an aircraft, and disturbances affecting its motion are next developed. Finally, fundamentals of aircraft feedback control system design and analysis are introduced and stability augmentation and automatic flight control systems are described.

Topics:

- Control surfaces, primary flight controls and flight control systems.
- Co-ordinate systems, equations of motion, stability derivatives, thrust effect, short period and Phugoid approximation.
- Lateral motion, stability and reduced order approximation of equations of motions.
- Flight and handling qualities, effects of structural flexibility and disturbance characteristics.
- Controllability, observability and stabilisation, automatic flight control systems design and analysis and sensor and actuator dynamics.
- Instrumented low approach systems, automatic landing and terrain following, active control and alleviation control.
- Digital control of aircraft and their implementation and adaptive flight control systems.

Textbooks:

EAS309 Study Guide (UDC - SUSS)
ISBN-13: SG-0822

EAS309 Laboratory Manual
ISBN-13: OT-3871

Flight Dynamics Principles: A Linear Systems Approach to Aircraft Stability and Control 3rd Michael V. Cook Butterworth-Heinemann
ISBN-13: 9780080982427

Learning Outcome:

- Analyse primary flight controls and flight control systems together with co-ordinates systems, equations of motion.
- Appraise controllability, automatic flight control systems design and analysis.
- Apply theories learnt in the lecture with the hands-on laboratory sessions.
- Formulate test procedures to evaluate performance of flight control system and interpret results.
- Develop computer simulations to assist in understanding aerodynamics concept and perform analysis.
- Appraise case studies with theory learnt and relate relevance of lecture material to systems operational in latest aircrafts.

Assessment Strategies - Regular Semester (Evening Class):

Components	**Description**	**Weightage Allocation (%)**
Overall Continuous Assessment	QUIZ 1	10
	LAB REPORT 1	12
	TUTOR-MARKED ASSIGNMENT 1	8
Overall Examinable Components	Written Exam	70
Total		**100**

*The information listed is subject to review and change.