Stochastic Processes

MH 3512

Introduction

This lecture

Background

- **Since 2019:** Nanyang Assistant Professor at NTU
- **06.2015-12.2018:** Postdoc in Financial and Insurance Mathematics at ETH Zurich
- **02.2012-05.2015:** PhD in Mathematics, ETH Zurich (Columbia U.)

  Supervisors: Prof. Marcel Nutz (Columbia University), Prof. Martin Schweizer (ETH Zurich)

  Thesis title: Knightian Uncertainty in Mathematical Finance
- **10.2006-10.2011:** Bachelor and Master in Mathematics at ETH

Research interests:

- Machine Learning Algorithms in Finance and Insurance
- Model Uncertainty in Financial Markets
- Financial and Insurance Mathematics
- Stochastic Analysis & Stochastic Optimal Control
- Stochastic Optimization and Applied Probability Theory

Schedule & Teaching Method

- **Lecture:** Online (Recorded videos on NTULearn available)

- We shall have lectures followed by exercises after each chapter, whose solutions are available in the lecture notes

Remark: If there is an exercise you would like me to explain more in detail, please send me an email and I can explain it to you and/or make a video for everyone available

Knowledge requirement: MH2500 (Introduction course to probability)

Help (repetition of MH2500): Chapter 1 of lecture notes

Recommendation: Solve as many exercises as possible

- **Repetition & Tutorial (voluntary):**
  - Friday 10:30-12:30 online via Zoom, during week 1-2
  - Friday 10:30-12:30 at SPMS-LT1 (recorded), from week 3 on

- 45-60 minutes repetition of this week's topic, followed by
- 30-45 minutes of discussion of the homework/exercise, followed by
- 15-30 minutes of question times

- Maximum 49 students per tutorial class (safe distancing measures)
- May register each week online via doodle link I'll send you per email

Remark: If one student does not get a spot in one of the tutorial classes, please send me an email

Learning subjects & resources

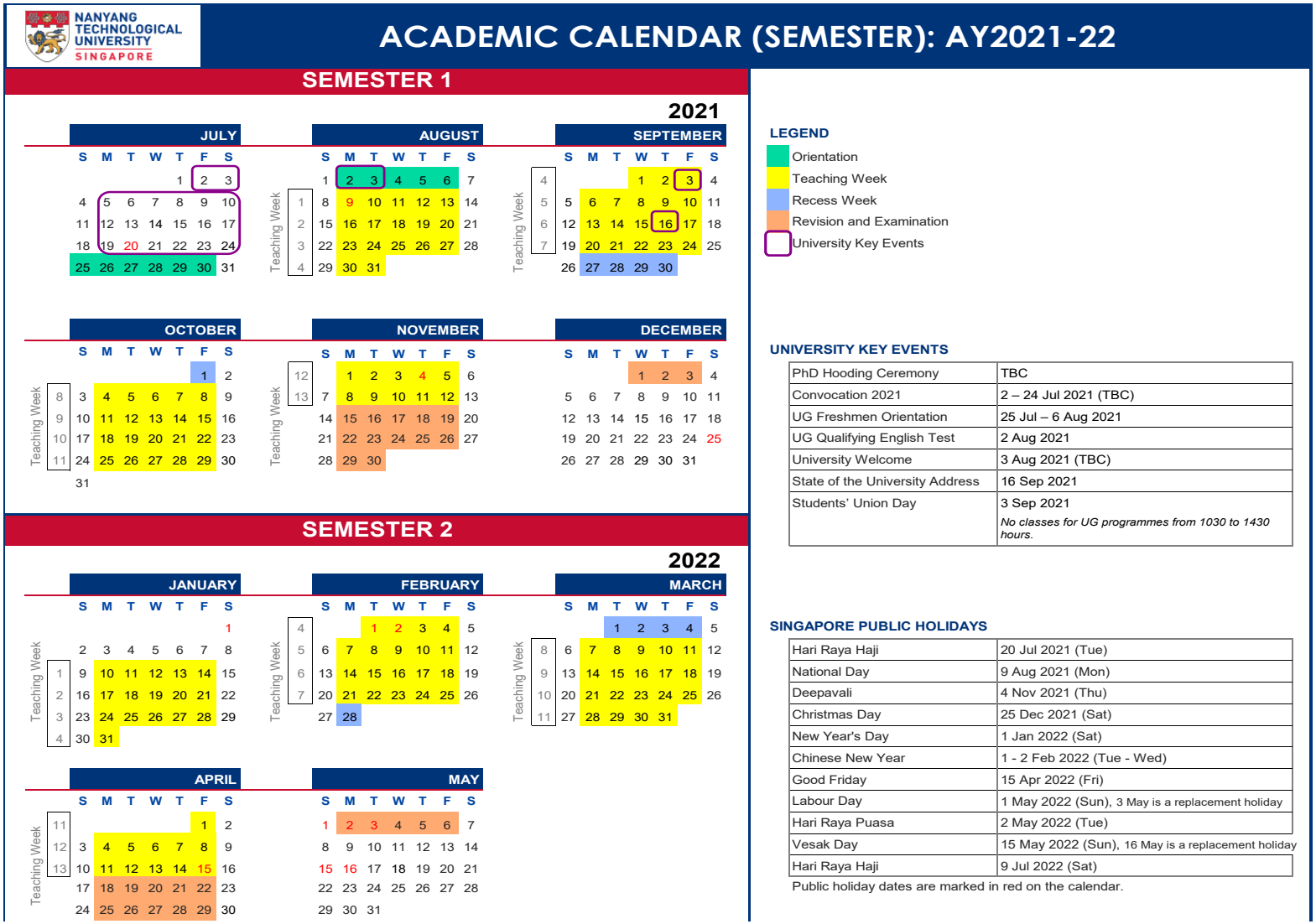
- Part I: Gambling Problems (1 week; Week 1)
- Part II: Random Walks (1 week; Week 2)
- Part III: Discrete-time Markov Chains (1 week; Week 3)
- Part IV: First Step Analysis (1 week; Week 4)
- Part V: Classification of States (1 week; Week 5)
- Part VI: Long-Run Behavior of Markov Chains (1 week; Week 6)
- Repetition week (1 week; Week 7)
- Mid term exam (1 week; Week 8)
- Part VII: Discrete-Time Martingales (1 week Week 9)
- Part VIII: Branching Processes (1 week Week 10)
- Part IX: Continuous-time Markov Chains (2 weeks Week 11-12)
- Repetition week (1 week; Week 13)

- **Lecture notes** will be available on NTULearn and on my webpage

  www.ntu.edu.sg/home/ariel.neufeld

- **Consult** and **discuss** with your class mates

Semester Dates



NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

ACADEMIC CALENDAR (SEMESTER): AY2021-22

SEMESTER 1

2021

JULY

	S	M	T	W	T	F	S
					1	2	3
	4	5	6	7	8	9	10
	11	12	13	14	15	16	17
	18	19	20	21	22	23	24
	25	26	27	28	29	30	31

AUGUST

Teaching Week	S	M	T	W	T	F	S
		2	3	4	5	6	7
1	8	9	10	11	12	13	14
2	15	16	17	18	19	20	21
3	22	23	24	25	26	27	28
4	29	30	31				

SEPTEMBER

Teaching Week	S	M	T	W	T	F	S
				1	2	3	4
4	5	6	7	8	9	10	11
5	12	13	14	15	16	17	18
6	19	20	21	22	23	24	25
7	26	27	28	29	30		

OCTOBER

Teaching Week	S	M	T	W	T	F	S
						1	2
8	3	4	5	6	7	8	9
9	10	11	12	13	14	15	16
10	17	18	19	20	21	22	23
11	24	25	26	27	28	29	30
	31						

NOVEMBER

Teaching Week	S	M	T	W	T	F	S
12		1	2	3	4	5	6
13	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30				

DECEMBER

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

SEMESTER 2

2022

JANUARY

Teaching Week	S	M	T	W	T	F	S
							1
	2	3	4	5	6	7	8
1	9	10	11	12	13	14	15
2	16	17	18	19	20	21	22
3	23	24	25	26	27	28	29
4	30	31					

FEBRUARY

Teaching Week	S	M	T	W	T	F	S
4			1	2	3	4	5
5	6	7	8	9	10	11	12
6	13	14	15	16	17	18	19
7	20	21	22	23	24	25	26
	27	28					

MARCH

Teaching Week	S	M	T	W	T	F	S
			1	2	3	4	5
8	6	7	8	9	10	11	12
9	13	14	15	16	17	18	19
10	20	21	22	23	24	25	26
11	27	28	29	30	31		

APRIL

Teaching Week	S	M	T	W	T	F	S
11						1	2
12	3	4	5	6	7	8	9
13	10	11	12	13	14	15	16
	17	18	19	20	21	22	23
	24	25	26	27	28	29	30

MAY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

LEGEND

- Orientation
- Teaching Week
- Recess Week
- Revision and Examination
- University Key Events

UNIVERSITY KEY EVENTS

PhD Hooding Ceremony	TBC
Convocation 2021	2 – 24 Jul 2021 (TBC)
UG Freshmen Orientation	25 Jul – 6 Aug 2021
UG Qualifying English Test	2 Aug 2021
University Welcome	3 Aug 2021 (TBC)
State of the University Address	16 Sep 2021
Students' Union Day	3 Sep 2021 *No classes for UG programmes from 1030 to 1430 hours.*

SINGAPORE PUBLIC HOLIDAYS

Hari Raya Haji	20 Jul 2021 (Tue)
National Day	9 Aug 2021 (Mon)
Deepavali	4 Nov 2021 (Thu)
Christmas Day	25 Dec 2021 (Sat)
New Year's Day	1 Jan 2022 (Sat)
Chinese New Year	1 - 2 Feb 2022 (Tue - Wed)
Good Friday	15 Apr 2022 (Fri)
Labour Day	1 May 2022 (Sun), 3 May is a replacement holiday
Hari Raya Puasa	2 May 2022 (Tue)
Vesak Day	15 May 2022 (Sun), 16 May is a replacement holiday
Hari Raya Haji	9 Jul 2022 (Sat)

Public holiday dates are marked in red on the calendar.

Indicative assessment

1. Midterm Exam: 25%
   - 2 hours
   - Closed book (= **no notes**)

   Date & time: Wednesday 06. October, 13:30-15:30

   Location: **HALL F**

   Remark: Everyone is required to attend

2. Homework: 25%

   Remark: Everyone is required to solve it him/herself

3. Final exam: 50%
   - 2 hours
   - Closed book (= **no notes**)

   Date & time: Friday 26. November, 14:30-16:30

   Location: **TBA**

Questions

- If you have any questions, please feel free to contact me per email or in person during tutorial class on Friday

My **email** address: ariel.neufeld@ntu.edu.sg

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