Course number	U-LAS70 10002 SE50				
Course title (and course title in English)	ILAS Seminar-E2 :Chaos theory（カオス理論） ILAS Seminar-E2 :Chaos theory	**Instructor's name, job title, and department of affiliation**	Graduate School of Science Associate Professor,DECHANT，Andreas		
Group	Seminars in Liberal Arts and Sciences	**Number of credits**	2	**Number of weekly time blocks**	1
Class style	seminar (Face-to-face course)	**Year/semesters**	2025・First semester	**Quota (Freshman)**	15 (15)
Target year	Mainly 1st year students	**Eligible students**	For all majors	**Days and periods**	Wed.5
Classroom	02, Yoshida-South Campus Academic Center Bldg. West Wing			**Language of instruction**	English
Keyword	Science / Physics / Chaos / Programming				

[Overview and purpose of the course]

This seminar introduces various fascinating aspects of chaos. While “chaos” often has the connotation of something complicated and uncontrollable, we will see that chaotic behavior can emerge from seemingly simple situations. We will discover that chaos can be, in its own way, very ordered. Perhaps even more surprisingly, chaos can actually be a source of stability. Along the way, we will familiarize ourselves with some of the necessary mathematical tools to describe chaotic behavior. Finally, we will discuss where chaos occurs in physics and everyday phenomena. Throughout the seminar, we will perform several simple experiments on a computer and learn to recognize chaotic behavior.

[Course objectives]

- Understanding the connection between non-linearity and chaos.
- Becoming familiar with the basic mathematical theory of chaos.
- Recognizing chaotic phenomena in daily life and physics.
- Being able to write simple computer programs to visualize chaotic behavior.

[Course schedule and contents)]

Week 1-2: Dynamical systems and phase-space description.
Week 3-6: Using the Julia programming language to visualize dynamical systems.
Week 7-9: Bifurcations: the route to chaos.
Week 10: The Lyapunov exponent: chaotic or not?
Week 11-12: Self-similarity and Feigenbaum constants: order in chaos.
Week 13-14: Chaos in physics.
Week 16：Feedback

[Course requirements]

Basic programming skills and knowledge about basic physics (mechanics) are helpful but not required. Students should be familiar with high-school level mathematics (algebra and calculus).

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ILAS Seminar-E2 :Chaos theory（カオス理論）(2)

[Evaluation methods and policy]

The students will be graded based on their participation in class (30%) as well as worksheets and programming assignments (70%). Students will need at least 60% in total to pass.

[Textbooks]

No textbook, handouts will be provided.

[Study outside of class (preparation and review)]

Students will occasionally have to complete assignments or simple programming exercises.

[Other information (office hours, etc.)]

Office hour: Wed. 15:00-16:00

[Essential courses]