Course number	U-LAS70 10002 SE50				
Course title (and course title in English)	ILAS Seminar-E2 :Introduction to Probability（確率入門） ILAS Seminar-E2 :Introduction to Probability	**Instructor's name, job title, and department of affiliation**	Research Institute for Mathematical Sciences Associate Professor,Croydon, David Alexander		
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**	2024・First semester	**Quota (Freshman)**	8 (8)
Target year	Mainly 1st year students	**Eligible students**	For all majors	**Days and periods**	Thu.4
Classroom	31, Yoshida-South Campus Academic Center Bldg. North Wing			**Language of instruction**	English
Keyword	mathematics / probability / random variable / stochastic process / Markov chain				

[Overview and purpose of the course]

This seminar-style course will give students a chance to learn about some important models in applied probability. The focus will be on Markov chains, which are central to the understanding of random processes, and have applications in simulation, economics, optimal control, genetics, queues and many other areas. As well as introducing mathematical techniques, it will be a goal to show how these can be applied to understand certain random phenomena, such as the long-time behaviour of random walks, survival/extinction of branching processes, convergence of algorithms, and reinforcement.

[Course objectives]

- To understand basic models of applied probability, particularly Markov chains
- To apply mathematical techniques to understand random phenomena in applications
- To gain experience in reading and presenting mathematics in English

[Course schedule and contents)]

In the first lecture, the lecturer will introduce the topic, and basic aims of the course. For most subsequent weeks, the classes will consist of two parts:
- a part where students present their attempts to solve problems set by the lecturer in the previous class;
- a part where the lecturer introduces some new topics upon which the following week's student problems will be based.

The following indicates possible topics, though this may vary depending on the students’ proficiency level and background.

(1) Introduction to applied probability and Markov chains [1 week]
Review of basic probability, definition of a Markov chain, outline of course
(2) Basic properties of discrete-time Markov chains [7 weeks]
Class structure, hitting times/probabilities, computations using probability generating functions
(3) Long-time behavior of discrete-time Markov chains [3 weeks]
recurrence/transience, invariant distributions, convergence to equilibrium, time reversal, ergodic theorem
(4) Applications [3 weeks]
Random walks, branching processes, urn models, queuing models

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Total: 14 classes and 1 week for feedback

[Course requirements]

None

[Evaluation methods and policy]

Students will be expected to participate in class, both by presenting material prepared in advance, and by discussing problems. Their performance in these aspects will contribute 70% of the final mark. There will also be a final exam, in which students will be asked to apply the techniques covered in the course, which will also contribute 30% of the final mark.

[Textbooks]

Norris 『Markov Chains』 （University Press, 1997）
Grimmett and Stirzaker 『Probability and random processes』 （Oxford University Press, 2001）
All the material needed for this course will be provided in the classes, and so there is no need to purchase the listed textbooks. However, they are both good sources for additional reading. Particularly, the course will follow quite closely Chapter 1 of the Norris book.

[Study outside of class (preparation and review)]

As noted in the course schedule, from the second week, students will be asked to prepare and present problem solutions. (Their efforts on such assignments form part of the assessment.) Details will depend on the number of students enrolled on the course, and will be discussed in the first class. Typically the lecturer would expect students to spend 1-2 hours per week on study outside the class.

[Other information (office hours, etc.)]