

## Syllabus for the first semester of 2022

## General Information

<b>Subject number</b>	3772
<b>Subject name</b>	mathematical modeling
<b>Consultation time</b>	
<b>Core Competency</b>	Can draw and utilize new ideas and methods by looking at things and events from various angles Understand various information and knowledge, identify problems, analyze and reason, and apply them to problem solving
<b>Lecture Goals</b>	
<b>Notes on course application</b>	<p>* Depending on the progress of COVID-19 and the face-to-face/non-face-to-face policies of the government and school authorities, the class may be face-to-face, non-face-to-face, or hybrid. *This is a course to learn how to develop mathematical models and some artificial intelligence approaches that can be used in real life, such as tumor cancer research and corona epidemic spread models, by combining them with mathematical theories. *</p> <p>Foreign textbooks 1 and 2, which are the main textbooks, can be purchased at Kyobo Bookstore and Amazon, but they do not have to be purchased as they can be explained in detail during class. * Among the main textbooks, 3 machine learning textbooks (learned within 24 hours...) can be easily purchased in Korea and are known to be around 15,000</p>

## evaluation rate

Item	importance(%)	perfect score	Disclosure
attendance rate	15	100	open
midterm exam rate	35	100	open
Final exam rate	35	100	open
Assignment rate	15	100	open
Quiz	0	0	open
Announcement	0	0	open
project	0	0	open
debate	0	0	open
Other 5	0	0	open

won. In the case of this textbook, we will explain in detail in ppt or textbook (in case of online) in class. You can download the MATLAB code from the author's website.

### lecture material

number	Classification of textbooks	Textbook name	author	publisher	Year of publication
One	episcopal material	Nonlinear dynamics and chaos	Steven H. Strogatz	Westview Press	
2	episcopal material	Mathematical modeling of biological processes	Avner Friedman and Chiu-Yen Kao	Springer	
3	episcopal material	Machine learning examples learned in 25 hours (using MATLAB)	Kim Jun-seok   Kim Sang-kwon   Jeong Da-rae   Choi Yong-ho   Kim Seong-ki   Kim Young-rok	Emotion Media	

### Lecture assignments

number	Project Title	When to submit	How to submit
One	Mathematical analysis of the mathematical models	20220624	

### Weekly syllabus

parking	period	topic	lecture content	Class type	lecture activities	Instructor in charge
One	03/02 ~ 03/08	Introduction	Introduce various problems			
2	03/09 ~ 03/15	Discrete-time models	How to derive several different discrete, time-dependent models			
3	03/16 ~ 03/22	Ordinary Differential Equations	Discuss the basic theory and properties of ordinary differential equations.			
4	03/23 ~ 03/29	Ordinary differential equations	Discuss how to construct a mathematical model based on an ordinary differential equations.			
5	03/30 ~ 04/05	Ordinary Differential Equations	Discuss how to interpret the solutions from the ordinary differential equations and get insights from the model.			

parking	period	topic	lecture content	Class type	lecture activities	Instructor in charge
6	04/06 ~ 04/12	A system of Ordinary Differential Equations	Discuss the theory and properties of a system of ordinary differential equations.			
7	04/13 ~ 04/19	dynamic system	Introduce several differential equations from various mathematical models			
8	04/20 ~ 04/26	dynamic system	Designing models from various problems in industry and biology.			
9	04/27 ~ 05/03	AI: machine learning 1	Machine learning and mathematical tools			
10	05/04 ~ 05/10	AI machine learning 2	Mathematical theory for machine learning.			
11	05/11 ~ 05/17	AI machine learning 3	Probability theory and machine learning algorithm			
12	05/18 ~ 05/24	machine learning 4	Develop Matlab codes for machine learning and MNIST system			
13	05/25 ~ 05/31	Partial differential equations	Discuss the analytical and numerical solutions of certain partial differential equations. Develop mathematical models based on either a PDE or a system of PDEs			
14	06/01 ~ 06/07	Cellular automata and related models	Introduce various cell-based models including cellular automata and lattice-free individual models.			
15	06/08 ~ 06/14	Estimating parameters	Learn how to estimate certain parameters that are not available from experiments or real data			
16	06/15 ~ 06/21	Projects	Describes several projects			