



AIT
Asian Institute of Technology



Ministry of Energy and Water
Islamic Republic of Afghanistan

Design of Diversion Works

2-15 October 2015
Asian Institute of Technology (AIT), Thailand

PROGRAM SCHEDULE

PROGRAM OF OPENING & ORIENTATION SESSION

Date: 2ND October 2015

Venue: AITCC (Room No.: B225)

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

Training Program (2 - 15 October, 2015)

DESIGN OF DIVERSION WORKS

2-15 October 2015 | AIT, Thailand

SCHEDULE OF TRAINING SESSIONS

Course-3: Design of diversion works (Design of diversion works, sediment transport and settling basins, river training, pumps, quantities and cost estimations, construction methods and construction management.)

Day	SID	Type	Contents	RP
Day-1 02 Oct (Fri)		08:00 - 08:30	Registration	All
	D1S0	08:30 - 09:00	Opening and introduction	AIT
	D1S1	09:00 - 10:00	Course introduction	SS
	D1S2	10:15 - 11:45	Orientation and AIT Campus Tour	All
	D1S3	13:30 - 15:00	Irrigation system planning, development & management [L]	MSB
	D1S4	15:15 - 17:45	Flow types, continuity/momentum equations [L]	TT
		18:30 - 20:30	Welcome dinner	All
Day-2 03 Oct (Sat)	D2S1	08:30 - 10:30	Layout of diversion works; dam site selection & dam construction issues [L+ Video]	VPP
	D2S2	10:30 - 12:00	Bernoulli's equation; head loss & energy calculations [L]	TT
	D2S3	13:00 - 15:30	Hydraulic jump, flow over spillways and through gates [P]	TT
	D2S4	15:45 - 17:45	Hydraulic jump, flow over spillways and through gates [P]	TT
Day-3 04 Oct (Sun)	D3S1	08:30 - 10:00	Dam design, failure and safety [L+P]	LD
	D3S2	10:15 - 11:45	Dam design, failure and safety [L+P]	LD
	D3S3	13:00 - 15:00	Tools/Techniques for dam design [P]	LD
	D3S4	15:15 - 17:15	Tools/Techniques for dam design [P]	LD
Day-4 05 Oct (Mon)	D4S1	08:30 - 10:00	Agro-advisory system demonstration [L]	GS
	D4S2	10:15 - 11:45	Exposure visit to RIMES (Regional Integrated Multi-Hazard Early Warning System for Africa & Asia)	GS
	D4S3	13:00 - 15:00	Hydraulic structures, their function; duty & delta [L+P]	VPP
	D4S4	15:15 - 17:15	Design discharge for intake & canals [L]	VPP
Day-5 06 Oct (Tue)	Free time to explore culture, society and market			
Day-6 07 Oct (Wed)	D6S1	08:30 - 10:00	Design of weir portion, spillways, seepage theories [L+P]	YT
	D6S2	10:15 - 11:45	Design of weir portion, spillway, seepage theories [L+P]	YT
	D6S3	13:00 - 15:00	Tools/Software for weir design & seepage analysis [P]	YT
	D6S4	15:15 - 17:15	Tools/Software for weir design & seepage analysis [P]	YT



Day-7 08 Oct (Thu)	D7S1	08:30 - 10:00	Climate change & design of hydraulic structures [L+P]	SS
	D7S2	10:15 - 11:45	Climate change & design of hydraulic structures [L+P]	SS
	D7S3	13:00 - 15:00	Design discharge for canals: CROPWAT Model [L+P]	VPP
	D7S4	15:15 - 17:15	Design discharge for canals: CROPWAT Model [P]	VPP
Day-8 09 Oct (Fri)	D8S1	08:30 - 10:00	Design of under-sluices [L+P]	SS1
	D8S2	10:15 - 11:45	Design of under-sluices (contd. ...) [L+P]	SS1
	D8S3	13:30 - 15:00	Structural protection & river training works	SS1
	D8S4	15:15 - 17:15	Dam safety	SS1
Day-9 10 Oct (Sat)	D9S1	08:30 - 10:00	Design of energy dissipating structures [L+P]	YT
	D9S2	10:15 - 11:45	Design of energy dissipating structures [L+P]	YT
	D9S3	13:00 - 15:00	Design of energy dissipating structures [L+P]	YT
	D9S4	15:15 - 17:15	Methods for diversion work construction [L] & Video demonstration	YT
Day-10 11 Oct (Sun)	Free time to explore culture, society and market			
Day-11 12 Oct (Mon)	D11	08:30 - 18:00	Field visit [F]: Royal Irrigation Department (RID), their facilities and Pak Kret Demonstration Field	All
Day-12 13 Oct (Tue)	D12	08:30 - 18:00	Field visit [F]: Pa Sak Dam at Lop Buri, its headworks, irrigation system components	All
Day-13 14 Oct (Wed)	D13S1	08:30 - 10:00	Construction management techniques [L+P]	DSS
	D13S2	10:15 - 11:45	Construction safety [L]	DSS
	D13S3	13:00 - 15:00	Design discharge for hydraulic structures [L+P]	VPP
	D13S4	15:15 - 17:15	Design discharge for hydraulic structures [P]	VPP
Day-14 15 Oct (Thu)	D14S1	08:30 - 10:00	Demonstration & exercise of WinFlume [P]	VPP
	D14S2	10:15 - 11:30	Demonstration & exercise of WinFlume [P]	VPP
	D14S3	11:30 - 12:00	Evaluation, certificate distribution & official closure	All
	D14S4	12:00 -	Closing Lunch (@ AIT Conference Center) & Free Time	All

NOTES

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

DSS: Dr. Dojen San Santoso; GS: Dr. Govindarajalu Srinivasan; LD: Lochan Devkota

MSB: Prof. Mukand S Babel; SS: Dr. Sangam Shrestha; SS1: Dr. Sompop Sucharit

TT: Prof. Tawatchai Tingsanchali; VPP: Dr. Vishnu Pd. Pandey; YT: Dr. Yutthana Talaluxmana

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: Review of theories for hydraulic design

- 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 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: Estimating design discharge for hydraulic structures

- Various types of hydraulic structures and their functions
- Estimating design discharge for canals: calculation of crop water requirement, irrigation water requirement (NET & GROSS), system water requirement, duty, delta, command area, base period; introduction/demonstration to CROPWAT8.0 & CLIMWAT2.0
- Flood frequency analysis; Estimating design discharge for various types of hydraulic structures (e.g. Spillway, Intake, weir, etc.)

IV.) Module-3: Design of dams

- Introduction and layout of diversion structures
- Types of diversion works: dam, weir, barrage, intake, etc.
- Layout of dams, site selection criteria (hydraulic & environmental considerations), issues with dam construction; selected cases
- Concepts and types of dams
- Dam failure & safety: causes of failure (e.g., piping, uplift, etc.) and potential remedies
- Design of earth dams & concrete gravity dams
- Tools/Software used for dam design

V.) Module-4: Design of Diversion Headwork components

- Design of weir portion, spillways:
 - Principles for design for surface flow (location, waterway, shapes, crest length, length and thickness of impervious flow)
 - Principles of design for sub-surface flow of structure: Blight's theory, Lanes theory, Khosla's seepage theory
- Design of under-sluices, and other components

- Energy dissipating structures (e.g. sediment transport and settling basins, etc.): design criteria, techniques and tools/software
- Structural protection works, river training works
- Demonstration of suitable software for designing diversion headwork components

VI.) 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

DR. DOJEN SAN SANTOSO (DSS) is an Associate Professor of Construction Management at Asian Institute of Technology (AIT). (Email: djoensan@ait.asia)



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. LOCHAN DEVKOTA (LD) is a project manager (Hydropower) for South East Asian Region at ILF Consulting Engineers. (Email: lochandevkota@gmail.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 Expert in Irrigation Engineering 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. Before joining AIT, 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 management, 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)

DR. YUTTHANA TALALUXMANA (YT) is a Lecturer at Kasetsart University, Thailand. (Email: fengynt@ku.ac.th)

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- **DR. SANGAM SHRESTHA** (Email: sangam@ait.asia; Tel: 0847-284-535)
- **DR. VISHNU PRASAD PANDEY** (Email: vishnu.pandey@gmail.com; Tel: 094-903-697) for technical matters related to the training course

PARTICIPANTS

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