

# **FRE 9743, Special Topics: Markov Processes in Finance**

## **Instructor Information**

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## **Course Information**

- FRE 9743 Sec# B
- Special Topics: Markov Processes in Finance
- This course will motivate a solid foundation in the theory of Markov processes with numerous applications in finance. Applications will be taken from: mortgage modeling, credit modeling, dynamic programming, Monte Carlo Markov chain and Hidden Markov Models. Theory will be taken from: stationary distributions, quasi-stationary distributions, absorption probabilities, convergence, statistical modeling, etc. We will focus will be primarily on finite Markov chains but also discuss various divergences from this type of model. The class will place emphasis on mathematics and statistical modeling.
- Familiarity with probability theory and linear algebra
- Wednesdays, 6:00 – 8:30
- 615 Rogers Hall

## **Course Overview and Goals**

This course will motivate a solid foundation in the theory of Markov processes with numerous applications in finance. Applications will be taken from: mortgage modeling, credit modeling, dynamic programming, Monte Carlo Markov chain and Hidden Markov Models. Theory will be taken from: stationary distributions, quasi-stationary distributions, absorption probabilities, convergence, statistical modeling, etc. We will focus will be primarily on finite Markov chains but also discuss various divergences from this type of model. The class will place emphasis on mathematics and statistical modeling.

## **Upon Completion of this Course, students will be able to:**

- Understand the mathematics of Markov chains and processes including stationary distributions, quasi-stationary distributions, absorption probabilities, etc.
- Understand the applications of Markov chains and processes to finance including credit modeling, mortgage modeling and market modeling

## Course Requirements

### Assignments

Pre-midterm homework assignment

Pre-final homework assignment

### Tests & Quizzes

Midterm Exam

Final Exam

### Assigned Readings

Online lecture notes: <http://www.atteson.com/Markov/>

These will be supplemented with book material which will be provided in class

### Grading of Assignments

The grade for this course will be determined according to the following formula:

Assignments/Activities	% of Final Grade
Pre-midterm homework assignment	25%
Midterm	25%
Pre-final homework assignment	25%
Final	25%

## Letter Grades

Letter grades for the entire course will be assigned as follows:

Letter Grade	Points	Percent
<b>A</b>	4.00	Example: 92.5% and higher
<b>A-</b>	3.67	Example: 90.0 – 92.49%
<b>B+</b>	3.33	Example: 87.5% - 89.99%
<b>B</b>	3.00	Example: 82.5% - 87.49%
<b>B-</b>	2.67	Example: 80% - 82.49%
<b>C+</b>	2.33	Example: 77.5% - 79.99%
<b>C</b>	2.00	Example: 70.0% - 77.49%
<b>F</b>	.00	Example: 69.99% and lower

## Course Materials

### Resources

- **Access your course materials:** [NYU Classes](#) (nyu.edu/its/classes)
- **Databases, journal articles, and more:** [Bern Dibner Library](#) (library.nyu.edu) [NYU Virtual Business Library](#) (guides.nyu.edu/vbl)
- **Obtain 24/7 technology assistance:** Tandon IT Help Desk ([soehelpdesk@nyu.edu](mailto:soehelpdesk@nyu.edu), 646.997.3123)  
NYU IT Service Desk ([AskIT@nyu.edu](mailto:AskIT@nyu.edu), 212-998-3333)

## Policies

### Academic Misconduct

- A. **Introduction:** The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.
- B. **Definition:** Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
  1. **Cheating:** intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
  2. **Fabrication:** including but not limited to, falsifying experimental data and/or citations.
  3. **Plagiarism:** intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
  4. **Unauthorized collaboration:** working together on work that was meant to be done individually.

5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

## Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the **Moses Center for Students with Disabilities** (212-998-4980 or [mosescsd@nyu.edu](mailto:mosescsd@nyu.edu)) for further information. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for assistance.