

Syllabus

Microfluidics

Course Name	Course type (credit/hours)		전선(3/3)		Course code	
	Target students Division/major/grade		기계공학과 대학원생/		Opening semester	2018년 1학기
	Class time and classroom		목10(동331) 목11(동331) 목12(동331)(동331)			
Reference to this course	Related basic courses		Fluid mechanics, Thermodynamics, Heat transfer, Numerical analysis			
	Recommended concurrent courses		None			
	Related advanced courses		None			
Instructor	Name (title/division)		Dong-Kwon Kim(Associate Professor, Department of Mechanical Engineering)			
	Office Room Number	East Hall 205	Office phone Number	3660	e-mail	dkim@ajou.ac.kr
	Office hours	Monday Morning		Homepage address	None	
Teaching Assistant	Name (title/division)					
	Office Room Number	Thermofluid Control System Lab.	Office phone Number	2350	e-mail	None

This course is an introduction to transport phenomena at the micro- and nanoscale. Emphasis will be put on the physics and engineering aspect though mathematical derivations will be presented when necessary. Topics to be covered include a review of macroscopic transport phenomena, transport at the microscale, microfluidics and microscale energy conversion. Materials selection and micro/nanofabrication processes relevant to micro- and nanosystems will be briefly covered. Specific engineering applications such as thermal management, energy conversion, and microfluidics will be also discussed.

This class is taught in English.

2. Course Objectives

To understand basic principles which govern transport phenomena in microfluidic devices.

3. Class types and activities

Lecture based class (3 hours per week)

4. Teaching Method

Lecture based class

5. Knowledge and ability required for taking this course

Basic knowledge on mechanical engineering

6. Method of Evaluation

Evaluation Item	The Number of Times	Evaluation Proportion	Remarks
Attendance	1	20%	
midterm exam	1	25%	
final exam	1	35%	
quiz			
presentation			
discussion			
homework	5	20%	
etc			

Midterm exam 25%
Final exam 35%
Home work 20%
Attendance 20%

7. Textbooks

Main/Sub	Title	Writer	Publisher	Publication year
주교재	Microfluidics (Handout)			2013
부교재	Physicochemical hydrodynamics	Ronald Probst	John Wiley & Sons	2005

8. Lecture Schedule

Week	Lecture contents	Lesson type	Remark
1	Introduction		
2	Overview of Macroscopic Transport Phenomena – Thermodynamics		
3	Overview of Macroscopic Transport Phenomena – Heat transfer, Fluid mechanics		
4	Theory of micro/nanofluidics – Governing equations		
5	Theory of micro/nanofluidics – Governing equations		
6	Theory of micro/nanofluidics – Electrokinetics		
7	Theory of micro/nanofluidics – Electrodialysis		
8	Midterm exam		
9	Theory of micro/nanofluidics – Reverse electrodialysis		
10	Microfluidic devices and application		
11	Heat transfer in micro/nanochannels		
12	Heat transfer in micro/nanochannels		
13	Numerical methods for micro/nanofluidics		
14	Numerical methods for micro/nanofluidics		
15	Summary and Q/A		
16	Final exam		

9. Others

None
