Process Fluid Mechanics

Course Name	Course type (credit/hours)	Required course(3/3)	Course code	D017
	Target students Division/major/grade	Chemical Engineering/Sophomore	Opening semester	2021 2ND SEMESTER
	Class time and classroom	Wed B(WEB303)Fri B(WEB303)	English Grade	A(100%English)

Reference to this course	Prerequisite courses	
	Related basic courses	Material and energy resins 1
	Recommended concurrent courses	
	Related advanced courses	Heat transfer, material transfer, transportation theory, polymeric processing

Instructor	Name (title/division)		Ju-Hyung Kim(Associate Professor, Energy Systems Research)		
	Office Room Number	West Hall 205-1	Office phone Number	2386	e-mail
	Office hours		Homepage address		
Teaching Assistant	Name (title/division)				
	Office Room Number		Office phone Number		e-mail

1. Introduction

In this class, the basic knowledge of fluid mechanics is prented, which is essential to the analysis, design and operation of chemical processes or the fluid transport and measurement in chemical plants. The following stuffs will be dealt with:

- Fluid mechanics and chemical industry, research topics concerned with fluid mechanics
- Definition of fluid density and viscosity
- Macroscopic fluid transport equations and their applications in processes
- Fluid friction coefficient and its application
- Microscopic fluid motion equation (Navier-Stokes equation) and fluid flow analysis
- Packed bed flow and its application in chemical processes
- Turbulent flows and non-Newtonian fluid mechanics

2. Course Objectives

The objective of this subject is to acquire the fundamental knowledge of hydrodynamics necessary for the analysis, design and operation of various chemical processes and devices that handle fluid transport or quantification in chemical plants.

3. Class types and activities

- Introduction and fundamentals of fluid mechanics will be covered in this lecture.

4. Teaching Method

☑ lecture	☐ discussion and debate
☐ team project(presentation and case studies)	☐ experiments(role-playing,etc)
☐ designing and production	☐ on-site learning(on-site training)
☐ others	

5. Support Systems in Use

☑ AjouBb	☐ automatic recording system	☐ web-based assignment
☐ cyber lecture	☐ online content	
☐ class behavior analyazing system	☐ others	

6. Teaching Tools

☑ PBL(Problem Based Learning)	☑ CBL(Case Based Learning)	☐ TBL(Team Based Learning)
☐ UR(Undergraduate Research)	☐ FL(Flipped Learning)	☐ DSAL(Data Science Active Learning)
☐ others		

7. Knowledge and ability required for taking this course

Basic knowledge of the engineering unit system, unit conversion, material balance, etc. that is taught in "Material and Energy Resin 1" is required.

8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance			F for absenteeism in excess of 1/4 of the number of class days
midterm exam	1	40	
final exam	1	40	
quiz	1	20	Quiz can take place by online
presentation			
discussion			
homework			
etc			
study hours			

9. Textbook and supplementary material

Main/Sub	Title (Web-site)	Writer	Publisher	Publication year
Main	Unit Operation of Chemical Engineering 7th ed.	McCabe, Smith & Harriott	McGraw-Hill	2005
Sub	Process Fluid Mechanics	Morton M. Denn	Pretice Hall	1980

10. Class system and Class shedule

The contents of this subject are organized into the following order.

1. Macrofluidic motion equation induction, transportation and metering of fluids and calculation of required power
2. Induction of the Navier-Stokes equation and analysis of flow fields
3. Basic principles and applications such as analysis of filling and fluidized layers and utilization in chemical processes
4. Introduction to turbulence and non-Newtonian fluid dynamics and learning application cases

< Class Schedule >

* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction	E	Ju-Hyung Kim	Recording/online		
2	Fluid Statics and Its Applications	E	Ju-Hyung Kim	Recording/online		
3	Fluid Flow Phenomena	E	Ju-Hyung Kim	Recording/online		

< Class Schedule >

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
4	Fluid Flow Phenomena	E	Ju-Hyung Kim	Recording/online		
5	Basic Equations of Fluid Flow (Continuity Equation)	E	Ju-Hyung Kim	Recording/online		
6	Basic Equations of Fluid Flow (Equations of Motion)	E	Ju-Hyung Kim	Recording/online		
7	Basic Equations of Fluid Flow (Eulers Equation, Couette Flow)	E	Ju-Hyung Kim	Recording/online		
8	Mid-Term Exam.	E	Ju-Hyung Kim	Face-to-face	Mid exam	
9	Macroscope Momentum Balances	E	Ju-Hyung Kim	Recording/online		
10	Mechanical Energy Equaton	E	Ju-Hyung Kim	Recording/online		
11	Mechanical Energy Equaton	E	Ju-Hyung Kim	Recording/online		
12	Shear Stress in Pipes	E	Ju-Hyung Kim	Recording/online		
13	Non-Newtonian Fluids, Turbulent Flow	E	Ju-Hyung Kim	Recording/online		
14	Turbulent Flow, Friction Losses	E	Ju-Hyung Kim	Recording/online		
15	Flow Past Immersed Objects	E	Ju-Hyung Kim	Recording/online		
16	Final Exam.	E	Ju-Hyung Kim	Face-to-face	Final exam	

11. Other items of notification

None.