

Syllabus: ADVANCED HYDROLOGY (2011)

Lecturers: Pat Yeh, Kei Yoshimura, Shinta Seto, Kazuao Oki.

Hours: Thursday, 1:30pm-3:10pm

Venue: @ As 311 Komaba II Campus

Note:

June 2: As313

July 21: An403

Email: Pat YEH (patyeh@iis.u-tokyo.ac.jp)

Kei YOSHIMURA (kei@iis.u-tokyo.ac.jp)

Shinta SETO (seto@rainbow.iis.u-tokyo.ac.jp)

Kazuo OKI (kazu@rainbow.iis.u-tokyo.ac.jp)

Web Page: <http://hydro.iis.u-tokyo.ac.jp/~patyeh/teaching.htm>

Recommended Textbook

Brutsaert, Wilfred, 2005, "Hydrology: An Introduction", Cambridge Univ. Press
(both Japanese and English version are available)

Reference Textbooks:

1. Dingman, 2002, Physical Hydrology, Prentice-Hall, Inc.
2. Chow, V.T., D.R. Maidment, and L.W. Mays, 1988, Applied Hydrology, McGraw-Hill Book Company.

Evaluation:

60% Term Project

(Final Presentation (30%), Written Report (30%))

40% Lecture Attendance

Lecture Topics and Dates:

1. **Hydrological cycle and Water Balance (Yeh)** May/12
 - Basic Definition and Terms
 - Global and Regional Hydrological Cycle and Water Balance
 - Surface/Subsurface Hydrological Processes in a Basin
 - Global Energy Balance

2. **Infiltration (Yeh)** May/19
 - Infiltration capacity
 - Horton's infiltration model
 - Green-Ampt equation
 - Philip equation

3. **Unsaturated-zone Processes (Yeh)** May/26
 - Porosity, Soil moisture content, Relative saturation, Field capacity, Wilting point
 - Gravity force vs. Capillary force
 - Richards Equation

4. **Runoff and River Flow (Yeh)** June/2
 - Runoff Generation mechanisms, River flow routing
 - Unit Hydrograph and Storm hydrograph
 - Hydrograph separation and Baseflow recession
 - Geomorphology

5. **Groundwater (Yeh)** June/9
 - Darcy's Law
 - Regional groundwater aquifer
 - Groundwater equation, Analytical and numerical solutions

6. **Remote Sensing of Water Quality (Oki K.)** June/16
 - Principles of remote sensing
 - Case I water and case II Water
 - Chlorophyll, Suspended Solids

7. **Water Quality (Oki K.)** July/23
 - River Basin
 - Pollution load such as nitrogen and phosphorus
 - Mapping the Potential Annual Pollution Load in the River Basins

8. **Precipitation, Water Vapor, Cloud, Snow (Seto)** June/30
 - Cloud and Precipitation

- Cloud microphysics
 - Statistical characteristics of precipitation rate
 - Rain gauge
9. Remote Sensing in Hydrology (Seto) Jul/7
- Rain drop size distribution
 - Weather radar
 - Global precipitation maps
10. Atmospheric circulations (Yoshimura) July/14
- Dynamic motion of Atmosphere; momentum equations and Coriolis force
 - Hadley/Ferrel/Polar circulations and Walker circulations
11. Evapotranspiration processes (Yoshimura) July/21
- Albedo and Bowen ratio
 - Penman equation and Penman-Montieth equation
 - Big-leaf models
12. Isotope Hydrology (Yoshimura) July/28
- Stable water isotopes and isotopic fractionation
 - Rayleigh's Distillation Process
 - Spacio/temporal distributions of precipitation water isotopes
13. Final Project Presentation I (All Lectures) Aug/ 4
14. Final Project Presentation II (TBD, if necessary) Aug/ 11