

SYLLABUS

Classification	Elective	Course No.	07502	Cr. Hrs.		Instructor	Prof. Joon Ha Kim
Course Title	Korean	환경전문가 역량 함양 교육					
	English	Environmental Professionals Capacity Building					
<p><u>Course Outline :</u></p> <p>Students may become a technical professional, perhaps a engineer, or scientist in the near future. They are not a professional speaker, but communication is part of their job (proposals, lab reports, technical presentations, data sheets, manuscripts for journal, and so on).</p> <p>This course offers students technical communication skills for how to transfer their ideas & confidence to clear, coherent and structured expressions.</p> <p>The course covers from technical writing, communication etiquette, professional presentation skill, paper structuring & formating for journal, interview practice for jobs, dealing with patent & government information, etc.</p>							
Prerequisite		English Communication					
<i>Expectations from the course</i>							
<p>After completing this course, you should be able to:</p> <ul style="list-style-type: none"> ● Use active voice to communicate with confidence and authority ● Identify and explain the roles professionals play in the workplace ● Understand your audience and target your speech content appropriately ● Learn how to write & speak for an international audience ● Learn how to integrate documentation development into the best engineering practices ● Make your documents and presentations clearer and more compelling ● Organize information to meet the needs, goals, and interests of your audience ● Develop winning research, proposals, manuscripts for journal 							

Coordinator 김 준 하 (Seal)

Dept. Chair 조 재 원 (Seal)

SYLLABUS

Classification	선택	Course No.	07403	Cr. Hrs.	3	Instructor	Detlef Meuller
Course Title	Korean	에어로졸 측정 및 실습					
	English	Aerosol Measurement					
<u>Course Outline</u> : Physical principles of aerosol measurement techniques to determine chemical and physical properties of atmospheric aerosols will be theoretically studied, and their experimental operations will be conducted in the laboratory..							
Prerequisite							
Textbook and References		Aerosol Measurement (Baron Willeke)					
Weekly Course Schedule							
Calendar	Description						Lecturers
1st week	Introduction1						
2nd week	Introduction2						
3rd week	Atmospheric sampling devices1 (Filter sampler)						
4th week	Atmospheric sampling devices2 (Cascade sampler)						
5th week	Aerosol generation1 (Atomizer)						
6th week	Aerosol generation2 (VOAG)						
7th week	Aerosol generation3 (Powder dispenser)						
8th week	Particle size distribution measurement1 (OPC)						
9th week	Particle size distribution measurement2 (APS)						
10th week	Particle size distribution measurement3 (SMPS)						
11th week	Particle size distribution measurement4 (NanoSMPS)						
12th week	Sampling and transport efficiency						
13th week	Particle structure and morphology1 (TEM)						
14th week	Particle structure and morphology2 (EDS)						
15th week	Particle structure and morphology3 (AFM)						
16th week	Oral presentation						
17th week	Final Exam						1학기 spring break

* If there will be experiments, mark it in the "Remarks".

Coordinator
Dept. Chair

Detlef Meuller
조재원



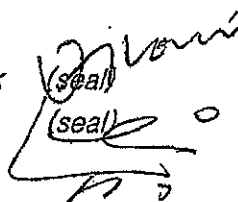
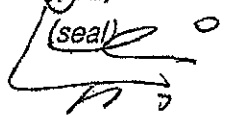
SYLLABUS

Classification		Course No.	07406	Cr. Hrs.	2	Instructor	Yang, Mo
Course Title	Korean	입자 측정분석					
	English	Particle measurement and analysis					
<p><u>Course Outline</u> : This class includes a recent particle measurement technology focusing on single particle mass spectrometry. In addition to physical properties of particles, chemical properties of particles will be studied.</p>							
Prerequisite							
Textbook and References		Air sampling instruments (ACGIH), Aerosol Measurement (Willeke),					
<i>Weekly Course Schedule</i>							
<i>Calendar</i>	<i>Description</i>					<i>Lecturers</i>	
1st week	Introduction						
2nd week	Particles in various environments						
3rd week	Particle size						
4th week	Particle mass and density						
5th week	Sampling methods						
6th week	Chemical composition of particles						
7th week	Mass Spectrometry						
8th week	Ionization methods						
9th week	Single particle mass spectrometry						
10th week	Electron impact ionization						
11th week	Laser ionization						
12th week	Chemical ionization						
13th week	Review for particle analysis tools						
14th week	Real time Versus off-line analysis						
15th week	Real time detection of particles and gases						
16th week	Oral presentation						
17th week	Final Exam						

* If there will be experiments, mark it in the "Remarks".

Coordinator Yang, mo and Kihong Park
Dept. Chair

Choi, J.

(seal) 
(seal) 

SYLLABUS

Classification	Selective	Course No.	7602	Cr. Hrs.	3	Instructor	한 승 회
Course Title	Korean	기기분석					
	English	Instrumental Analysis					
<u>Course Outline</u> Develop a basic and practical understanding of instrumental analysis for organic and inorganic qualitative and quantitative determination such as AAS, ICP, Mass Spectrometry, Gas Chromatography and High-Performance Liquid Chromatography. * Lecture (L) + Experiment (E) + Interpretation (I)							
Prerequisite		None					
Textbook and References		Skoog, D.A. and Leary J.J. (1993) Principles of Instrumental Analysis (4th Ed.), Saunders College Pub.					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction (L1)						
2nd week	Field Trip for Sampling (E1)					Sampling	
3rd week	Sample Preparation (E2)					Sample Preparation	
4th week	Analytical Chart (I1)					Weighing	
5th week	Sample Decomposition Technique (E3)					Sample Decomposirtion	
6th week	Atomic Spectroscopy (L2)					Standard Solution	
7th week	Determination (E4)					AAS	
8th week	Mid-term Exam						
9th week	Univariate Interpretation I (I2)					Data Treatment	
10th week	Univariate Interpretation II (I3)					Data Treatment	
11th week	Multivariate Interpretation (I4)					Data Treatment	
12th week	Mass Spectrometry (L3)						
13th week	Gas Chromatography (L4)					GC	
14th week	High-Performance Liquid Chromatography (L5)					IC	
15th week	Term Report						
16th week	Final Exam						

* If there will be experiments, mark it in the "Remarks".

Instructor
Dept. Chair

한 승 희
조 재 원



SYLLABUS

Classification	Elective	Course No.	07603	Cr. Hrs.	3:3	Instructor 최희철(H.Choi)
Course Title	Korean	환경전산유체역학				
	English	Computational Fluid Dynamics for Environmental Engineers				
<u>Course Outline</u> This course deals with theoretical aspects and practical application of numerical methods to help better understand environmental systems associated with mathematical models. Convergence, stability concept, accuracy, and characteristics of various numerical schemes for ODE and PDE are being taught. Finite difference method (FDM) and Finite element method (FEM) will be dealt with a major emphasis on environmental processes.						
Prerequisite		Engineering mathematics, Fluid mechanics, FORTRAN or equivalent computer languages, or instructor's approval				
Textbook and References		Numerical Methods for Engineers by Steven C. Chapra Computational Techniques for Fluid Dynamics, Vol. 1 by C.A.J. Fletcher				
Weekly Course Schedule						
Calendar	Description					*Remarks
1st week	Introduction, Approximations and errors, roots of equations					
2nd week	Systems of LAE: Gauss elimination, Matrix inversion and Gauss-Seidel					
3rd week	Numerical Differentiation and Integration					
4th week	Ordinary differential equation: Euler's method, Runge-Kutta methods, etc					numerical exp.
5th week	Partial differential equations: Introduction, mathematical background: mass, energy and momentum balance equations					
6th week	Preliminary computational techniques					numerical exp.
7th week	Theoretical background: convergence, consistency, stability					
8th week	Mid-term exam.					
9th week	FDM, FEM : Elliptic, Parabolic and Hyperbolic equations					
10th week	Multidimensional splitting methods					
11th week	Convective transport equations					
12th week	Convective-dominated problems					
13th week	Application to environmental engineering					numerical exp.
14th week	Application to environmental engineering					numerical exp.
15th week	Application to environmental engineering					numerical exp.
16th week	Final exam.					

Instructor Heechul Choi
 Dept. Chair 조재원



Course Noticement

Classification	신제	Course No.	07606	Cr. Hrs.	3	Instructor	김상돈 Kim, Sang Don
Course Title	Korean	환경공학 특론 (수 독성학 기술)					
	English	Special topic I : Techniques in Aquatic Toxicology					
Course Outline 수 독성학을 연구하는데 있어 필수적으로 요구되는 기본적인 실험기술과 이와 관련된 이론들을 공부하며, 이를 통해 환경에 유입되는 오염물질의 수독성을 평가하는데 기초를 제공하고자 한다.							
Prerequisite		환경독성학 (Environmental Toxicology)					
Textbook and References		Techniques in Aquatic Toxicology (volume 2)					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	Introduction						
2nd week	Integrative measures of toxicant exposure using fish						
3rd week	Enhanced frog embryo teratogenesis assay						
4th week	Sperm cell and embryo toxicity tests using the sea urchin						
5th week	Cellular diagnostics and its application						
6th week	Introduction of endocrine disrupting chemicals (EDCs)						
7th week	Enzyme-linked immunosorbent assay (ELISA)						
8th week	Yeast estrogen screening (YES)						
9th week	E-screen assay: Human breast cancer cell						
10th week	Estrogenic activity measurement in wastewater						
11th week	Rapid toxicity fingerprinting using lux-marked bacteria						
12th week	Toxicity assessment for <i>in-situ</i> bioremediation of PAH						
13th week	Measuring metals and metalloids in water, sediment and biological tissues						
14th week	Estimation of inorganic species aquatic toxicity						
15th week	Improved microalgal bioassays using flow cytometry						
16th week	Summary and Conclusions						

Instructor Kim, Sang Don (Seal)

Dept. Chair 조재원 (Seal)

SYLLABUS

Classification	Elective	Course No.	07621	Cr. Hrs.	3	Instructor	문승현
Course Title	Korean	수화학					
	English	Aquatic Chemistry					
Course Outline Fundamental and advanced principles of Aquatic Chemistry involved in natural and engineered processes will be studied including equilibrium calculations.							
Prerequisite		Environmental Chemistry					
Textbook and References		Water Chemistry, M.M. Benjamin, McGraw Hill 2002 Aquatic Chemistry, W. Stumm and J.J. Morgan, Wiley 1996 Water Chemistry, V. L. Snoeyink and D.Jenkins, Wiley 1980					
Weekly Course Schedule							
Calendar	Description					*Remarks	
1st week	Introduction						
2nd week	Chemical reaction kinetics						
3rd week	" "						
4th week	Chemical equilibrium						
5th week	" "						
6th week	Acid-base chemistry						
7th week	" "						
8th week	" "						
9th week	Coordination chemistry						
10th week	Precipitation and dissolution						
11th week	Electrochemistry						
12th week	Oxidation-reduction reactions						
13th week	" "						
14th week	Seawater chemistry / Nanomaterials for water chemistry						
15th week	Presentation						
16th week	Final Exam						

* If there will be experiments, mark it in the "Remarks".

Instructor 문승현

(Seal)

Dept. Chair 조재원

(Seal)

SYLLABUS

Classification	elective	Course No.	7653	Cr. Hrs.	3	Instructor	Young J. Kim
Course Title	Korean	대기오염 모니터링					
	English	Air Pollution Monitoring					
<u>Course Outline :</u> This course covers operational principles and applications of monitoring techniques for gaseous and particulate air pollutants.							
Prerequisite		None					
Textbook and References		Course material					
Weekly Course Schedule							
Calendar	Description						Lecturers
1st week	Introduction						
2nd week	Fundamental of Air Sampling and Monitoring						
3rd week	Monitoring of Criteria Gaseous Air Pollutants: Reference Methods						
4th week	PM Mass Monitoring: Reference and Equivalent Methods						
5th week	Measurement of Atmospheric Particles: Physical Properties						
6th week	Measurement of Atmospheric Particles: Chemical Composition						
7th week	Atmospheric Optics and Visibility						
8th week	Toxic and Hazardous Air Pollutants						
9th week	Mid-Term						
10th week	Active Optical Remote Sensing : DOAS						
11th week	Active Optical Remote Sensing : LIDAR						
12th week	Passive Remote Sensing: Sunphotometry						
13th week	Passive Remote Sensing: Satellites						
14th week	Atmospheric Composition Change Monitoring						
15th week	Recent Developments in Air Quality Monitoring						
16th week	Final Exam						

* If there will be experiments, mark it in the "Remarks".

Instructor Young J. Kim
 Dept. Chair 조재원

(seal)

(seal)

SYLLABUS

Classification	신재원	Course No.	7662	Cr. Hrs.	3	Instructor	Park, Kihong
Course Title	Korean	에어로졸입자공학 II					
	English	Aerosol/Particle Engineering II					
Course Outline : This class will provide advanced particle dynamics and introduce state-of-the art aerosol measurement techniques. Also it will cover current research areas of interest such as nanoparticles, aerosol mass spectrometry (single particle mass spectrometry), particle reaction, synthesis and generation of particles, and so on.							
Prerequisite		Aerosol/particle engineering I					
Textbook and References		Smoke, Dust, and Haze: Fundamentals of Aerosol Behavior (Friedlander)					
Weekly Course Schedule							
Calendar	Description					Lecturers	
1st week	Introduction and overview					Park, kihong	
2nd week	Free-molecule, continuum, and transition regime					Park, kihong	
3rd week	Characterizing particle size distribution					Park, kihong	
4th week	Particle nucleation I					Park, kihong	
5th week	Particle nucleation II					Park, kihong	
6th week	Single particle growth by condensation and reaction					Park, kihong	
7th week	Coagulation and coalescence					Park, kihong	
8th week	Particle transport					Park, kihong	
9th week	General Dynamic Equation					Park, kihong	
10th week	Particle light scattering					Park, kihong	
11th week	Characterization of ultrafine particles and nanoparticles I					Park, kihong	
12th week	Characterization of ultrafine particles and nanoparticles II					Park, kihong	
13th week	Aerosol Mass Spectrometry					Park, kihong	
14th week	Particle generation and synthesis					Park, kihong	
15th week	Particle reaction					Park, kihong	
16th week	Final Exam					Park, kihong	
17th week	or Final Exam					1학기/ spring break	

* If there will be experiments, mark it in the "Remarks".

Coordinator Kihong Park
Dept. Chair 조재원



SYLLABUS

Classification	선택	Course No.	67682	Cr. Hrs.	3	Instructor	Hor-Gil Hur
Course Title	Korean	환경 생화학					
	English	Environmental Biochemistry					
<u>Course Outline :</u> - To assist students in understanding general bio/chemical reactions leading to synthesis and degradation of biological materials. - To assist students in developing research plans, and gathering and analyzing data to become a critical scientific board member in the future							
Prerequisite		Biology, Chemistry and Microbiology					
Textbook and References		Biochemistry 5/e by Stryer, 2nd/ Introduction to Ecological Biochemistry by J.B. Harborn					
Weekly Course Schedule							
Calendar	Description					Lecturers	
1st week	General Introduction					Hor-Gil Hur	
2nd week	Foundations of Biochemistry					Hor-Gil Hur	
3rd week	Structures of Amino acids, Peptides, and Proteins					Hor-Gil Hur	
4th week	Fundamentals of Enzymology					Hor-Gil Hur	
5th week	Fundamentals of Enzymology					Hor-Gil Hur	
6th week	Carbohydrates and Lipid					Hor-Gil Hur	
7th week	Biological Membrane					Hor-Gil Hur	
8th week	Principles of Bioenergetics					Hor-Gil Hur	
9th week	Chemical Reactions for Glycolysis					Hor-Gil Hur	
10th week	Chemical Reactions for Citric Acid Cycle					Hor-Gil Hur	
11th week	Chemical Reactions for Fatty Acid Oxidation					Hor-Gil Hur	
12th week	Carbohydrate Biosynthesis					Hor-Gil Hur	
13th week	Lipid Biosynthesis					Hor-Gil Hur	
14th week	Biosynthesis of Amino Acids, and Nucleotides					Hor-Gil Hur	
15th week	Aerobic Metabolism of Aromatics/Anaerobic Metabolism of Aromatics					Hor-Gil Hur	
16th week	Final Exam					Hor-Gil Hur	
17th week							

* If there will be experiments, mark it in the "Remarks".

Coordinator
Dept. Chair

Hor-Gil Hur
조재원

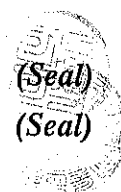


SYLLABUS

Classification	선택	Course No.	◦ 7686	Cr. Hrs.	3	Instructor	송철한
Course Title	Korean	대기 에어로졸					
	English	Atmospheric Aerosols					
Course Outline : The objective of this course is to introduce physical & chemical aerosol processes in the atmosphere such as aerosol chemistry, aerosol thermodynamics, nucleation, coagulation, particle growth, condensation & evaporation, and dry/wet deposition of aerosols.							
Prerequisite		Thermodynamics; Environmental Chemistry (7503); Environmental Transport Phenomena (7504)					
Textbook and References		Atmospheric Chemistry & Physics (by John H. Seinfeld; Spyros N. Pandis)					
Weekly Course Schedule							
Calendar	Description					Lecturers	
1st week	Properties of Aerosols 1					Chul H. Song	
2nd week	Properties of Aerosols 2						
3rd week	Dynamics of Single particles 1						
4th week	Dynamics of Single particles 2						
5th week	Aerosol Thermodynamics 1						
6th week	Aerosol Thermodynamics 2						
7th week	Aerosol Thermodynamics 3						
8th week	Nucleation 1 & Mid-term						
9th week	Nucleation 2						
10th week	Gas-to-particle & Particle-to-gas transfer 1						
11th week	Gas-to-particle & Particle-to-gas transfer 2						
12th week	Gas-to-particle & Particle-to-gas transfer 3						
13th week	Dynamics of Aerosol Population 1						
14th week	Dynamics of Aerosol Population 2						
15th week	Dry & Wet Deposition						
16th week	Final Exam						
17th week	or Final Exam					1학기 spring break	

* If there will be experiments, mark it in the "Remarks".

Instructor 송철한
Dept. Chair 조재원



SYLLABUS

Classification	선택	Course No.	07688	Cr. Hrs.	3	Instructor	김준하
Course Title	Korean	환경 데이터 분석 및 실습					
	English	Environmental Data Analysis & Practicum					
<p><u>Course Outline</u> : This course offers students a practical learning for how to transfer their thinking to a concrete & visualized output through computer tools. The course covers from basic data analysis, modeling to uncertainty analysis to verify the analysis and/or modeling outputs.</p>							
Prerequisite		Engineering Mathematics, Statistics,					
Textbook and References		The course instructor will tell about the materials at the classroom.					
Weekly Course Schedule							
Calendar	Description					Lecturers	
1st week	Data Structure						
2nd week	Basic Data Analysis						
3rd week	What is "modeling"?						
4th week	Correlation Analysis (auto/cross-correlation)						
5th week	Time Series & Spectral Analysis						
6th week	Best Parameter Fit						
7th week	Probabilistic Error Analysis						
8th week	Mid-term						
9th week	Mass Balance Analysis (reactor approach)						
10th week	Monte Carlo Simulation						
11th week	Sensitivity & Uncertainty Analysis						
12th week	Least-Mean-Square Error Linear Prediction						
13th week	Problem Based Learning I						
14th week	Problem Based Learning II						
15th week	Problem Based Learning III						
16th week	Final Exam						

* If there will be experiments, mark it in the "Remarks".

Coordinator 김 준 하
Dept. Chair 조 재 원

(seal)

(seal)

Course Noticement

Classification	수학	Course No.	97690	Cr. Hrs.	3	Instructor	장인섭 In Seop Chang
Course Title	Korean	환경공학 특론 II (미생물호흡작용과 환경에서의 영향)					
	English	Special topic II : Microbial respiratory processes and their effects in environment					
Course Outline Microbes dominate and mediate nearly all geochemical transformation taking place on our planet. Microorganism catalyzing these reactions provide a promising future in biotechnology for novel biocatalysis, bioremediation and bioenergy. New work aimed at understanding how these processes work at the molecular level is providing insights into fundamental physiological processes of environmental microorganisms. This course provides the information of this area by introducing recently published articles in Science, Nature and other journals.							
Prerequisite		환경미생물학 (Environmental Microbiology)					
Textbook and References		Recently published articles					
Weekly Course Schedule							
Calendar	Description					Remarks	
1st week	Introduction						
2nd week	A overview of microbial respiration in environment						
3rd week	Acetogenesis and methanogenesis: principle						
4th week	Recent research in acetogenesis & methanogenesis						
5th week	Sulfidogenesis: principle						
6th week	Recent research in sulfidogenesis						
7th week	Ecological role of sulfidogenesis and geochemical cycle						
8th week	Metal reduction: principle						
9th week	Recent research in metal reduction						
10th week	Geochemical cycle of metals and ecological role						
11th week	Microbial dehalogenation: principle						
12th week	Recent research in microbial dehalogenation						
13th week	New respiration process: electrode reduction						
14th week	New respiration process: perchlorate reduction						
15th week	New respiration process: symbiotic association						
16th week	Summary and Conclusions						

Instructor In Seop Chang
Dept. Chair 조재원

(Seal)
(Seal)

SYLLABUS

Classification	Elective	Course No.	○ 7699	Cr. Hrs.	3	Instructor	Jaeyoung Lee
Course Title	Korean	공업전기화학					
	English	Industrial Electrochemistry					
Course Outline : The objective of this course is the discussion of the many diverse roles of electrochemical technology in industry. Cathodic electroplating in semiconductor industry, corrosion and its control, wastewater treatment and water disinfection using electrocatalysis, future energy systems (fuel cells) and current energy storage system (battery) will be presented.							
Prerequisite							
Textbook and References		Lecture materials will be delivered					
Weekly Course Schedule							
Calendar	Description						Lecturers
1st week	Course introduction						
2nd week	Basic understanding of electrochemistry						
3rd week	The chlor-alkali process						
4th week	Energy conversion systems I						
5th week	Energy conversion systems II						
6th week	Energy storage systems						
7th week	Electrochemical treatment of (Waste)water						
8th week	Electroremediation						
9th week	Mid exam						
10th week	Electrodeposition of conducting metal oxides						
11th week	Electroplating in semiconductor industry						
12th week	Corrosion and its control						
13th week	Anodization: Ordered nano-template						
14th week	Hydrogen generation by water electrolysis						
15th week	Final exam						
16th week							

* If there will be experiments, mark it in the "Remarks".

Coordinator Jaeyoung Lee
Dept. Chair 조재원



SYLLABUS

Classification	Elective	Course No.	28609	Cr. Hrs.	3	Instructor	Sunbaek Bang
Course Title	Korean	유해오염물질 모니터링 및 제어					
	English	Hazardous Chemicals Monitoring and Control					
<u>Course Outline</u> : This course will introduce the basic concepts of hazardous chemicals and wastes, provide the monitoring and analysis methods, and deal with management skill and treatment methods							
Prerequisite							
Textbook and References		"Hazardous Waste Management" by M.D. LaGrega					
Weekly Course Schedule							
Calendar	Description					Lecturers	
1st week	Overview					Sunbaek Bang	
2nd week	Hazardous chemicals I					Sunbaek Bang	
3rd week	Hazardous chemicals II					Sunbaek Bang	
4th week	Monitoring of hazardous chemicals					Sunbaek Bang	
5th week	Analysis of hazardous chemicals					Sunbaek Bang	
6th week	Fate and transport of hazardous contaminants I					Sunbaek Bang	
7th week	Fate and transport of hazardous contaminants II					Sunbaek Bang	
8th week	Hazardous waste and process fundamentals					Sunbaek Bang	
9th week	Environmental audits and pollution prevention					Sunbaek Bang	
10th week	Physico-chemical processes					Sunbaek Bang	
11th week	Biological methods					Sunbaek Bang	
12th week	Stabilization and solidification					Sunbaek Bang	
13th week	Thermal methods					Sunbaek Bang	
14th week	Land disposal					Sunbaek Bang	
15th week	Risk assessment					Sunbaek Bang	
16th week	Final Exam					Sunbaek Bang	

* If there will be experiments, mark it in the "Remarks".

Coordinator: 방선백

Dept. Chair: 조재원

