



Nonlinear Dynamical Systems

SWAYAM Prabha Course Code – E17

PROFESSOR'S NAME	Prof. Madhu N.Belur ,Prof. Harish K. Pillai
DEPARTMENT	Electrical Engineering
INSTITUTE	Indian Institute of Technology, Bombay
COURSE OUTLINE	Besides course outline, it should also indicate if there are any pre-requisites (i.e, prior knowledge) required .
	<p>This course "Nonlinear Dynamical Systems" covers basics of nonlinear differential equations that are encountered when dealing with practical dynamical systems in the context of their control. Classification of stable and unstable equilibrium points using phase portraits forms the initial focus, after which we study various features of dynamical systems that one encounters only in nonlinear systems: robust sustained oscillations, finite escape time, finite time to reach equilibrium position, amongst others. The course then covers necessary and sufficient conditions for existence and uniqueness of a solution and proof of this theorem (the Lipschitz condition). Study of periodic orbits forms an important aspect due to their practical utility. Lyapunov stability concepts followed by Lyapunov's theorems for stability, and some converse theorems, are introduced next. The Lure problem is studied next to address absolute stability considerations for sector-nonlinearity type of characteristics. A review of Nyquist stability criteria (of linear systems) is done here so that understanding the small gain theorem, passivity results and the circle/Popov criteria is easier and more thorough. Finally, we cover the describing function method and relate</p>

	this topic to earlier stability conditions.
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COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1	L1	Introduction
2	L2	First Order Systems
3	L3	Classification of Equilibrium points
4	L4	Lipschitz Functions
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References if

Any: