[Title]			[Instructor]		
Advanced Water Quality Assessment			Futaba Kazama / Kei Nishida / Eiji Haramoto		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
PTM702	2	Environmental and Social System Science Course	2nd Semester	Fri.／II	English／Japanese

[Outline and purpose]

Environmental issues and the applied methodologies are outlined specifically on terrestrial environments such as groundwater, river or lake. Natural and human-induced water contents, estimations of pollutant load and health risk/guideline, modeling water quality incorporated with infiltration/flow/runoff processes are discussed. English is potentially used.

[Objectives]

- Understanding basic concept of water quality control and calculation of guideline values
- Understanding basic concept of water quality modelling and capable of introducing the equations

[Requirements]

Basics of water quality is desirable.

[Evaluation]

Quiz and assignments: 70%
Attitude in the class: 30%

[Textbooks]

Not designated. Related literatures or research examples will be introduced when necessary.

[References]

Not designated. Related literatures or research examples will be introduced when necessary.

[Schedule]

1 Introduction (Kazama, Nishida, and Haramoto)
2 Outline of health-related items (Haramoto)
3 Outline of microbiological indicators (Haramoto)
4 Methods for microbial risk assessment (Haramoto)
5 Future of microbiological indicators (Haramoto)
6 Outline of living environmental items (Nishida)
7 Future of living environmental items (Nishida)
8 Methods for water quality monitoring (Nishida)
9 Principle of loading estimation (Nishida)
10 Outline of governmental procedures for setting water quality standards (Kazama)
11 Examples of governmental procedures for setting water quality standards: health items (Kazama)
12 Examples of governmental procedures for setting water quality standards: items for conservation of the living environment (Kazama)
13 Management of water quality and activities of citizens (Kazama)
14 Group discussion 1 (Kazama, Nishida, and Haramoto)
15 Group discussion 2 (Kazama, Nishida, and Haramoto)

[Title]			[Instructor]		
Advanced Hydrology and Water Resources			Keiichi Masutani /Hiroshi Ishidaira / Kazuyoshi Sohma		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
PTM703	2	Environmental and Social System Science Course	1nd Semester	Thu.／II	English／Japanese

[Outline and purpose]

The aim of the lecture is to learn mechanism and modeling of water flows. The lecture starts from describing basic equations of fluid motion, followed by 1-dimensional water flow equations and storage type water dynamics modeling. The lecture deals with not only theoretical description of water flow modeling but also its numerical solution technique. The topics treated in the lecture are crucial for understanding water flows and river basin environmental science. The lecture is mainly given in Japanese while English is also used when needed.

[Objectives]

1. To understand basic equations of fluid motion and their derivation.
2. To understand 1-dimensional open channel flow equations and their derivation.
3. To understand kinematic wave model equations and their derivation.
4. To understand storage type water dynamics model and their derivation.
5. To understand basic of numerical solution technique for water flow models.

[Requirements]

Basic knowledge on hydraulics, hydrology and calculus.

[Evaluation]

Report: 40%
Final exam: 40%
Attendance and Attitude: 20%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Basic equations of fluid motion
3. Basic equations of material transport
4. Runoff process and water quality
5. Vertical movement of soil water and solute transport
6. Groundwater flow and solute transport
7. River flow process
8. Evapotranspiration: theory
9. Evapotranspiration: model
10. River basin hydrological model: conceptual model and lumped model
11. River basin hydrological model: distributed model
12. Modeling of water use and water control
13. Water resources in Japan
14. Water resources in the world
15. Summary

[Title]			[Instructor]		
Advanced Environmental Treatment Technology			Futaba Kazama / Kazuhiro Mori / Tadashi Toyama		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
PTM704	2	Environmental and Social System Science Course	2nd Semester	Thu.／II	English／Japanese

[Outline and purpose]

The purpose of this lecture is to learn the purification/remediation technologies for polluted soil and water. They include physicochemical technology, biological technology and ecological technology for removal of organic compounds, nutrients (nitrogen and phosphorus), heavy metals and persistent organic pollutants. In this lecture, we will learn the technologies for energy/material recovery from solid waste/wastewater. Also, we will discuss the methodology/road map for social implementation of environmental technology and international contribution by environmental technology.

[Objectives]

3. To understand the history, background and current situation of environmental pollution.
4. To understand the purification technology for organic pollution.
5. To understand the purification technology for nutrients (nitrogen and phosphorus) pollution.
6. To understand the purification technology for heavy metal pollution.
7. To understand the purification technology for persistent organic pollutants.
8. To understand the technology for energy/material recovery from wastes.
9. To understand the methodology for social implementation of environmental technology and international contribution by environmental technology.

[Requirements]

It is desirable that you should have basic knowledge of chemistry, biology and environmental engineering.

[Evaluation]

2. Reports and/or short examination; evaluation point is theoretical consideration of environmental technology; 70%
3. Lecture attendance; evaluation point is active participation/attitude; 30%

[Textbooks]

[References]

[Schedule]

1. Introduction (Kazama, Mori, Toyama)
2. Purification technology for organic pollution: Source and type of pollution, current situation (Mori)
3. Purification technology for organic pollution: Basic of technology, leading-edge technology, future development (Mori)
4. Purification technology for nutrients (nitrogen and phosphorus) pollution: Source and type of pollution, current situation (Toyama)
5. Purification technology for nutrients (nitrogen and phosphorus) pollution: Basic of technology, leading-edge technology, future development (Toyama)
6. Purification technology for heavy metal pollution: Source and type of pollution, current situation (Kazama)
7. Purification technology for heavy metal pollution: Basic of technology, leading-edge technology, future development (Kazama)
8. Purification technology for persistent organic pollutants Source and type of pollution, current situation (Toyama)
9. Purification technology for persistent organic pollutants Basic of technology, leading-edge technology, future development (Toyama)
10. Technology for energy/material recovery from wastes: Basic of issue, current situation (Mori, Toyama)
11. Technology for energy/material recovery from wastes: Basic of technology, leading-edge technology, future development (Mori, Toyama)
12. International contribution by environmental treatment technology: Group work 1 (Kazama, Mori, Toyama)

13. International contribution by environmental treatment technology: Group work 2 (Kazama, Mori, Toyama)
14. International contribution by environmental treatment technology: Group work 3 (Kazama, Mori, Toyama)
15. Presentation and discussion (Kazama, Mori, Toyama)

[Title]			[Instructor]		
Advanced River Basin Management			Shinichi Muto /Yutaka ichikawa / Kazuyoshi Sohma		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
PTM705	2	Environmental and Social System Science Course	2nd Semester	Tue.／II	English／Japanese

[Outline and purpose]

In this lecture, students will learn the integrated river basin management and regional planning to solve the local water issues. This lecture deals with the management of floods / sediments within basin, water hazard risk estimation for disaster reduction, and environmental assessment / cost-benefit analysis for river basin environment and water resources. The lecture is mainly given in English.

[Objectives]

-To understand how to manage water quantity, quality, and environment within river basin.
-To understand how to evaluate water hazard risk
-To understand how to carry out cost-benefit analysis for river basin management

[Requirements]

Basic knowledge of environmental sciences (Hydrologic cycle, Hydrospheric Science), or engineering (Hydrology, Water Resources Engineering, River Engineering, Infrastructure Planning and Management).

[Evaluation]

Final exam: 50%
Mid-term exam: 50%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. River structure and environment
3. Concept of river basin management in Japan
4. Examples of river basin management in Japan
5. The way to make river management plan in Japan
6. Practice of making river management plan: setting of objectives
7. Practice of making river management plan: planning strategy
8. Flooding simulation for water hazard risk estimation: basic equations
9. Flooding simulation for water hazard risk estimation: numerical solutions
10. Flooding simulation for water hazard risk estimation: practices
11. Applications of water hazard risk estimation
12. Cost-benefit analysis for river basin management
13. Cost-benefit analysis based on economic equilibrium models
14. Practice of cost-benefit analysis for river basin management
15. Presentations of cost-benefit analysis for river basin management

[Title]			[Instructor]		
Advanced Environmental Data Analysis			Kei Nishida / Eiji Haramoto / Takashi Nakamura / Tadashi Toyama		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
PTM706	2	Environmental and Social System Science Course	1st Semester	Fri.／I	English／Japanese

[Outline and purpose]

Basics of environmental measurements are learned to understand what the obtained information means. Basics of data processing are also learned by using monitoring results from a model basin. Japanese and oversea students study together through group work. English is potentially used.

[Objectives]

- Master the basics of experimental methods and how to finalize the data
- Master the basics of sorting monitoring data and estimate environmental loads
- Develop leadership, cooperativeness, and internationality

[Requirements]

Basic knowledge on water chemistry, microbiology, and hydrology is desirable.

[Evaluation]

Quiz and assignments: 50%
Attitude in the class: 25%
Presentation and discussion: 25%

[Textbooks]

Nothing special

[References]

Nothing special

[Schedule]

1. Introduction (Nishida, Haramoto, Toyama, Nakamura)
2. Physicochemical analysis: outline of stable isotope analysis 1 (Nishida, Nakamura)
3. Physicochemical analysis: outline of stable isotope analysis 2 (Nishida, Nakamura)
4. Physicochemical analysis: stable isotope analysis for pollutants (Nishida, Nakamura)
5. Physicochemical analysis: standard curve and calibration (Nishida, Nakamura)
6. Physicochemical analysis: finalizing data (Nishida, Nakamura)
7. Physicochemical analysis: nutrient loading (Nishida, Nakamura)
8. Physicochemical analysis: presentation (Nishida, Nakamura)
9. Microbial analysis: outline of fecal indicator microorganisms (Haramoto, Toyama)
10. Microbial analysis: measurement of fecal indicator microorganisms 1 (Haramoto, Toyama)
11. Microbial analysis: measurement of fecal indicator microorganisms 2 (Haramoto, Toyama)
12. Microbial analysis: measurement of fecal indicator microorganisms 3 (Haramoto, Toyama)
13. Microbial analysis: data analysis 1 (Haramoto, Toyama)
14. Microbial analysis: data analysis 2 (Haramoto, Toyama)
15. Microbial analysis: presentation (Haramoto, Toyama)

[Title]			[Instructor]		
Advanced Remote Sensing and Geographic Information System			Keiichi Masutani / Hiroshi Ishidaira / Jun Magome		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
PTM707	2	Environmental and Social System Science Course	2nd Semester	Fri.／I	English／Japanese

[Outline and purpose]

This course provides basic theories and techniques to analyze environmental information, including remote sensing, GIS.
Japanese and oversea students study together through work group on some topics. English is potentially used.

[Objectives]

To understand the principles of remote sensing and GIS.
To understand the potential use of remote sensing and GIS on environmental analysis.

[Requirements]

Basic skills of computing.

[Evaluation]

1. Report: 20%
2. Attendance and Attitude: 50%
3. Summary report: 30%

[Textbooks]

Using original documents.

[References]

[Schedule]

1. Introduction
2. Basic concept of remote sensing
3. Basic theory of remote sensing
4. Exercise (1): handling of satellite images
5. Correction of satellite images
6. Exercise (2): geometric correction
7. Remote sensing for land
8. Exercise (3): normalized difference vegetation index (NDVI) and land-cover classification
9. Basic concept of GIS
10. Structure and preparation of GIS data
11. Exercise (4): visualization of GIS data
12. Spatial information analysis method
13. Exercise (5): spatial analyses with GIS
14. Exercise (6): spatial analyses with GIS
15. Summary