MRCET CAMPUS

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS INSTITUTION – UGC, GOVT. OF INDIA)

Department of AERONAUTICAL ENGINEERING

(R20A2112)

AIRCRAFT STABILITY AND CONTROL

COURSE COVERAGE SUMMARY

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nit No	Title of the Unit	Topics of the Unit	Name of The Text Book	Chapter No	Page No
UNIT – I	Stability, Control Requirements &Static Longitudinal Stability and Control	Degree of Freedom of a system -Static and dynamic stability - Purpose of controls - Inherently and marginally stable airplanes	Airplane performance stability & control by courtland D.Perkins ,Robert E .Hage John wiley & sons	5	213-229
		Stick Fixed Basic equilibrium equation-stability criterion , contribution of wing, tail, fuselage- the most aft center of gravity	Airplane performance stability & control by courtland D.Perkins,Robert E .Hage John wiley & sons	5	219-229
		Power effects-elevator power, stick fixed neutral point-stick free stability-Hinge moment coefficient-stick free neutral points-maneuvers-stick force Gradients stick force per'g'-Aerodynamic Balancing.	Airplane performance stability & control by courtland D.Perkins,Robert E .Hage John wiley & sons	5	230-292
UNIT – II	Aircraft Equations of motion Perturbed Motion- Linearized, Decoupled Equations	Aircraft equations of motion (EOM) ,Aircraft position & orientation , stability-frame & body frame,Eulers equations, small disturbance	Yechout .T.R Introduction to Aircraft Flight Mechanics ,AIAA education series 2003,	4	145-164
		Theory and Linearization of EOM, longitudinal and Decoupling in to lateral-directional motions- conditions for validity- role of symmetry	Yechout .T.R Introduction to Aircraft Flight Mechanics ,AIAA education series 2003,	4	239-285
		Lateral and directional stability-definition, static directional	Airplane performance stability & control	8	315-338

		stability rudder fixed , directional control, stick – free directional stability, dihedral effect and lateral control	by courtland D.Perkins,Robert E .Hage John wiley & sons		
UNIT – III	**Lateral ,Directional& Dynamic Stability- Response To Contro**l .	estimation of airplane dihedral effect, lateral control introduction ,estimation of lateral control power, Adverse yaw , aileron control forces	Airplane performance stability & control by courtland D.Perkins,Robert E .Hage John wiley & sons	9	341-370
		Solutions to the stability quartic of the linearized equations of motion, the principal mode-phugoid,short period, Dutch roll and spiral modes-further approximations , restricted degrees of motion – solutions , response to controls, auto rotation and spin.	Flight Stability and Automatic Control by Nelson, R. C., 2nd Edition., Tata Mc Graw Hill, 2007 Airplane performance stability & control by courtland D.Perkins,Robert E .Hage John wiley & sons	10,11	5 374-460
UNIT – IV	**Control System Modeling and Feedback Control**	Basic components of control system, open loop system, closed loop system, Types. Reduction of block diagrams - rules and conventions Stability analysis- Routh Hurwitz,Bode plot , Polar plot, - determination of gain margin and phase margin	Flight Stability and Automatic Control by Nelson, R. C., 2nd Edition., Tata Mc Graw Hill, 2007	7	235-251
			Flight Stability and Automatic	8	313-319

furtherapproximations, restricted degrees of

UNIT - V	**Design of Aircraft Controller, Stability and Control Augmentation & Auto Pilots**	Design of Stability Augmentation System (SAS) using displacement & rate feed-back, Control augmentation system	Control by Nelson, R. C., 2nd Edition., Tata Mc Graw Hill, 2007		
		Full authority fly-by-wire control, need for automatic control. Auto pilots- purpose, functioning, displacement auto pilot, pitch, yaw, bank, altitude and velocity hold auto pilot.		8	313-319