

## Computational Statistics

Course Name	Course type (credit/hours)	Required course(3/3)	Course code	E005
	Target students Division/major/grade	Environmental and safety Engineering/Sophomore	Opening semester	2018 1ST SEMESTER
	Class time and classroom	Mon D(Pal107)Thu D(Pal107)	English Grade	A(100%English)
Reference to this course	Prerequisite courses			
	Related basic courses	과학계산프로그래밍, 환경전산학 / MATLAB, Environmental computer		
	Recommended concurrent courses			
	Related advanced courses			

Instructor	Name (title/division)		Seungho Jung(Assistant Professor, Environmental and safety Engineering)			
	Office Room Number	서관312호	Office phone Number	2401	e-mail	
	Office hours	목요일 9시~12시		Homepage address		
Teaching Assistant	Name (title/division)					
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### 1. Introduction

Engineers practically deal with real world systems and have often to make decisions based on data which is characterized by considerable variabilities. In this introductory course for Environmental Engineers, students will learn fundamental concepts of statistics and probability and how to apply them to Environmental Engineering problems. While applications for Environmental Engineering will be focused, students will learn the statistical principles which are universal and can be applied to all engineering/science branches.

In addition, a big data analysis program, RAPID-miner will be taught by a guest-lecturer for a week.

### 2. Course Objectives

In the end of the course, students should be able to:

- Analyze engineering data
- Conduct hypothesis tests on statistical parameters such as the mean and the variance.
- Develop and evaluate simple and multiple linear regression models.
- Carry out basic statistical data analysis using Minitab or a spreadsheet software

### 3. Class types and activities

- Lecture for each class.
- English A (100%) class.
- Home works will be assigned in every 2 weeks (about 7 times overall)
- In the end of class, home works using MS Excel or statistical program (i.e. Minitab, SPSS) will be assigned.

### 4. Teaching Method

- |  |   |
|--|---|
| <input checked="" type="checkbox"/> lecture                          | <input checked="" 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

- |  |   |   |
|--|---|---|
| <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 analyzing system | <input type="checkbox"/> others                     |   |

### 6. Teaching Tools

- |  |   |   |
|--|---|---|
| <input 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

- Basic statistics in the level of highschool
- Basic mathematics
- MS Excel

## 8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10%	
midterm exam		30%	
final exam		40%	
quiz			
presentation			
discussion			
homework		20%	
etc			
study hours			

## 9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	Engineering Statistics (5th ed)	Douglas Montgomery, George Runger and Norma Hubele	WILEY	2012
Sub	Statistics for Environmental Engineers	P.Berthouex and	Lewis Publishers	1994

## 10. Class system and Class shedule

- Lectures for understanding basic concepts of probabilistic and statistical analysis
- Home work reports to further understand and get familiar with the theoretical aspects
  - Assignments must be Neat.
  - Underline the final numerical answer clearly.
  - Bi-weekly assignments will be gathered at the beginning of Fridays
  - Late assignments will not be accepted without documented medical evidence or another substantial reasons
- Written tests to evaluate and policies are as followings;
  - Midterm and final exams are closed book.
  - Only faculty approved non-programmable calculators will be allowed.

## < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Diagnostic Test	E	Seungho Jung			
2	Role of Statistics in Engineering / Data Summary and Presentation	E	Seungho Jung			
3	Probability rules / Conditional probability and independence	E	Seungho Jung			
4	Big data analysis using Rapid-miner by guest lecturer	K/E	Seungho Jung			Half of the class on Monday / another half of the class on Thursday
5	Random Variables and Probability Distributions – Probability density and cumulative functions	E	Seungho Jung			
6	/ Normal and other continuous distributions / Normal probability plots / Discrete distributions (Binomial, Poisson)	E	Seungho Jung			
7	Random Variables and Probability Distributions – Properties of random variables / Sampling distributions and the central limit theorem	E	Seungho Jung			
8	Midterm exam	E	Seungho Jung			Calculator
9	Decision Making for Single Samples – Case 1	E	Seungho Jung			
10	Decision Making for Single Samples – Case 2	E	Seungho Jung			
11	Decision for Two (or more) Samples – Comparing two independent means (variances known and unknown) / Pair comparison	E	Seungho Jung			
12	Decision for Two (or more) Samples – Comparing two variances / Comparing more than two means: Analysis of Variance	E	Seungho Jung			
13	Empirical Model Building with Linear Regression – Simple linear regression with least-squares	E	Seungho Jung			

## < Class Schedule >

\* language : K-korean, E-English

Week s	Topics	lang uag e	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
14	Empirical Model Building with Linear Regression – ?Testing a regression (residuals analysis, ANOVA)	E	Seungho Jung			
15	Empirical Model Building with Linear Regression – ?Multiple linear regression and model building	E	Seungho Jung			
16	Final exam	E	Seungho Jung			Calculator

## 11. Other items of notification

서관 3층에 환경공학 PC실에 통계프로그램 MINITAB 라이선스 20개 구비되어 있음.  
별도의 실습 시간은 학기 말에 있을 예정이나 중간중간 과제 때 가끔 이용할 필요가 있을 때 개방하여 실습 및 과제를 할 수 있도록 할 예정.  
RAPID-miner 프로그램도 구매되어 수업에 이용될 예정.

There are 20 MINITAB (statistics software) license copies in Environment dep. PC lab located in West hall 3rd floor.  
Whenever students need, the lab will be open for practices and homeworks.  
In addition, 1 copy of RAPID-miner will be used for learning big-data analysis.