



# 2023학년도 2학기 강의계획안 (Syllabus)

Course Title	Carbon Energy (탄소에너지) (舊 자원공학개론)	Course No.	38523 (학수번호 변경 없음)
Department/ Major	Climate and Energy Systems Engineering (기후·에너지시스템공학전공)	Credit/Hours	3.0 / 3.0
Class Time/ Classroom	Monday 2 (09:30-10:45) at the Research Cooperation Bldg. B109 (연구협력관 B109) Thursday 3 (11:00-12:15) at the Research Cooperation Bldg. B109 (연구협력관 B109)		
Instructor	Name: Baehyun Min (민 배 현)	Department: Climate & Energy Systems Eng. (기후 · 에너지시스템공학전공)	
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Office Hours/ Office Location	Hours: Please make an appointment via email or cyber campus in advance. Location: Office #404 at the Research Cooperation Bldg. (연구협력관 404호)		

## I. 교과목 정보 Course Overview

### 1. 교과목 개요 Course Description

대표적인 탄소에너지원인 석유, 가스의 개발 및 활용과 관련된 공학적 이론을 다룬다. 구체적으로 다공질 암석의 물리적 성질과 암석내에서 지하유체분포 제어기능, 지하유체의 물리적 특성 및 상거동 등을 학습한다. This course addresses engineering theories on the development of carbon energy (e.g., oil and gas). In particular, this course covers rock properties, mechanisms for distribution of fluids, fundamental behaviors of hydrocarbon fluids, and reserve estimation.

### 2. 선수학습사항 Prerequisites

N/A

### 3. 강의방식 Course Format

강의 Lecture	발표/토론 Discussion/Presentation	실험/실습 Experiment/Practicum	현장실습 Field Study	기타 Other
90%	-	10%	-	-

(위 항목은 실제 강의방식에 맞추어 변경 가능합니다.)

강의 진행 방식 설명 (explanation of course format): Powerpoint & Writing on the Whiteboard

### 4. 교과목표 Course Objectives

다공성 지층 내에 존재하는 석유 및 가스의 개발 및 활용과 관련한 공학적 이론을 다룬다. 석유 및 가스 자원의 생성, 석유개발과정, 저류층 물성에 관해 학습한 후 Darcy 방정식을 이용한 석유 및 가스의 이동과 온도 압력에 따른 상거동 양상을 파악한다. 암석, 유체, 암석유체 물성 등 다양한 저류층 물성을 학습한다. 마지막으로 매장량 평가, 물질평형방정식, 생산감퇴곡선 분석 등 매장량 평가기법의 기초를 학습한다.



Course objectives are to learn the following:

- Fundamentals of Petroleum Engineering - What is Petroleum? (석유란 무엇인가)
- Petroleum Industry (석유산업의 구조)
- Field life cycle of Petroleum Reservoirs (광구의 전주기)
- Reserve & Resources (매장량과 자원량)
- Rock Properties (암석의 물성)
- Darcy's Law (Darcy의 법칙)
- Rock-Fluid Properties (암석-유체의 물성)
- Fluid Properties (유체의 물성)
- Reserve Estimation (매장량 평가)

### 5. 학습평가 방식 Evaluation System

Relative evaluation     Absolute evaluation     Others : \_\_\_\_\_

- Explanation of evaluation system:

(아래 항목은 실제 학습평가방식에 맞추어 변경 가능합니다.)

- 상대평가 (Relative Evaluation)
- 지각 1회 = 결석 0.5회. 지각 여부는 수업 시작시간을 기준으로 함.
- 결석 3회 이하는 최종 성적에 영향 없음
- 결석 3회 초과부터는 결석 1회당 최종 성적에서 2점씩 감점 (지각은 1회당 0.5점 감점)
- 결석 10회 초과는 F 학점 부여

“Relative Evaluation” is the evaluation system of this course. You are encouraged to attend all class sessions. If you have any situation which prevents you from attending class (e.g., illness, family or personal issues, etc.), please let me know your absence via email or message at the Cyber Campus before class in advance. Three or fewer absences do not affect your grade. If you miss four days or more, however, every absence from the fourth absence deducts two points from your final score. Two late arrivals are equal to one absence. More than ten absences will force you to be given F grade by the university regulation.

중간고사 Midterm Exam	기말고사 Final Exam	퀴즈 Quizzes	발표 Presentation	리포트 Report	과제물 Assignments	참여도 Participation	기타 Others
35%	40%	10%	%	%	10%	5%	%

\* Evaluation of group projects may include peer evaluations.

## II. Course Materials and Additional Readings

### 1. 주교재 Required Materials

Lecture Notes (강의노트)

강주명, 2008. 석유공학개론-개정판, 서울대학교 출판부

### 2. 부교재 Supplementary Materials

Dake, L.P., 1978. Fundamentals of Reservoir Engineering, Elsevier.

### 3. 참고문헌 Optional Additional Readings

N/A

## III. 수업운영규정 Course Policies

\* For laboratory courses, all students are required to complete lab safety training.



IV. 주차별 강의계획 Course Schedule

Week	Date	Topics & Class Materials, Assignments (주요강의내용 및 자료, 과제)
Week 1		
	8.31 (Thu)	0. Course Introduction (Pre-recorded video lecture, PRL)
Week 2	9.4 (Mon)	1. What is Petroleum? (석유란 무엇인가?)
	9.7 (Thu)	1. What is Petroleum?
Week 3	9.11 (Mon)	2. Petroleum Industry (석유산업의 구조)
	9.14 (Thu)	2. Petroleum Industry
Week 4	9.18 (Mon)	3. Field Life Cycle (광구의 전주기)
	9.21 (Thu)	3. Field Life Cycle
Week 5	9.25 (Mon)	4. Reserve & Resources (매장량과 자원량)
	9.28 (Thu)	5. Rock Properties: Porosity (암석의 물성: 공극률) (PRL due to National Holiday)
Week 6	10.2 (Mon)	5. Rock Properties: Compressibility (암석의 물성: 압축률)
	10.5 (Thu)	5. Rock Properties: Permeability (암석의 물성: 유체투과율)
Week 7	10.9 (Mon)	6. Darcy's Law: Incompressible Fluid Flow (Darcy의 법칙: 비압축성 유동) (PRL due to National Holiday)
	10.12 (Thu)	6. Darcy's Law: Compressible Fluid Flow (Darcy의 법칙: 압축성 유동)
Week 8	10.16 (Mon)	6. Darcy's Law: Examples (Darcy의 법칙: 예제)
	10.19 (Thu)	Midterm Examination
Week 9	10.23 (Mon)	7. Rock-Fluid Properties: Saturation (암석-유체의 물성: 포화도)
	10.26 (Thu)	7. Rock-Fluid Properties: Resistivity (암석-유체의 물성: 비저항)
Week 10	10.30 (Mon)	7. Rock-Fluid Properties: Wettability (암석-유체의 물성: 습윤도)
	11.2 (Thu)	7. Rock-Fluid Properties: Capillary Pressure (암석-유체의 물성: 모세관압) (PRL due to a domestic energy resources conference)
Week 11	11.6 (Mon)	7. Rock-Fluid Properties: Relative Permeability (암석-유체의 물성: 상대유체투과율)
	11.9 (Thu)	8. Fluid Properties: PVT Analysis (유체의 물성: 상거동)
Week 12	11.13 (Mon)	8. Fluid Properties: Equation of State (유체의 물성: 상태방정식)
	11.16 (Thu)	8. Fluid Properties: Gas Compressibility Factor (유체의 물성: 가스 압축계수)
Week 13	11.20 (Mon)	9. Reserve Estimation: Drive Mechanism (매장량 평가: 생산 드라이브 메커니즘)
	11.23 (Thu)	9. Reserve Estimation: Material Balance Equation (매장량 평가: 물질평형방정식)
Week 14	11.27 (Mon)	9. Reserve Estimation: Material Balance Equation
	11.30 (Thu)	9. Reserve Estimation: Decline Curve Analysis (생산감퇴곡선 분석)
Week 15	12.4 (Mon)	9. Reserve Estimation: Decline Curve Analysis
	12.7 (Thu)	Final Examination
Week 16	12.11 (Mon)	Q&A
	12.14 (Thu)	
보강1 (필요시) Makeup Classes	(요일, 장소)	TBD
보강2 (필요시) Makeup Classes	(요일, 장소)	TBD



### V. 참고사항 Special Accommodations

\* According to the University regulation section #57-3, students with disabilities can request for special accommodations related to attendance, lectures, assignments, or tests by contacting the course professor at the beginning of semester. Based on the nature of the students' request, students can receive support for such accommodations from the course professor or from the Support Center for Students with Disabilities (SCSD). Please refer to the below examples of the types of support available in the lectures, assignments, and evaluations.

(학칙 제57조에 의거하여 장애학생은 학기 첫 주에 교과목 담당교수와의 면담을 통해 출석, 강의, 과제 및 시험에 관한 교수학습지원 사항을 요청할 수 있으며 요청된 사항에 대해 담당교수 또는 장애학생지원센터를 통해 지원받을 수 있습니다.)

Lecture	Assignments	Evaluation
<ul style="list-style-type: none"> <li>. Visual impairment : braille, enlarged reading materials</li> <li>. Hearing impairment : note-taking assistant</li> <li>. Physical impairment : access to classroom, note-taking assistant</li> </ul>	Extra days for submission, alternative assignments	<ul style="list-style-type: none"> <li>. Visual impairment : braille examination paper, examination with voice support, longer examination hours, note-taking assistant</li> <li>. Hearing impairment : written examination instead of oral</li> <li>. Physical impairment : longer examination hours, note-taking assistant</li> </ul>

- Actual support may vary depending on the course.

\* The contents of this syllabus are not final—they may be updated (강의계획안의 내용은 추후 변경될 수 있습니다).