

Modeling and Simulation in Chemical Engineering

Course Name	Course type (credit/hours)	Elective course(3/3)	Course code	D010
	Target students Division/major/grade	Chemical Engineering/Senior	Opening semester	2021 2ND SEMESTER
	Class time and classroom	Tue 5.5(WH540) Tue 6.5(WH540) Tue 7.5(WH540)	English Grade	A(100%English)
Reference to this course	Prerequisite courses	Computer Programming		
	Related basic courses			
	Recommended concurrent courses	Comprehensive Design in Chemical Engineering		
	Related advanced courses			

Instructor	Name (title/division)		Chee Burm Shin(Professor, Energy Systems Research)			
	Office Room Number	West Hall 201	Office phone Number	2388	e-mail	
	Office hours	Tue. & Thu. 1-3pm		Homepage address	http://matproc.ajou.ac.kr	
Teaching Assistant	Name (title/division)					
	Office Room Number	Chemical Engineering Laboratory	Office phone Number	2949	e-mail	hello7518@ajou.ac.kr , ljw2205@ajou.ac.kr

1. Introduction

The purpose of this course is to introduce the modeling of diverse processes in chemical engineering and the numerical methods to obtain the solutions of mathematical models to undergraduate students. The students will learn how to analyse and design the chemical processes through the various examples on chemical process modeling and simulation provided in lectures, homeworks, and design projects.

2. Course Objectives

Course objectives

- Exemplification of the methodology of modeling and simulation for the analysis and design of chemical processes
- Instruction of numerical methods to obtain the solutions of mathematical models

Course outcomes

- Application of chemical engineering principles to the modeling and simulation of chemical processes
- Derivation of the equations of mathematical models of chemical processes
- Obtaining the solutions of mathematical models
- Use of the methodology of modeling and simulation for the analysis and design of chemical processes

3. Class types and activities

- Official language of this course is English.
- Methodologies of the modeling and simulation of chemical processes will be covered in lectures and the homeworks will be assigned to illustrate how to apply the methodologies in the analysis and design of chemical processes.
- Design projects will be performed in 5-person groups to develop design skills and teamwork. Each group will present design results and submit design report.
- Mid-term and final examinations will be given to evaluate the understanding of students on the main concepts of the course.

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 checked="" 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 knowledge in unit conversion and material & energy balances
- Basic principles in chemical engineering mathematics, reaction engineering, and transport phenomena
- Basic skills in computer use

8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance			
midterm exam	1	25	Mid-Term Exam.
final exam	1	25	Final Exam.
quiz			
presentation			
discussion			
homework	Many	10	Homeworks and Attendance
etc	1	40	Team Projects
study hours			

9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	Lecture note	Chee Burm Shin	N/A	–

10. Class system and Class shedule

The course will proceed in the following order:

- 1) Application of chemical engineering principles to the modeling and simulation of chemical processes
- 2) Derivation of the equations of mathematical models of chemical processes
- 3) Use of the means and tools to obtain the solutions of mathematical models
- 4) Use of the methodology of modeling and simulation for the analysis and design of chemical processes

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Model Formulation I		Chee Burm Shin	Lecture, Design project		
2	Model Formulation II		Chee Burm Shin	Lecture, Design project	Project evaluation	
3	Systems of Linear Equations		Chee Burm Shin	Lecture, Design project	Project evaluation	
4	Systems of Nonlinear Equations		Chee Burm Shin	Lecture, Design project	Project evaluation	

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
5	Numerical Differentiation		Chee Burm Shin	Lecture, Design project	Project evaluation	
6	Numerical Integration		Chee Burm Shin	Lecture, Design project	Project evaluation	
7	Ordinary Differential Equations		Chee Burm Shin	Lecture, Design project	Project evaluation	
8	Design Project		Chee Burm Shin	Design Project	Project evaluation	
9	Partial Differential Equations		Chee Burm Shin	Lecture, Design project	Project evaluation	
10	Regression		Chee Burm Shin	Lecture, Design project	Project evaluation	
11	Presentation of Design Project I		Chee Burm Shin	Presentation of design project and discussion	Project evaluation, discussion evaluation	
12	Presentation of Design Project II		Chee Burm Shin	Presentation of design project and discussion	Project evaluation, discussion evaluation	
13	Presentation of Design Project III		Chee Burm Shin	Presentation of design project and discussion	Project evaluation, discussion evaluation	
14	Presentation of Design Project IV		Chee Burm Shin	Presentation of design project and discussionproject	Project evaluation, discussion evaluation	
15	Presentation of Design Project V		Chee Burm Shin	Presentation of design project and discussion	Project evaluation, discussion evaluation	
16	Final Exam.		Chee Burm Shin		Evaluation of final exam.	

11. Other items of notification