

## Mathematical Analysis for Finance 2

Course Name	Course type (credit/hours)	Required course(3/3)	Course code	1091
	Target students Division/major/grade	Financial Engineering/Junior	Opening semester	2021 2ND SEMESTER
	Class time and classroom	Tue F(Da406)Thu E(Da406)	English Grade	A(100%English)
Reference to this course	Prerequisite courses			
	Related basic courses			
	Recommended concurrent courses			
	Related advanced courses			

Instructor	Name (title/division)		Hyeng Keun Koo(Professor, Financial Engineering)		
	Office Room Number	Dasan 525	Office phone Number	2706	e-mail
	Office hours	Tuesday 3:00-4:00		Homepage address	<a href="https://sites.google.com/ajou.ac.kr/hkoo/">https://sites.google.com/ajou.ac.kr/hkoo/</a>
Teaching Assistant	Name (title/division)				
	Office Room Number		Office phone Number		e-mail asj92@ajou.ac.kr

### 1. Introduction

We will study mathematical analysis which provides a foundational methodology for financial engineering in this course. We will first review the concepts of metric space, limits of sequences, and continuity of functions. We will next study differentiation, the intermediate value theorem, integration, and fundamental theorem of calculus. We will study fixed point theorems and their applications. Afterwards, we will discuss sequences and series of functions, and learn about Taylor's theorem and Fourier analysis. We will define the exponential function and trigonometric functions by using series of functions and define the logarithmic function and arcsine, arccosine, and arctangent functions as their inverses. We will talk about partial derivatives of functions of several variables, and the inverse function theorem and the implicit function theorem. Finally we will introduce measure and Lebesgue integration.

### 2. Course Objectives

The objective of the course is to enable students to grasp basic concepts and tools of mathematical analysis so that they will be able to solve problems arising from financial engineering by using mathematical tools.

### 3. Class types and activities

The course will be online and consist of lectures and presentations. Presentations will be real-time online (using Zoom) and will be scheduled around final few weeks of the course.

Presentations:

1. A team will select a topic related to the course material and do research on the topic.
2. The instructor will randomly select the order of presentations and make announcement.
3. Each team will upload the presentation material (e.g., ppt file) on the Ajou Bb by the midnight the day before the presentation.
4. Every member of a team will need to participate in presentation. The time for presentation for each team will be about 15 minutes including the time for Q&A.
5. Students will need to form teams, each team will consist of 2 (or 3) members. When, it's difficult to form a team for a student, the instructor will assign the student to a team.

### 4. Teaching Method

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> lecture                                     | <input checked="" type="checkbox"/> discussion and debate   |
| <input checked="" type="checkbox"/> team project(presentation and case studies) | <input type="checkbox"/> experiments(role-playing,etc)      |
| <input type="checkbox"/> designing and production                               | <input type="checkbox"/> on-site learning(on-site training) |
| <input type="checkbox"/> others   |   |

### 5. Support Systems in Use

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|--|--|---|
| <input checked="" type="checkbox"/> AjouBb               | <input checked="" type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input type="checkbox"/> cyber lecture                   | <input type="checkbox"/> online content                        |   |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others                                |   |

### 6. Teaching Tools

- |   |  |  |
|---|--|--|
| <input checked="" type="checkbox"/> PBL(Problem Based Learning) | <input checked="" type="checkbox"/> CBL(Case Based Learning) | <input checked="" type="checkbox"/> TBL(Team Based Learning) |
| <input type="checkbox"/> UR(Undergraduate Research)             | <input type="checkbox"/> FL(Flipped Learning)                | <input type="checkbox"/> DSAL(Data Science Active Learning)  |
| <input type="checkbox"/> others                                 |  |  |

## 7. Knowledge and ability required for taking this course

logical reasoning, calculus, Mathematical analysis for finance 1

## 8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	
midterm exam		30%	
final exam		30%	
quiz		20%	2 quizzes
presentation	1	10%	
discussion			
homework			
etc			
study hours			

## 9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	Principles of Mathematical Analysis	Walter Rudin	MaGraw Hill	2013
Ref.	Real Analysis with Economic Applications	Efe A. Ok	Princeton University Press	2007
Ref.	Microeconomic Theory	Mas-Collel, Winston, Green	Oxford University Press	2012

## 10. Class system and Class shedule

The course will introduce basic concepts and tools of mathematical analysis. It will cover the following contents:

1. Review of metric spaces, sequences and their limits, continuity of functions, definition of differentiation
2. Differentiation: the mean-value theorem, fundamental theorem of calculus
3. Integration: definition, properties, integration by parts
4. Sequences and series of functions
5. The fixed point theorems and their applications
6. Special functions
7. Functions of several variables
8. Introduction to measure theory

< Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction and Reveiw	E	Hyeng Keun Koo		lecture	
2	Review	E	Hyeng Keun Koo		lecture	
3	Review	E	Hyeng Keun Koo		lecture	
4	Differentiation and Integration	E	Hyeng Keun Koo		lecture	
5	Integration	E	Hyeng Keun Koo		lecture	
6	Sequences of Functions 1	E	Hyeng Keun Koo		lecture	
7	Sequences of functions 2	E	Hyeng Keun Koo		lecture	
8	Mid-term	E	Hyeng Keun Koo		written exam	
9	Fixed Point Theorems and Applications	E	Hyeng Keun Koo		presentation and lecture	
10	Special Functions	E	Hyeng Keun Koo		presentation and lecture	
11	Functions of Several Variables	E	Hyeng Keun Koo		presentation and lecture	
12	Introduction to Measure Theory	E	Hyeng Keun Koo		presentation and lecture	
13	Presentations	E	Hyeng Keun Koo		presentation and lecture	
14	Presentations	E	Hyeng Keun Koo		presentation and lecture	
15	Presentations	E	Hyeng Keun Koo		presentation and lecture	
16	Overview	E	Hyeng Keun Koo		presentation and lecture	

11. Other items of notification

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