

## Differential Equations for Finance

Course Name	Course type (credit/hours)	Required course(3/3)		Course code	1104
	Target students Division/major/grade	Financial Engineering/Sophomore		Opening semester	2019 1ST SEMESTER
	Class time and classroom	Mon C(Da311)Wed C(Da311)		English Grade	A(100%English)
Reference to this course	Prerequisite courses				
	Related basic courses				
	Recommended concurrent courses				
	Related advanced courses				
Instructor	Name (title/division)		Hyeong-Ohk Bae(Professor, Financial Engineering)		
	Office Room Number	다산관 422호	Office phone Number	2572	e-mail
	Office hours		Homepage address		
Teaching Assistant	Name (title/division)				
	Office Room Number		Office phone Number		e-mail

### 1. 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.

### 2. Course Objectives

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.

### 3. Class types and activities

- 1.The course willbe delivered in lecture.  
We try to explain the concepts oftheequations and to solve them.
- 2.There will be homeworks and three exams.

### 4. Teaching Method

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|--|---|
| <input checked="" type="checkbox"/> lecture                          | <input type="checkbox"/> discussion and debate              |
| <input 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 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 analyzating 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 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

1.수학1과 수학2를 이수했고 성실히 공부하는 학생이라면 이 과목을 수강하는데 어려움이 없다.

We need Math1 and 2 as prerequisites. Especially we need knowledge on differentiation.

2.연립미분방정식의해를구할 때선형대수가필요하므로동시수강을권장한다.

To solve differential equations, students needs some techniques to solve linear system.

So we recommend students to take linear algebra simultaneously.

## 8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10	
midterm exam	2	50	each 25%
final exam	1	30	
quiz			
presentation			
discussion			
homework		10	
etc			
study hours			

## 9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	elementary differential equations	william trench	online version	

## 10. Class system and Class shedule

<p>1계미분방정식과해법,모델링-&gt;2계미분방정식과해법,모델링-&gt;고계미분방정식-&gt;2계미분방정식의역급수해법-&gt;LaplaceTransform-&gt;1계연립미분방정식의해법</p> <p>1st order ODE and solver, modeling                  2nd order ODE                  higher order ODE                  series solution                  Laplace transform                  1st order linear system</p>
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### < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Ch1, introduction 2.1 linear first ODE	E	Hyeong-Ohk Bae			
2	2.2,-2.5 separable, existence, exact equation	E	Hyeong-Ohk Bae			

## < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
3	2.6,4.1, 4.5, 5.1-5.2 integrating factor, application, homo linear eq	E	Hyeong-Ohk Bae			
4	5.3, 5,4 nonhomo linear eq . exam	E	Hyeong-Ohk Bae			
5	5.5-5.6 undetermined coefficients, reduction,	E	Hyeong-Ohk Bae			
6	5.7, 7.1-7.2 variation of parameter, power series solution	E	Hyeong-Ohk Bae			
7	7.2, 7.3 series solution	E	Hyeong-Ohk Bae			
8	exam	E	Hyeong-Ohk Bae			
9	7.4, 7.5 regular singular	E	Hyeong-Ohk Bae			
10	7.6. 7,7 frobenius	E	Hyeong-Ohk Bae			
11	8.1, 8.2 laplace transform	E	Hyeong-Ohk Bae			
12	8.3, 8.4 IVP	E	Hyeong-Ohk Bae			
13	8.5, 8.6 unit step convolution,	E	Hyeong-Ohk Bae			
14	8.7-8.8 laplace trans	E	Hyeong-Ohk Bae			
15	review	E	Hyeong-Ohk Bae			
16	exam	E	Hyeong-Ohk Bae			

## 11. Other items of notification

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.