AMITY UNIVERSITY

UTTAR PRADESH

Course Title : Optimal Flight Control System
Course Level : PG
Course Code : SPAC611

Credit Units : 04

L	T	P/ S	SW/F W	TOTAL CREDIT UNITS
3	1	0	0	04

Course Objectives:

This course seeks to impart basic understanding of Modern Control Engineering as applied to flight control systems in one Semester

Pre-requisites:

- Engineering Mathematics : Laplace Transform, Matrix Algebra, Differential Equations, Taylor's Series, Calculus of Variation; Fuzzy Maths
- Classical Control Theory.
- Knowledge of Flight /System Dynamics.

Course Contents/Syllabus:

	Weightage (%)
Module I : State Space Concepts	**30**
1. Concept of system and state 2. Formulation of System Dynamics in State Space representation; 3. Concept of Stability & Controllability of systems; 4. Controller Design in State Space for linear time-invariant systems; 5. Concept of Observability and Observer Design in State Space;	
Module II : Optimal Control	**30**
1. Concept of Optimal Control and Performance Criterion. 2. Formulation of Performance Index and Minimization 3. Introduction to Calculus of Variation 4. Pontrygen's Minimum Principle and its application to solve Optimal Control problems.	

Module III: Non-linear Systems 1. Concept of non-linearity. 2. Peace-meal linearization of system dynamics 3. Liapunov's Stability Analysis 4. Phase plane method : Basic Concepts 5. Stability of non-linear systems	**20**
Module IV: Advances in Control Systems 1. Concepts of robustness and system sensitivity 2. Adaptive Control **3.** Fuzzy Logic control	**20**

Student Learning Outcomes:

On completion of the course the student will be able to:

- Analyse dynamics of engineering systems.
- Apply control engineering techiniques in time domain
- Develop analytical & design ability of flight control systems
- Prepare himself for engineering /flight control project /activities

Pedagogy for Course Delivery: The course pedagogy will include lectures & tutorials having rigorous application to flight control problems. It also includes discussion on problems and challenges faced by control engineers.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100	**Nil**	**100**

Theory Assessment (L&T):

	End Term Examination				
Components (Drop down	**Class Test**	**Viva-Voce**	**Home Assignment**	**Attendance**	**End Term Exam**
Weightage (%)	10	8	7	5	70

Texts:

- Control System Engineering (5th Edition) by IJ Nagrath & M Gopal, New Age International Publishers

References:

- *Modern Control System Theory by M Gopal, Wiley Eastern Ltd*
- Flight Stability & Automatic Control (2nd Edition) by Dr Robert C Nelson, Mc Graw Hill Education (India) Pvt Ltd

Lecture notes

1. Linear Control Theory : Prof S Sinha IIT Kgp
2. Optimal Control Theory : Prof MK Gosh, IIT Kgp
3. Non-linear Control Theory : Prof YP Singh, IIT Kgp