

MATH-332

**Stochastic processes**

Mountford Thomas

Cursus	Sem.	Type
Mathematics	BA6	Opt.
Statistics	MA2, MA4	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

The course follows the text of Norris and the polycopie (which will be distributed chapter by chapter).

**Content**

We will follow the book of Norris beginning with a recap of basic probability. Then we pass to the definition of Markov chains and the definition of irreducible. We analyze notions of recurrence and transience, particularly for irreducible chains. We then define positive recurrence and stationary distributions before proving the convergence theorem for aperiodic positive recurrent markov chains. The last two topics are continuous times Markov Chains and renewal theorems.

**Keywords**

Stationary distributions. Irreducibility. Aperiodicity. Communicating classes. Transience and recurrence. Transition matrices. Operators.

**Learning Prerequisites****Required courses**

Second year probability.

**Learning Outcomes**

By the end of the course, the student must be able to:

- Compute stationary distributions
- Classify communicating classes
- Solve hitting probabilities
- Use the renewal theorem
- Check irreducibility

**Transversal skills**

- Demonstrate the capacity for critical thinking

**Teaching methods**

Lectures followed by exercise sessions

### Assessment methods

The greater part of the note will be determined by the final (written) exam. There will also be small contribution by a "midterm" exam and by exercises.

Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

### Supervision

Office hours	No
Assistants	No

### Resources

#### Bibliography

Markov Chains by J. Norris is recommended but not obligatory.

#### Ressources en bibliothèque

- [Markov Chains / Norris](#)

#### Notes/Handbook

Notes will be made available

#### Moodle Link

- <https://go.epfl.ch/MATH-332>