科目ナンバリング	U-LAS70 10002 SE50						
授業科目名<英訳>	ILAS Seminar-E2 :Chaos theory（カオス理論） ILAS Seminar-E2 :Chaos theory			担当者所属職名・氏名	理学研究科　准教授　DECHANT, Andreas		
群	少人数群	単位数	2単位	週コマ数	1コマ	授業形態	ゼミナール（対面授業科目）
開講年度・開講期	2026・前期	受講定員(1回生定員)	15 (15) 人	配当学年	主として1回生	対象学生	全学向
曜時限	水5	教室	共西02			使用言語	英語
キーワード	Science / Physics / Chaos / Programming						

[授業の概要・目的]

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.

[到達目標]

- 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.

[授業計画と内容]

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

[履修要件]

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).

[成績評価の方法・観点]

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.

[教科書]

No textbook, handouts will be provided.

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[授業外学修（予習・復習）等]

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

[その他（オフィスアワー等）]

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

[主要授業科目（学部・学科名）]