Asian Institute of Technology

Ministry of Energy and Water
Islamic Republic of Afghanistan

Design of Irrigation and Drainage Structures

1-14 September 2015
Asian Institute of Technology (AIT), Thailand

PROGRAM SCHEDULE

PROGRAM OF OPENING & ORIENTATION SESSION

Date: 1ST September 2015

Venue: AITCC (Room No.: B225)

08:00 – 08:30	Registration
08:30 – 08:35	Objectives of the training [*Dr. Sangam Shrestha*, Assoc. Prof., AIT]
08:35 – 08:40	Introduction of the participants
08:40 – 08:50	Welcome remarks [*Prof. Worsak Kanok-Nukulchai*, President, AIT]
08:50 – 09:00	Welcome remarks [*Prof. Voratas Kachitvichyanukul*, Dean, School of Engineering and Technology, AIT]
09:05 – 09:10	Remarks from representative(s) of the participants
09:10 – 09:15	Group photo
09:15 – 09:40	Training course introduction [*Dr. Sangam Shrestha*, Associate Professor, AIT]
09:40 – 10:00	Initial evaluation (or expectation) from training course [*Participants*; questionnaire fill]
10:00 – 10:15	Tea/Coffee break
10:15 – 11:45	Orientation and AIT Campus Tour

Training Program (1-14 September, 2015)

DESIGN OF IRRIGATION AND DRAINAGE STRUCTURES

1-14 September, 2015 | AIT, Thailand

SCHEDULE OF TRAINING SESSIONS (as of 2015.08.25)

Course-2: Design of irrigation and drainage systems and structures (Review of principles of hydraulics for irrigation and drainage networks, design of hydraulic structures for irrigation and drainage systems – flow measuring structures, road crossings, chutes and drops, flumes, siphons, spillways, structural protection. Regulating and control structures – headgates, checks, turnouts, silt ejectors, gates.)

Day	SID	Type	Contents [Type]	RP
Day-1 01 Sep (Tue)		08:00 - 08:30	Registration	All
	D1S0	08:30 - 09:00	Opening and introduction	All
	D1S1	09:00 - 10:00	Course introduction	SS
	D1S2	10:15 - 11:45	Orientation and AIT Campus Tour	All
	D1S3	13:00 - 15:00	Irrigation System Planning, Development & Management [L]	MSB
	D1S4	15:15 - 17:15	Type of flows, continuity & momentum equations [L]	TT
		18:00 - 20:00	Welcome dinner	All
Day-2 02 Sep (Wed)	D2S1	08:30 - 10:00	Bernoulli's equation; head loss & energy calculations [L]	TT
	D2S2	10:15 - 11:45	Head loss & energy calculations [P]	TT
	D2S3	13:00 - 15:00	Canal design approaches, canal network structures [L]	VPP
	D2S4	15:15 - 17:15	Canal design, best hydraulic x-section [P]	VPP
Day-3 03 Sep (Thu)	D3S1	08:30 - 10:00	Chezy, Manning & Saint Venant equations [L]	TT
	D3S2	10:15 - 11:45	Various types of flow; critical flow/velocity, discharge [L]	TT
	D3S3	13:00 - 15:00	Canal design, best hydraulic x-section [P]	VPP
	D3S4	15:15 - 17:15	Canal design, best hydraulic x-section [P]	VPP
Day-4 04 Sep (Fri)	D4S1	08:30 - 10:00	Canal design, best hydraulic x-section [P]	VPP
	D4S2	10:15 - 11:45	Canal design, best hydraulic x-section [P]	VPP
	D4S3	13:00 - 15:00	Hydraulic jump, flow over spillways and through gates [L]	TT
	D4S4	15:15 - 17:15	Hydraulic jump, flow over spillways and through gates [L]	TT
Day-5 05 Sep (Sat)	D5S1	08:30 - 10:00	Flow measuring devices/structures [L]	AR
	D5S2	10:15 - 11:45	Laboratory exercise on flow measurement [P]	AR
	D5S3	13:00 - 15:00	Laboratory exercise on flow measurement [P]	AR
	D5S4	15:15 - 17:15	Laboratory exercise on flow measurement [P]	AR

Day-6 06 Sep (Sun)	Free time to explore culture, society and market			
Day-7 07 Sep (Mon)	D7S1	08:30 - 10:00	Chutes, drops and falls [L+P]	KI/CT/WP
	D7S2	10:15 - 11:45	Chutes, drops and falls [L+P]	KI/CT/WP
	D7S3	13:00 - 15:00	Chutes, drops and falls [L+P]	KI/CT/WP
	D7S4	15:15 - 17:15	Introduction of dams, weirs, barrage and intake; & their construction issues [L+P] (incl. video demonstration)	VPP
Day-8 08 Sep (Tue)	D8S1	08:30 - 10:00	Regulatory & control structures (e.g. headgates, checks, turnouts, silt ejectors, gates, etc)	KI/CT/WP
	D8S2	10:15 - 11:45	Cross-drainage structures (L+P]	KI/CT/WP
	D8S3	13:00 - 15:00	Cross-drainage structures (L+P]	KI/CT/WP
	D8S4	15:15 - 17:15	Cross-drainage structures (L+P]	KI/CT/WP
Day-9 09 Sep (Wed)	D9S1	08:30 - 10:00	Agro-advisory system demonstration [L]	GS
	D9S2	10:15 - 11:45	Exposure visit to RIMES (Regional Integrated Multi-Hazard Early Warning System for Africa and Asia)	GS
	D9S3	13:00 - 15:00	Introduction and hands-on-exercise with WinFlume [P]	VPP
	D9S4	15:15 - 17:15	Introduction and hands-on-exercise with WinFlume [P]	VPP
Day-10 10 Sep (Thu)	D11	08:00 - 18:00	Field visit [F]: Pa Sak Dam at Lop Buri, its headworks, irrigation system components; overnight stay at Bangkok	All
Day-11 11 Sep (Fri)	D12	08:30 - 18:00	Field visit [F]: Royal Irrigation Department (RID), their facilities and Pak Kret Demonstration Field	All
Day-12 12 Sep (Sat)	D12S1	08:30 - 10:00	Spillways [P]	SS1
	D12S2	10:15 - 11:45	Spillways [P]	SS1
	D12S3	13:00 - 15:00	Spillways [P]	SS1
	D12S4	15:15 - 17:15	Structural protection; river training [L+P]	SS1
Day-13 13 Sep (Sun)	Free time to explore culture, society and market			
Day-14 14 Sep (Mon)	D14S1	08:30 - 10:00	Climate change & design of hydraulic structures [L+P]	SS
	D14S2	10:15 - 11:30	Climate change & design of hydraulic structures [L+P]	SS
	D14S3	11:30 - 12:00	Evaluation, certificate distribution & closure	All
	D14S4	12:00 -	Closing Lunch & Free Time	All

10:00 - 10:15h: Tea/Coffee break [Morning]; 11:45 - 13:00h: Lunch Break

15:00 - 15:15h: Tea/Coffee Break [afternoon]; 13:00 - 13:30h: Prayer time [Fridays]

L: Lecture & Discussion; **P**: Practical/Exercise; **F**: Field Visit; **SID**: Session ID; **RP**: Resource Person

AR: Mr. Arturo Roa; CT: Mr. Chakkrapong Taewichit; GS: Dr. Govindarajalu Srinivasan; KI: Mr. Krairerk Inchayanunth; MSB: Prof. Mukand S Babel; SS: Dr. Sangam Shrestha; SS1: Dr. Sompop Sucharit; TT: Prof. Tawatchai Tingsanchali; VPP: Dr. Vishnu Prasad Pandey; WP: Mr. Waruth Pojsilapachai

DETAILS OF TRAINING MODULES

I.) Opening, course introduction and orientation

- Registration, introduction of participants and resources persons, course introduction, and orientation and AIT Campus Tour

II.) Module-1: Basic principles of hydraulics for irrigation & drainage

- An overview on importance of irrigation, global, regional and national scenarios; irrigation and drainage system; and their development history and practices.
- Concepts and types of flows, basics of open-channel hydraulics
- Continuity, momentum equations, demonstration of their applications
- Energy and Bernoulli's equation; calculation of head loss and energy
- Chezy, Manning's and Saint Venant equations and issues in their applications
- Various types of flows, critical flow and critical velocity, discharge
- Hydraulic jump, their formation, flow over various types of spillways and gates
- Demonstration on using WinFlume for design and calibration of flumes and weirs

III.) Module-2: Design of conveyance and distribution systems

- Various types of channels, canal networks, philosophies and approaches for both lined and non-lined channels, their suitability and limitations
- Determine design discharge for canals
- Canal design examples and practices
- Best hydraulic cross-section: theories, calculation, and practices
- Flow/discharge measuring devices (weirs, flumes, siphons, orifice, current meters), their applications and limitations, and practical challenges
- Laboratory sessions on flow/discharge measurement
- Practical/Exercise sessions on flow regulation, distribution and control structures.

IV.) Module-3: Design of irrigation network components

- Main reservoir (dam) and diversion headwork (weir, barrage, intake)
- Site selection criteria for reservoir and diversion
- Canal network (main, secondary and tertiary canals)
- Canal structures (falls/drops, chutes, regulators, intake/offtake, flow measuring structures, spillways.)
- Cross-drainage structures (e.g., aqueduct, syphon, culvert, super-passage, level crossing, inlet/outlet, Fall or drop structures, etc)
- Regulation and control structures: headgates, checks, silt ejectors, gates, division boxes, baffle distributors, upstream and downstream control, etc.
- Canal outlets (pipe outlet, weirs, etc.)
- Structural protection works

V.) Field visit, final reflections and closing

- Exposure visits for dam, diversion and irrigation networks (*Sites: Royal Irrigation Department (RID), Demonstration farm of Royal Irrigation Development Institute (IDI) at Pak Kre; and Pa Sak Dam, Lop Buri*)
- Visit to RIMES (Regional Integrated Multi-Hazard Early Warning System for Africa and Asia) and demonstration of Agro-advisory system
- Visits to market places in and around Bangkok (self-exploration)
- Evaluation, certificate distribution, and closing

RESOURCE PERSONS

MR. ARTURO ROA (AR) is a Senior Lab Supervisor at Asian Institute of Technology. (Email: roa@ait.asia)

MR. CHAKKRAPONG TAEWICHIT (CT) is a Professional Level Civil Engineer at Royal Irrigation Department (RID), Thailand. (Email:)

DR. GOVINDARAJALU SRINIVASAN (GS) is currently working as Chief Scientist, Climate Applications with Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES). His work focuses on climate variability and change, particularly on issues of climate risk management that put societal systems at risk. He has more than 25 years' experience in research and operational aspects of climate information, applications and services. He has represented India at UNFCCC and IPCC meetings and been involved in policy issues of climate change. He has served on the editorial board of the international journals - *Agricultural and Forest Meteorology* & *Climate Research*. He has also been a contributing author and expert reviewer for the IPCC AR4 and earlier reports. He held positions as consultant, Climate Adaptation and Prediction branch, World Meteorological Organization (WMO); Program Manager, Climate Change, Ministry of Earth Sciences &; Scientist, Dept. of Science & Technology (DST), Govt of India; Director, Climate Unit, India Meteorological Department. Dr. Srinivasan holds a Doctoral Degree in Atmospheric Sciences from Indian Institute of Technology, Delhi and carried out postdoctoral work at the Climate Research Unit (CRU), University of East Anglia, U.K., and the School of Environmental Sciences, Rutgers State University of New Jersey, USA. (Email: srini@rimes.int)

MR. KRAIRERK INCHAYANUNTH (KI) is a Senior Expert in Civil Engineering at Royal Irrigation Department (RID), Thailand. (Email: krairerk99@hotmail.com)

DR. MUKAND S BABEL (MSB) is a Full Professor and Coordinator of Water Engineering and Management at Asian Institute of Technology (AIT). He has over 28 years of experience in water engineering and management: teaching, research and consultancy and has supervised 16 doctoral and 110 master theses, and published extensively with more than 250 publications. Prof. Babel has carried out more than 57 research and sponsored projects with international/government agencies in Asian and beyond, which include The World Bank; FAO; UNESCO-IHE; UNU; ADB; DANIDA, ICH, Norway and NEF, Japan; GWP, Sweden; UN-DESA; ASCE; UNESCO; UNEP; IGES, Japan; UCC-Water, Denmark; Govt. of Thailand; Govt. of Indonesia; Govt. of Nepal; Govt. of Bhutan; and ICAR, Govt. of India, as well as with respected universities, such as Konkuk University, South Korea; Oregon State University, USA; Tohoku University, Japan; and University of Tokyo, Japan. (Email: msbabel@ait.asia)

DR. SANGAM SHRESTHA (SS) is an Associate Professor of Water Engineering and Management at Asian Institute of Technology. He is also a Visiting Faculty Member of the University of Yamanashi, Japan, and Research Fellow of the Institute for Global Environmental Strategies (IGES), Japan. His research interests are within the field of hydrology and water resources including, climate change impact assessment and adaptation on the water sector, water footprint assessment, and groundwater assessment and management. Dr Shrestha has published more than three dozen peer-reviewed articles in international journals and presented over fifty conference papers ranging from hydrological modelling to climate change adaptation in the water sector. His present work responsibilities at AIT include delivering lectures at the postgraduate and undergraduate levels, supervising research to postgraduate students, and providing consulting

services on water related issues to government and donor agencies and research institutions. He has conducted several projects relating to water resources management, climate change impacts, and adaptation with awards from International organizations such as APN, CIDA, EU, FAO, IFS, IGES, UNEP, UNESCO. (Email: sangam@ait.asia)

DR. SOMPOP SUCHARIT (SS1) is a Senior Irrigation Engineer at Royal Irrigation Department (RID), Thailand. (Email: pop9863@gmail.com)

PROF. TAWATCHAI TINGSANCHALI (TT) is a Distinguished Adjunct Professor of Water Engineering and Management (WEM) at Asian Institute of Technology (AIT), Thailand after he retired as a Full Professor in 2007. He was also a Visiting Professor at Leichtweiss Institute for Hydrology, Water Management and Water Protection, Technical University of Braunschweig, Germany in 2011 and during 2013-2014. He has over forty years of teaching and professional experience in the areas of hydraulics; flood and water-related disaster engineering and risk management; and river engineering and sedimentation. He has published over 200 articles in referred journals, conference proceedings and research reports. He has handled more than 20 projects in water engineering, flood control and management, river engineering and telemetering system as a team leader and leading consultant since 1980 to present. Prof. Tawatchi received Bachelor degree in Engineering from Chulalongkorn University, Thailand in 1968, and Master and Doctoral degrees in Water Resources Engineering from AIT in 1970 and 1975, respectively. (Email: tawatch_t@hotmail.com)

DR. VISHNU PRASAD PANDEY (VPP) is a Research Fellow at Asian Institute of Technology (AIT), Thailand. He was a postdoctoral researcher for nearly three years with International Research Center for River Basin Environment (ICRE), University of Yamanashi, Japan (Oct 2010 to June 2013) and a Research Faculty at Asian Institute of Technology and Management (AITM), Nepal (July 2013 to March 2015). Dr. Pandey has received several awards and fellowships and published over two dozen of peer-reviewed journal papers, several book chapters and conference papers. His recent books include “Climate Change and Water Resources” and “Kathmandu Valley Groundwater Outlook”. His research and professional interests are in the areas of hydrology and water resources, groundwater assessment and management, irrigation water engineering, and GIS application in water resources planning and management. Dr. Pandey received B.Eng. (Civil) from Tribhuvan University (Nepal), M.Eng. (Water Engineering and Management) from AIT (Thailand) and PhD (Integrated River Basin Management) from University of Yamanashi (Japan).(Email: vishnu.pandey@gmail.com)

MR. WARUTH POJSILAPACHAI is a Professional Level Civil Engineer at Royal Irrigation Department (RID), Thailand. (Email:)

Logistic Support

MRS. SIRIPORN HANMENG is working as a program officer at Asian Institute of Technology. (Email: siriporn t@ait.asia; Tel: 0896-741-709)

PARTICIPANTS

1. Mr. Abdul Mateen Kohistani (Design Engineer, Kabul)
2. Mr. Ahmad Shoja Mohammad Nabi (Engineer, MEW)
3. Mrs. Fawzia Matin (Engineer, MEW)
4. Mr. Habibullah Mashwani (Engineer, Jalalabad)
5. Mr. Ismatullah Mohammad Agha (Design Engineer, Kandhar)
6. Mrs. Mahbooba Omer (Supervisor, Kabul)
7. Mr. Mohammad Daud Qayoumi (Design Engineer, Main Office)
8. Mr. Mohammad Qasem Noori (National Senior Irrigation Design Engineer, RAO-IRDP/Technical Section Assistant, Kabul) … Team Leader
9. Mrs. Najia Safi (Engineer, MEW)
10. Mr. Zabiullah Esmati (Deputy Director, Mazar)

FIELD VISIT PROGRAM

Objectives:

- To familiarize the participants with activities of Royal Irrigation Department (RID) and facilities the office has.
- To provide an exposure on layout and design of irrigation systems and its components (including diversion headworks, irrigation system structures, cross-drainage works, protection works, etc.) of a selected RID project

Detailed Program:

Day-1 (10TH September 2015, Thursday)

8:00 – 10:00	Travel from AIT to Pa Sak Dam, Lop Buri
10:00 – 11:00	Briefing on "Project Background and Water Management for Agricultural Area" by Pa Sak Jolasid Dam Operation and Maintenance Project
11:00 – 13:00	Visit to dam site, canal and selected structures of the irrigation system, including pumping station, distribution structures, etc.
13:00 – 14:00	Lunch
14:00 – 17:30	Travel and visit to Ayutthaya
17:30 – 19:00	Travel to Bangkok and stay overnight in Bangkok

Day-2 (11TH September 2015, Friday)

8:30 – 10:00	Travel from Hotel to RID Headquarter, Bangkok
10:00 – 12:00	- Welcome address including Introduction of participants, - Briefing on an overview of RID's mandate and mission including history of irrigation development in Thailand and the current and future challenges and approaches
12:00 – 13:30	Lunch
13:30 – 16:30	- Visit to Irrigation Development Institute, Pak Kret - Briefing on its background and activities - Visit demonstration farm at Pak Kret
16:30 – 17:30	Travel to Chao Phraya River
17:30 – 21:00	Cruise & dinner
21:00 –	Travel from Bangkok to AIT

Contact (RID): (Phone: 02-241-5059; 02-243-7883)

- Ms. Sakuntala Bhalilrummarak, Foreign Relations Officer (Cell: 081-637-5842)
- Miss Laksmi Kamphumprasert (Cell: 086-9027-954)
- Mr. Wananat Leenin (Cell): 081-9003-111)