Navigation, Guidance, And Control - Web course

COURSE OUTLINE

This course covers the basics of Navigation, Guidance, and Control used in aerospace systems.

Basically all the above three topics use basic control theory for their mathematical framework.

This course covers all three topics under one course and is meant for undergraduate aerospace engineering students.

The course can also be used for first year graduate students in aerospace engineering to expose them to basics of control theory applied to aerospace engineering.

COURSE DETAIL

A Web course shall contain 40 or more 1 hour lecture equivalents.

Module	Topic	No.of Hours
1	Introduction to radars; Radar equation. Block Diagram and Operation; Radar Frequencies. Application of Radars; Range performance of radars. Minimum detectable signal ; Noise effects.	4
2	Continuous wave and Frequency modulated radars; Doppler effect. CW-radar; Isolation between transmitter and receiver. Radial velocity; CW radar applications; Frequency modulated CW radars.	4
3	MIT and Pulse Doppler radars; Description of operation.	2
4	Guided missiles; Classifications; Description of tactical missiles. Guidance phases during flight; Categories of Homing and command guidance. The kinematic equations.	4
5	Missile Guidance laws; Classification of guidance	4

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Aerospace Engineering

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	laws; Classical guidance laws; Modern guidance laws.		
6	Aircraft Navigation; Kinds of navigation - Position Fixing and Dead-reckoning systems.	6	
	LORAN; DECCA; OMEGA.		
	Very High Frequency Omni-Directional Range (VOR).		
	Celestial navigation and GPS based navigation; Inertial Navigation Systems.		
	Integrated navigation systems		
7	Control Systems-Classical linear time invariant control systems.	6	
	Transfer function representations; stability; time domain characteristics.		
	PID controller design for aerospace systems.		
8	Frequency domain characteristics; Root Locus.	8	
	Nyquist and Bode plots and their application to controller design for aerospace systems.		
	TOTAL	40	

References:

1. M .I. Skolnik: Introduction to Radar Systems, Tata McGraw-Hill, 2007.

2. M. Kayton and W. Fried: Avionics Navigation System, Wiley Interscience, 1997.

3. P. Zarchan: Tactical and Strategic Missile Guidance, AIAA, 2007.

4. N.S. Nise: Control Systems Engineering, Wiley-India, 2004.

5. B. Friedland: Control System Design, Dover, 2005.