

## Process Fluid Mechanics

Course Name	Course type (credit/hours)	Required course(3/3)			Course code	D048
	Target students Division/major/grade	Chemical Engineering/Sophomore			Opening semester	2020 2ND SEMESTER
	Class time and classroom	Wed B(CDL106)Fri B(CDL106)			English Grade	A(100%English)
Reference to this course	Prerequisite courses					
	Related basic courses	물질 및 에너지 수지 1				
	Recommended concurrent courses					
	Related advanced courses	열전달, 물질전달, 이동현상론, 고분자가공				
Instructor	Name (title/division)		Ju-Hyung Kim(Associate Professor, Energy Systems Research)			
	Office Room Number	서관 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 presented, 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

본 교과목의 목표는 화학 공장에서의 유체 수송이나 계량, 유체를 취급하는 각종 화학공정과 장치의 해석, 설계 및 운전에 필요한 유체역학의 기본 지식을 습득하는데 있다.

### 3. Class types and activities

### 4. Teaching Method

<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

<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 checked="" type="checkbox"/> PBL(Problem Based Learning)	<input checked="" 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

'물질 및 에너지수지 1'에서 강의하는 공학단위계 및 단위환산, 물질수지 등에 대한 기초지식을 필요로 한다.

## 8. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance		10	
midterm exam	1	40	
final exam	1	40	
quiz	1	10	
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

본 교과목의 내용은 다음과 같은 순서로 구성하여 강의한다.

1. 거시적 유체 운동 방정식 유도, 유체의 수송 및 계량과 소요동력 계산법
2. 미시적 운동방정식(Navier-Stokes식)의 유도와 simple geometry에서 유동장 해석
3. 층전층과 유동층의 해석, 화학공정에서의 활용 등 기본적인 원리 및 응용
4. 난류 및 비뉴턴유체역학 등에 대한 소개 및 응용 사례 학습

### < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
1	Introduction	K	Ju-Hyung Kim	강의		
2	Fluid Statics and Its Applications	K	Ju-Hyung Kim	강의		
3	Fluid Flow Phenomena	K	Ju-Hyung Kim	강의		
4	Fluid Flow Phenomena	K	Ju-Hyung Kim	강의		

## < Class Schedule >

\* language : K-korean, E-English

Weeks	Topics	language	Instructor	Teaching Method	Evaluation Method	Matter to be prepared
5	Basic Equations of Fluid Flow (Continuity Equation)	K	Ju-Hyung Kim	강의		
6	Basic Equations of Fluid Flow (Equations of Motion)	K	Ju-Hyung Kim	강의		
7	Basic Equations of Fluid Flow (Euler's Equation, Couette Flow)	K	Ju-Hyung Kim	강의		
8	Mid-Term Exam.	K	Ju-Hyung Kim	시험	중간지필평가	
9	Macroscopic Momentum Balances	K	Ju-Hyung Kim	강의		
10	Mechanical Energy Equation	K	Ju-Hyung Kim	강의		
11	Quiz	K	Ju-Hyung Kim	강의		
12	Shear Stress in Pipes	K	Ju-Hyung Kim	강의		
13	Non-Newtonian Fluids, Turbulent Flow	K	Ju-Hyung Kim	강의		
14	Turbulent Flow, Friction Losses	K	Ju-Hyung Kim	강의		
15	Flow Past Immersed Objects	K	Ju-Hyung Kim	강의		
16	Final Exam.	K	Ju-Hyung Kim	시험	기말지필평가	

## 11. Other items of notification