

Subject Hydrological Observation, Modeling & Forecasting

Course number : DMP281E

Instructor : Prof. Amithirigala Widhanelage JAYAWARDENA

Term / Time : Fall through Winter

1 Course Description

This course provides the hydrological basis for water-related risk management. It includes hydrological observation, flood frequency analyses, precipitation-runoff modeling and flood forecasting. Observational technology includes, in addition to the conventional gauging technologies, the latest retrieval algorithm of precipitation from satellite measurements. Frequency analyses will be preceded by basic data processing and quality assurance methodology. Hydrological modeling covers several typical models for estimating evapo-transpiration, infiltration and flow generation. Flood forecasting includes inundation calculation.

2 Course Outline (Course Topics)

Week

1. Processes in the hydrological cycle and their observations
2. Remote sensing of precipitation; satellite observation
3. Measurement of runoff; rating curve
4. Statistical analysis of rainfall data; intensity-duration-frequency curves
5. Stochastic analysis of rainfall data; time series analysis; rainfall prediction (1)
6. Stochastic analysis of rainfall data; time series analysis; rainfall prediction (2)
7. Peak flow estimation; rational method
8. Hydrograph prediction; unit hydrograph methods
9. Rainfall-runoff modeling; lumped approach (1)
10. Rainfall-runoff modeling; stochastic approach (2)
11. Rainfall-runoff modeling; distributed approach (3)
12. Rainfall-runoff modeling; data driven approach (4)
13. Flood forecasting; Kalman filtering
14. Future trends
15. Examination

3 Grading

There are two components to grading.

- 1) Home work 40%
- 2) Final Examination 60%

Students are required to get 60% for each component.

4 Textbooks

Subject Hydraulics

Course number : DMP282E

Instructor : Prof. Tadaharu Ishikawa

Term / Time : Fall through Winter

1 Course Description

This course provides the hydraulic engineering basis for the water-related risk management. It covers the fundamental concepts of open channel hydraulics including the equation for one-dimensional flow, roughness of channel and normal depth, critical depth, subcritical flow, supercritical flow, over flow and jump flow, gradually varied flow, unsteady flow, multi-crossed channel. Students are expected to become able to calculate the flood wave propagation in a real river.

2 Course Outline (Course Topics)

Week

- 1 : Framework of fundamental equation
- 2 : Equation for 1-dimension flow
- 3 : Roughness of channel and normal depth
- 4 : Critical depth, Subcritical flow, Supercritical flow
- 5 : Quiz
- 6 : Tour of laboratory
- 7 : Over flow and jump flow
- 8 : Gradually varied flow (1)
- 9 : Gradually varied flow (2)
- 10 : Unsteady flow
- 11 : Multi-crossed channel
- 12 : Junction flow and diversion flow
- 13 : Retarding basin
- 14 : Curved area and bar
- 15 : Examination

3 Grading

Class participation (30%), Reports (30%), Final Examination(40%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

4-2 Others

Subject Introduction to International Cooperation

Course number : DMP283E

Instructor : Mr. Mikio Ishiwatari

Term / Time : Fall through Winter

1 Course Description

This course provides the basic knowledge on international cooperation: players, objectives, target people and implementation mechanism. Japan International Cooperation Agency (JICA) experiences on disaster mitigation and regional development, especially on working together with local community will be the central focus of the lecture. It also covers the subjects of human security in disaster mitigation, relation between gender and community based disaster mitigation. This lecture will orient the students how to write their master thesis which is requested to take a form of an implementation plan to be submitted to the donor agencies.

2 Course Outline (Course Topics)

Week

- 1 : ODA & JICA
- 2 : To minimize disasters –Lessons from Japan
- 3 : International cooperation in disaster mitigation (1)
- 4 : International cooperation in disaster mitigation (2)
- 5 : Human security in disaster mitigation
- 6 : International contribution of JDR: Japan Disaster Relief Team (1)
- 7 : International contribution of JDR: Japan Disaster Relief Team (2)
- 8 : Relationship between gender & disaster
- 9 : Outline of regional development with residents (1)
- 1 0 : Outline of regional development with residents (2)
- 1 1 : Outline of regional development with residents (3)
- 1 2 : Planning with the residents
- 1 3 : Community based disaster mitigation (1)
- 1 4 : Community based disaster mitigation (2)
- 1 5 : Examination

3 Grading

Active participation(30%), Reports(40%), Final Examination(30%)

4 Textbooks

4-1 Required

4-2 Others

Subject Practice on Hydrological Observation, Modeling & Forecasting

Course number : DMP284E

Instructor : Prof. Amithirigala Widhanelage JAYAWARDENA

Term / Time : Fall through Winter

1 Course Description

This course aims at consolidating the material covered in Course No. DMP281E “Hydrological Observation, Modeling & Forecasting”.

Exercises related to each topic will be given to the students and they will be discussed and explained. It also includes field survey.

Students performance at these exercises will be counted toward their grades.

2 Course Outline (Course Topics)

Week

- 1 : Rating curve
- 2 : Intensity-duration-frequency curves
- 3 : Probability distribution; fitting goodness of fit
- 4 : Stochastic modeling - Time series analysis and prediction (1)
- 5 : Stochastic modeling - Time series analysis and prediction (2)
- 6 : Peak flow estimation
- 7 : Derivation of unit hydrograph and Synthetic unit hydrographs
- 8 : Hands on practice on typical rainfall-runoff models (1)
- 9 : Hands on practice on typical rainfall-runoff models (2)
- 1 0 : Hands on practice on typical rainfall-runoff models (3)
- 1 1 : Hands on practice on typical rainfall-runoff models (4)
- 1 2 : Flood forecasting using Kalman Filter
- 1 3 : Quiz
- 1 4 : Field Trip (1)
- 1 5 : Field Trip (2)

3 Grading

There are two components to grading.

- 1) Home work 30%
- 2) Quiz 40%
- 3) Final Exam 30%

Students are required to get 60% for each component.

4 Textbooks

4-1 Required

4-2 Others

Subject Practice on Hydraulics

Course number : DMP285E

Instructor : Prof. Tadaharu Ishikawa

Term / Time : Fall through Spring

1 Course Description

This course aims at consolidating the material covered in Course No. DMP282E “Hydraulics”.

Exercises related to each topic will be given to the students and they will be discussed and explained. It also includes field survey.

Students performance at these exercises will be counted toward their grades.

2 Course Outline (Course Topics)

Week

- 1, 2 : Framework of fundamental equation
- 3, 4 : Equation for 1-dimension flow
- 5, 6 : Roughness of channel and normal depth
- 7, 8 : Critical depth, Subcritical flow, Supercritical flow (1)
- 9, 10 : Critical depth, Subcritical flow, Supercritical flow (2)
- 11, 12 : Over flow and jump flow (1)
- 13, 14 : Over flow and jump flow (2)
- 15, 16 : Gradually varied flow (1)
- 17, 18 : Gradually varied flow (2)
- 19, 20 : Gradually varied flow (3)
- 21, 22 : Unsteady flow (1)
- 23, 24 : Unsteady flow (2)
- 25, 26 : Multi-crossed channel (1)
- 27, 28 : Multi-crossed channel (2)
- 29, 30 : Junction flow and diversion flow

3 Grading

Class participation (40%), Reports (60%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

4-2 Others

Subject IFRM(1) Basic Concepts of IRBM, IFRM & Global Trends

Course number : DMP380E

Instructor : Dr. Kuniyoshi Takeuchi

Term / Time : Fall

1 Course Description

This course provides the basic concepts of “Integrated Flood Risk Management (IFRM)” including disaster risk, natural hazard, societal vulnerability, coping capacity etc. as the basis of this Master Program of “Water-related Risk Management”. It also provides the current global and international trend and activities including Japanese flood management experiences, Hyogo Framework for Action, climate change, sustainable development etc. Those will be lectured by various international opinion leaders invited by ICHARM.

2 Course Outline (Course Topics)

Week

- 1 : Outline of integrated flood risk management (1)
- 2 : Outline of integrated flood risk management (2)
- 3 : Global trends of water-related disasters
- 4 : Basic concepts of IFRM
- 5 : Flood plain management
- 6 : Lessons from the past flood
- 7 : Japanese experiences
- 8 : Global trends (1)
- 9 : Global trends (2)
- 10 : International activities
- 11 : Effects of climate change (1)
- 12 : Effects of climate change (2)
- 13 : Project assessment (1)
- 14 : Project assessment (2)
- 15 : Examination

3 Grading

Active participation(30%), Reports(40%), Final Examination(30%)

4 Textbooks

4-1 Required

4-2 Others

Subject IFRM(2) Non-structural Measures & Community Defense

Course number : DMP381E

Instructor : Dr. Kuniyoshi Takeuchi

Term / Time : Fall through Winter

1 Course Description

This course focuses on the non-structural measures for Integrated Flood Risk Management (IFRM). They include institutional framework, flood insurance, education, flood preparedness, early warning, community defense, human behavior and social psychology. In community defense, the importance of human networking and organization underpinned by historically developed disaster culture will be emphasized. Students are expected to provide some local experiences from their home countries followed by some group discussions.

2 Course Outline (Course Topics)

Week

- 1 : Outline of Non-structural measures & Community defense
- 2 : Institutional framework
- 3 : Flood preparedness (1)
- 4 : Flood preparedness (2)
- 5 : Education
- 6 : Emergency response
- 7 : Recovery & Rehabilitation
- 8 : Human behavior and social psychology
- 9 : Early warning (1)
- 10 : Early warning (2)
- 11 : Community defense (1)
- 12 : Community defense (2)
- 13 : Flood insurance
- 14 : Forestation
- 15 : Examination

3 Grading

Active participation(30%), Reports(40%), Final Examination(30%)

4 Textbooks

4-1 Required

4-2 Others

Subject IFRM(3) IRBM & Structural Measures

Course number : DMP382E

Instructor : Prof. Shoji FUKUOKA

Term / Time : Fall through Winter

1 Course Description

This course provides the basic knowledge necessary for selecting and designing the structural measures for IFRM. The course first describes the river administration and planning for application of IFRM. Especially the methodology of comprehensive river management will be emphasized that includes planning of flood control, flood hydraulics and sediment movement to river channels and dam reservoirs. This will be followed by specific technologies of channel control and channel improvement.

2 Course Outline (Course Topics)

Week

- 1 . Outline, planning and administration of rivers
- 2 . River Design (1) Procedure of river planning, Plan/longitudinal /cross section of rivers
- 3 . River Design (2) Designed discharge, High water level, Observation of floods
- 4 . River Design (3) Meaning of observation of discharge and water height, Design and planning of dikes
- 5 . River Design (4) Design of medium and small size rivers
- 6 . River Channel Planning (1) Hydraulic of flood flow, Water surface profile, Marks of flood level
- 7 . River Channel Planning (2) Hydraulic structures – dike, revetment, Spur dike, weir
- 8 . River Channel Planning (3) Dam, Reservoir, Diversion/Confluence
- 9 . River Channel Planning (4) Sediment transport, Scour, Sedimentation, Transportation, Measurement and estimation of sediment load
- 1 0 . River Channel Planning (5) Form of river bed, Sand wave , Bar, Meandering
- 1 1 . River Management (1) Maintenance and management of river
- 1 2 . River Management (2) River management under construction
- 1 3 . Integrated River Basin Management (1)
- 1 4 . Integrated River Basin Management (2)
- 1 5 . Examination

3 Grading

Reports (20%) Final examination (80%)

4 Textbooks

4-1 Required

4-2 Others

prints made by the instructors

Subject Hazard Mapping & Evacuation Planning

Course number : DMP383E

Instructor : Mr. Shigenobu Tanaka

Term / Time : Fall

1 Course Description

This course provides not only general knowledge on flood hazard maps (FHM) in Japan and the world, but also professional knowledge and techniques which are indispensable for FHM such as run-off analysis, GIS and inundation analysis. In addition, students will also learn/understand information to be included in FHM, how to disseminate and utilize FHM through town watching (field survey and interviewing).

2 Course Outline (Course Topics)

Week

- 1 : Outline of flood hazard map
- 2 : Evacuation Planning
- 3 : Inundation analysis (1)
- 4 : Inundation analysis (2)
- 5 : Mapping and GIS
- 6 : Anticipated inundation area in Flood Hazard Map
- 7 : Latest technology for FHM
- 8 : Application of AROS data for FHM
- 9 : Topography of river and its alluvial plains
- 1 0 : Dissemination and Utilization of FHM
- 1 1 : Town Watching (1)
- 1 2 : Town Watching (2)
- 1 3 : Flood Hazard Map around the World
- 1 4 : Discussion
- 1 5 : Examination

3 Grading

Active participation (40%), Reports (30%), Final Exam (30%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

4-2 Others

Subject Sustainable Reservoir Development & Management

Course number : DMP384E

Instructor : Dr. Norihisa Matsumoto

Term / Time : Fall through Winter

1 Course Description

This course provides the basic ideas of dam reservoir design and construction. The lecture starts from the multiple objectives of dam reservoirs and looks into their environmental (including sediments) and societal impacts. The lecture covers the basic methodologies of planning of capacity and site selection, environmental impact assessment, sediment management and operation and maintenance of dam reservoirs. The students are expected to experience a preliminary but concrete process of environmental assessment of reservoirs and gets insight of the role of reservoirs dealing with climate changes.

2 Course Outline (Course Topics)

Week

- 1 . Outline of Dam Engineering
- 2 . Flood Control Plan
- 3 . Flood Control Operation
- 4 . Water Resources Planning
- 5 . Planning of Multi-purpose Dam
- 6 . Benefits of Dams
- 7 . Environmental Impact of Dams (1)
- 8 . Environmental Impact of Dams (2)
- 9 . Sediment Management in Reservoirs (1)
- 1 0 . Sediment Management in Reservoirs (2)
- 1 1 . Dam Construction (1)
- 1 2 . Dam Construction (2)
- 1 3 . Dam Management
- 1 4 . Effective Use of Existing Dams
- 1 5 . Roles of Dams in 21st Century

3 Grading

Class participation (30%) 、 Report and Final examination (70%)

If you miss the deadline for reports, your reports will only be evaluated for a certain percentage of what they are supposed to be:

Up to seven days: 70%

Eight days or longer: 50%

4 Textbooks

4-1 Required

4-2 Others

Subject Control Measures for Landslide & Debris Flow

Course number : DMP385E

Instructor : Dr. Shun Okubo

Term / Time : Fall through Winter

1 Course Description

This course provides the necessary knowledge and understanding of landslide and debris flow phenomena and their control measures necessary to exercise the IFRM. The lecture will illustrate the devastating phenomena and the causes of landslides and debris flows and provide the basic concepts of sabo works which control both hill slopes and channels. It will cover the important role of hazard mapping for sediment-related disasters in both structural and non-structural measures. The students are guided to some sabo protection sites near by Tsukuba area.

2 Course Outline (Course Topics)

Week

- 1 . Outline of sediment-related disasters
- 2 . Introduction to sabo projects
- 3 . Countermeasures for sediment-related disasters
- 4 . Hazard mapping for sediment-related disasters
- 5 . Comprehensive sediment-related disaster measures
- 6 . Countermeasures for earthquake-induced natural dams
- 7 . Sabo works in arid area and reforestation of degraded lands
- 8 . Volcanic sabo works
- 9 . Application of sabo works and landslide countermeasures to overseas countries
- 1 0 . Introduction of landslides
 - 1 1 . Characteristics and topography of landslides
 - 1 2 . Stability analysis for landslide
 - 1 3 . Survey and emergency response for landslide
 - 1 4 . Maintenance measures for roads and reservoirs in landslide areas
 - 1 5 . Permanent measures for landslide damage reduction

3 Grading

Class participation (30%) A Report and Final examination (70%)

4 Textbooks

4-1 Required

4-2 Others

Subject Practice on Integrated Flood Risk Management

Course number : DMP386E

Instructor : Dr. Kuniyoshi Takeuchi

Term / Time : Fall through Spring

1 Course Description

This course aims at consolidating the material covered in Course No. DMP380E “IFRM(1) Basic Concepts of IRBM, IFRM & Global Trends”, DMP381E “IFRM(2) Non-structural Measures & Community Defense” and DMP382E “IFRM(3) IRBM & Structural Measures”.

Exercises related to each topic will be given to the students and they will be discussed and explained. It also includes field survey.

Students performance at these exercises will be counted toward their grades.

2 Course Outline (Course Topics)

Week

- 1 : Practice on River Channel Planning (1)
- 2 : Practice on River Channel Planning (2)
- 3 : Practice on River Channel Planning (3)
- 4 : Practice on River Channel Planning (4)
- 5 : Practice on River Channel Planning (5)
- 6 : Practice on River Channel Planning (6)
- 7 : Practice on River Channel Planning (7)
- 8 : Practice on River Channel Planning (8)
- 9 : Practice on River Channel Planning (9)
- 1 0 : Practice on River Channel Planning (10)
- 1 1 : Practice on River Channel Planning (11)
- 1 2 : Project Assessment (1)
- 1 3 : Project Assessment (2)
- 1 4 : Flood control planning (1)
- 1 5 : Flood control planning (2)

3 Grading

Class participation(40%), Reports(60%)

4 Textbooks

4-1 Required

4-2 Others

Subject Practice on Hazard Mapping & Evacuation Planning

Course number : DMP387E

Instructor : Mr. Shigenobu Tanaka

Term / Time : Fall through Spring

1 Course Description

This course aims at consolidating the material covered in Course No. DMP383E “Hazard Mapping & Evacuation Planning”.

Exercises related to each topic will be given to the students and they will be discussed and explained. It also includes field survey.

Students performance at these exercises will be counted toward their grades.

2 Course Outline (Course Topics)

Week

1 : Inundation analysis (1)

2 : Inundation analysis (2)

3 : Inundation analysis (3)

4 : Inundation analysis (4)

5 : Mapping and GIS (1)

6 : Mapping and GIS (2)

7 : Mapping and GIS (3)

8 : Mapping and GIS (4)

9 : Town Watching (1)

1 0 : Town Watching (2)

1 1 : Town Watching (3)

1 2 : Town Watching (4)

1 3 : Town Watching (5)

1 4 : Town Watching (6)

1 5 : Town Watching (7)

3 Grading

Active participation (40%), Reports (30%), Final Exam (30%)

If a report is late for the deadline, it will be not evaluated.

4 Textbooks

4-1 Required

4-2 Others

Subject Practice on Sustainable Reservoir Development & Management

Course number : DMP388E

Instructor : Dr. Norihisa Matsumoto

Term / Time : Fall through Spring

1 Course Description

This course aims at consolidating the material covered in Course No. DMP384E “Sustainable Reservoir Development & Management”.

Exercises related to each topic will be given to the students and they will be discussed and explained. It also includes field survey.

Students performance at these exercises will be counted toward their grades.

2 Course Outline (Course Topics)

Week

- 1 . On-sight Survey for Dam Construction Site (Isawa Dam) (1)
- 2 . On-sight Survey for Dam Construction Site (Isawa Dam) (2)
- 3 . On-sight Survey for Dam Construction Site (Isawa Dam) (3)
- 4 . On-sight Survey for Dam Construction Site (Isawa Dam) (4)
- 5 . On-sight Survey for Dam Construction Site (Isawa Dam) (5)
- 6 . Field Survey on Dam Administration (Kawaji Dam, Ikari Dam) (1)
- 7 . Field Survey on Dam Administration (Kawaji Dam, Ikari Dam) (2)
- 8 . Field Survey on Dam Administration (Kawaji Dam, Ikari Dam) (3)
- 9 . Field Survey on Dam Administration (Kawaji Dam, Ikari Dam) (4)
- 1 0 . Practice on Dam Design (1)
- 1 1 . Practice on Dam Design (2)
- 1 2 . Practice on Dam Design (3)
- 1 3 . Practice on Dam Design (4)
- 1 4 . Application for other countries (1)
- 1 5 . Application for other countries (2)

3 Grading

Class participation (30%) 、 Report and Final examination (70%)

If you miss the deadline for reports, your reports will only be evaluated for a certain percentage of what they are supposed to be:

Up to seven days: 70%

Eight days or longer: 50%

4 Textbooks

4-1 Required

4-2 Others

Subject Practice on Control Measures for Landslide & Debris Flow

Course number : DMP389E

Instructor : Dr. Shun Okubo

Term / Time : Fall through Spring

1 Course Description

This course aims at consolidating the material covered in Course No. DMP385E “Control Measures for Landslide & Debris Flow”.

Exercises related to each topic will be given to the students and they will be discussed and explained. It also includes field survey.

Students performance at these exercises will be counted toward their grades.

2 Course Outline (Course Topics)

Week

1 . On-sight Survey for Sabo/Landslide Projects (1)

2 . On-sight Survey for Sabo/Landslide Projects (2)

3 . On-sight Survey for Sabo/Landslide Projects (3)

4 . On-sight Survey for Sabo/Landslide Projects (4)

5 . On-sight Survey for Sabo/Landslide Projects (5)

6 . On-sight Survey for Sabo/Landslide Projects (6)

7 . On-sight Survey for Sabo/Landslide Projects (7)

8 . On-sight Survey for Sabo/Landslide Projects (8)

9 . On-sight Survey for Sabo/Landslide Projects (9)

1 0 . Training of Development of Procedures for Sediment Disaster Warning and Evacuation (1)

1 1 . Training of Development of Procedures for Sediment Disaster Warning and Evacuation (2)

1 2 . Training of Development of Procedures for Sediment Disaster Warning and Evacuation (3)

1 3 . Training of Development of Procedures for Sediment Disaster Warning and Evacuation (4)

1 4 . Application of Sabo/Landslide Projects to Overseas Countries (1)

1 5 . Application of Sabo/Landslide Projects to Overseas Countries (2)

3 Grading

Class participation (30%) A Report and Final examination (70%)

4 Textbooks

4-1 Required

4-2 Others