

Differential Equations for Finance

Course Name	Course section (credit/hours)	Required course(3/3)			course code	I121
	course item				course component	
	Target students Division/major/grade				opening semester	2021 1ST SEMESTER
	Class time and classroom	Mon C(Da311)Wed C(Da311)			English Grade	A(100%English)
Reference to this course	Credit compositon	Theory(80) + Design(0) + Practice(20)				
	Prerequisite courses					
	Related basic courses					
	Recommanded concurrent courses					
	Related advanced course					
Instructor	Name (title/division)	Hyeong-Ohk Bae(Professor, Financial Engineering)				
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Teaching Assistant	Name (title/division)					
	Office Room Number		Office phone Number		e-mail	

1. Course Introduction

Many natural and social behaviors are described in forms of differential and partial differential equations. In particular, the famous Black-Scholes equation in financial engineering is a partial differential equation, and stock price movements can be expressed as a stochastic differential equation. In order to understand and solve them, as a tool we study differential equations based on the calculus. Differently from the previous sessions, we also study numerical calculation for ODE with python. In stead, series solution parts will be reduced.

2. Course Objectives & course outcome

1. 미분방정식을 안다. To understand differential equations.
2. 미분방정식과 관련된 현상들을 수학적으로 모델링한다. To get modeling of natural phenomena or social activities mathematically.
3. 방정식에 맞는 해법을 찾아 방정식의 해를 구한다. To find a method of solving differential equations, and find solution with these methods.
4. 방정식의 해를 해석한다. To analyse the solutions obtained and work on their dynamics.
5. 방정식 해의 계산을 수치적으로 파이썬 코드를 써서 직접 계산하는 방법을 익힌다. To calculate ODE solutions with python codes using simple numerical methods.

3. Class types and activities

- 1.The course will be delivered in lecture.
We try to explain the concepts of the equations and to solve them.
- 2.There will be homeworks and three exams.
3. The lectures will be done in the classroom and simultaneously will be delivered online.

4. Teaching Method

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|---|---|
| <input checked="" type="checkbox"/> lecture | <input 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 checked="" type="checkbox"/> online content | |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others | |

6. Teaching Tools

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

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10	
midterm exam	2	50	each 25%
final exam	1	30	
quiz			

7. Evaluation method of course outcome

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
presentation			
discussion			
homework		10	
etc			
study hours			

8. Textbook and Reference material

Main/Sub	Title	Writer	Publisher	Publication year
Main	elementary differential equations	william trench	online version	

9. Class system and Class shedule

<p>1계미분방정식과해법,모델링->2계미분방정식과해법,모델링->고계미분방정식->Laplace Transform->수치적 해의 계산</p> <p>1st order ODE and solver, modeling 2nd order ODE higher order ODE Laplace transform numerical solution</p>	
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< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
1	Ch1,introduction 2.1 linear first ODE	E	3				
2	2.2,-2.5 separable, existence, exact equation	E	3				
3	2.6,4.1, 4.5, 5.1-5.2 integrating factor, application, homo linear eq	E	3				
4	5.3, 5.4 nonhomo linear eq . exam	E	3				
5	5.5-5.6 undetermined coefficients, reduction,	E	3				

< Schedule >

* language : K-korean, E-English

Weeks	Title of lecture	language	time distribution(minutes)			Teaching Method	evaluation method
			theory	design	experiment practice		
6	5.7, 7.1-7.2 variation of parameter, power series solution	E	3				
7	8.1, 8.2 laplace transform	E	3				
8	exam	E	3				
9	8.3, 8.4 IVP	E	3				
10	8.5, 8.6 unit step convolution,	E	3				
11	8.7-8.8 laplace trans	E	3				
12	numerical methods	E	3				
13	numerical methods	E	3				
14	numerical methods	E	3				
15	review	E	3				
16	exam	E	3				

10. Contribution index of the course for attaining ABEEK program outcomes

course outcome	contribution scale
No Data	

11. Analysis of improved matters for the previous semester

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13. Reference items

This course will be delivered in English.
However, this course is relatively easy.
Because this course deals with mainly techniques,
if you have studied math1,2, then there might be no serious problems.