Syllabus

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Course Introduction

Logistics

- 2025 Fall, + ITM529 Stochastic Processes
- Monday 10AM-1PM, (Classroom)

Professor

- Sim, Min Kyu, mksim@seoultech.ac.kr
- Generally available for consulatation on
  - Monday: 9:00-9:45 and 4pm-5pm
  - Wednesday: 2PM-3PM
  - (Please make an appointment by email)
- Office: Frontier Rm. 915

Teaching Assistant

- TBA
- Office Hour:
- Office Location: Frontier Rm. 301-1
- You may visit him for any question related to the course.

What do we learn in this course?

- What is stochastic?
  - Stochastic: time + random
  - Concerns with **decision making under uncertainty** based on mathematical models
- Manufacturing system
  - Material order policy
  - Production line design
  - Revenue management
- Service system
  - Human resource management system
  - Marketing/strategic decision
- Sports
  - Team injury management
  - Strategic decision
- Gambling
  - Winning odds
  - Betting strategies.

Topics

1. Math preparations
2. Newsvendor Model
3. Queuing Theory
4. Discrete time Markov chains (DTMC)
5. Poisson Processes
6. Continuous time Markov chains (CTMC)
7. Markov reward process (MRP)

Importance of this course

- Academic importance
  - Many universities name IE department as "Operational Research'' department.
  - Operation research is generally divided by two parts - optimization and stochastic processes. This course learns stochastic processes and their applications. This course is therefore pivotal for advanced classes in IE curriculum.
  - You will also grow your quantitative skills including, but not limited to: Linear Algebra, Probability, and Statistics.
  - Doing well in this course will open the opportunity to learn subjects including but not limited to:
    - Markov Decision Process
    - Stochastic Optimization
    - Reinforcement Learning

- Practical importance
  - Many real-world systems contain stochastic natures. This course builds your intutive understanding on these systems.
  - Stochastic models can help you understand and deal with "decision making under uncertainty'' in scientific ways.

Course objectives

- At the end of this course, students will be able to:
    - Deal with mathematics regarding stochastic model.
    - Think about the applicability of stochastic model.
    - Discuss stochastic perspectives in your area.
    - Answer very well if your future job interviewer asks you "What did you learn in the stochastic process class and how can it be applied to our business model?' '
    - Model a system when randomness is significant
    - Describe how variability affects a system's behavior and performance
    - Apply Markov Chains and basic inventory models
    - Define key concepts in production flow such as bottlenecks, line balancing, and Little's Law

Logistics

Assessment

- Homework [25%]
- Tests
  - Quiz [10%] - Sep 15 (week 3)
  - Midterm [30%] - Oct 27 (week 9)
  - Final [35%] - Dec 8 (week 15)

Schedule

- Dates for video class
  - Sep 8 - Math Review (week 2)
  - Oct 6 - National Holiday (week 6)
  - Nov 17 - College applicants (week 12)

Homeworks

- There are two types of homework.
- Type I - "Study Record"
  - Hand-writing only. Please make it legible to anyone. You may summarize the topic covered, share your workflow for exercise problem, and/or bring your questions.
  - Submit by the beginning of the offline classes. Used for attendance checking as well.
  - Submit eight times (Sep 22, Sep 29, Oct 13, Oct 20, Nov 3, Nov 10, Nov 24, Dec 1)
  - The template is posted in e-class.
- Type II - "Problem set"
  - In each homework, exercise problem will be given. No late submission is allowed.
  - The primary purpose for this is to make you stay attentive to the ongoing course topic.
  - You are encouraged to discuss with other classmates, but you must submit your work independently with your handwriting.
  - Presentation always matters.

Exercises

- There will be exercise and solutions included in the lecture notes.
- You are advised to use them for test preparations.
- Will not be officially graded, but you are highly encouraged to submit your work. Your work will receive careful feedback.
- The best way to achieve good grade is completely understanding homework. You should not only aim to "get the right answer" but also to **"be able to create your work that matches the quality of posted solutions under test condition"**

Tests

- Closed notes, Closed book, NO calculator, and NO cheat sheet.
- Make-up quiz/exam can be only given for an official reason and it needs to be consulted immediately.
- Professors tend give make-up exams more difficult than regular ones because making two sets of fair exams are very difficult.

Others

- Lecture note will be posted at e-class earlier than (24) hours to class. Otherwise, I will have them printed out for you.
- If attendance rate is high enough, then annotated note will be posted e-class.
- You are expected to attend all classes. I can assure you that missing classes and attempting to catch up material by studying lecture notes is not a good strategy at all.
- Do not use laptop unless taking notes. Sit in the front rows if using laptop.
- Using tablet device to taking note is OK, but printing lecture notes and bring them in class is highly recommended.

Final grade

- IF total score $\geq$ 90% THEN guaranteed to get A.
- IF total score $\geq$ 80% THEN guaranteed to get B.
- IF total score $<$ 50% THEN most likely F.
- More than 25% of class will get A.
- More than 55% of class will get B or better.
- Good class performance will lower the "cut'' lines.

Student code of conduct

- Zero tolerance on cheating. F will be automatically given and student will be reported to department chair and whatever authorities that may be concerned.
- Professor and TA are obliged to protect "good" students against all the malicious/dishonest attempts.

Test/Quiz regrading request

1. Take your test back. **Check the solution and grading scheme.**

2. If grading was wrong⋯

3. **DO NOT write/modify/erase anything on your test.** Doing so will not only compromise your right to request regrading but also be possibly considered as honor code violation.

4. Write down your argument and [email address] in a separate paper.

5. STAPLE your written argument and test together and submit to professor.

6. Argument will be accepted only if
   i) grading mistake
   ii) grading inconsistency
   iii) CRITICALLY unfair partial grading policy

7. Regrading request must be made within (7) days from the first date when the graded quiz/exam started to be distributed.

Questionnaire - 2025 Fall

1. Name:
2. Major:
3. How many semesters have you spent in undergraduate so far (excluding Summer and Winter semester)?

4. Did you take Elementary Statistics? If so, mind if I ask your grade?

5. What grade do you expect to receive in this class?

6. Anything you want to say?

7. What is your plan after graduation? (Job area and/or major in graduate school)

8. Have you heard of exponential distribution? How familiar? (1-5 scale, 5 to be very familiar)

9. What is your biggest concern in this class?

10. If your concern is so big that you want to consult with me this week, then write down your email address. If your grade for Elementary Statistics was D or below, then this is necessary.

11. What is your hobby/interest?

"Stochastic Processes for ITM, 2025 Fall"