

<b>COURSE</b>	Name	: Nonlinear Control Systems
	Code	: EE185521
	Credit(s)	: 2
	Semester	: (Elective Course)

### Description of Course

The Nonlinear Control course discusses the modeling, analysis, and design methods of nonlinear systems and its applications in control systems. The first part of the course focuses on the analysis of the phenomena of nonlinear systems equipped with examples in real systems. The second section focuses on system stability via Lyapunov techniques, and the last focuses on the control design of nonlinear systems using feedback linearization techniques, sliding mode control and gain scheduling.

### Learning Outcomes

#### Knowledge

(P02) Mastering engineering concepts and principles to develop the necessary procedures and strategies for systems analysis and design in the areas of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

P(03) Mastering the factual knowledge of information and communication technology as well as the latest technology and its utilization in the field of power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

#### Specific Skill

(KK01) Being able to formulate engineering problems with new ideas for the development of technology in power systems, control systems, multimedia telecommunications, electronics, intelligent multimedia network, or telematics.

(KK03) Being able to produce system design for problem solving by utilizing other fields of study and concerning technical standards, performance aspect, reliability, ease of application, and assurance of sustainability.

#### General Skill

(KU07) Being able to improve the capacity of learning independently.

(KU11) Being able to implement information and communication technology in the context of execution of his/her work.

#### Attitude

(S09) Demonstrating attitude of responsibility on work in his/her field of expertise independently.

(S12) Working together to be able to make the most of his/her potential.

### Course Learning Outcomes

#### Knowledge

Mastering the concepts and engineering principles of nonlinear control to develop procedures and strategies needed for the analysis and design of nonlinear control using Matlab/Simulink.

#### Specific Skill

Able to analyze the stability of nonlinear systems and design nonlinear control systems taking into account the performance aspects and ease of application.

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**General Skill**

Able to improve the learning capacity independently through the design of nonlinear control and able to use Matlab/Simulink in designing of nonlinear control system.

**Attitude**

Demonstrating attitude of responsibility on his/her tasks independently and working together on a team to obtain better results.

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**Main Subjects**

1. Nonlinear Model and Nonlinear Phenomena
2. Phase Plane Analysis of Second Order Systems
3. Lyapunov Stability
4. Nonlinear Control Design
5. Feedback Linearization
6. Sliding Mode Control and Gain Scheduling

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**Reference(s)**

- [1] J.E. Slotine, W. Li (1991), "Applied Nonlinear Control," PHI, New Jersey
- [2] H.K. Khalil (2002), "Nonlinear System," PHI
- [3] S.S. Sastry (1999), "Nonlinear Systems, Analysis, Stability and Control," Springer Verlag
- [4] H.K. Khalil (1995), "Nonlinear Systems, in M.K. Masten (Ed.), Modern Controls Systems," IEEE Inc., New Jersey
- [5] International papers related to the nonlinear control problems

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**Prerequisite(s)**

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