

Hydrology and Hydraulics for Dam Safety Studies

March 5 – 9, 2018
Hydrologic Engineering Center
Davis, CA

Objective

The objective of the course is for participants to perform hydrologic and hydraulic modeling in support of Dam Safety studies. Course participants will be required to run HEC-HMS and HEC-RAS.

Topics presented will include: Development of Probable Maximum Precipitation (PMP); Hydrologic Modeling for PMP/PMF Events; Hydrologic Loading; Developing Dam Breach Parameters; Dam Breaching Analysis using HEC-HMS and HEC-RAS; Unsteady Flow Modeling with HEC-RAS; and Using RAS-Mapper for Inundation Mapping. Each participant will have the opportunity to prepare model input and analyze model output during course workshops.

Course Prerequisites: Students who come to this class should have knowledge on how to use HEC-HMS and HEC-RAS. This knowledge can be in the form of a basic training class or on the job experience. The preparation of basic input data and analysis of the output from these software packages will not be covered. Experience in unsteady flow modeling is a plus but is not required.

Monday, 5 March

8:00	9:00		COURSE INTRODUCTIONS
9:00	10:00	1.1 Lecture	OVERVIEW OF H&H FOR DAM SAFETY This lecture provides an overview of the process for performing the Hydrology, Hydraulics, and Mapping studies for a dam safety study. A discussion of Hydrologic Loading for Risk Assessment is included.
10:00	10:15	BREAK	
10:15	11:15	1.2 Lecture	DEVELOPMENT OF THE PROBABLE MAXIMUM PRECIPITATION Procedures for development of the probable maximum precipitation for the various regions of the United States are described.
11:15	12:30	ICEBREAKER LUNCH	
12:30	14:00	1.3 Workshop	DEVELOPMENT OF PMP This workshop will demonstrate how to develop a PMP event for the eastern half of the U.S. using HMR51 and HMR52.
14:00	14:15	Review	1.3 Workshop
14:15	14:30	BREAK	
14:30	15:15	1.4 Lecture	HYDROLOGIC MODELING FOR PMP/PMF EVENTS Discussion of modeling rainfall, infiltration, runoff transform, and baseflow methods focused towards PMF level events. Overview of reservoir routing options within HEC-HMS.
15:15	16:45	1.5 Workshop	DEVELOPING PMF INFLOWS TO RESERVOIRS AND ROUTING THE PMF This workshop will demonstrate how to calculate the PMF inflow to a reservoir, route that flow through the reservoir, and evaluate the adequacy of the spillway.
16:45	17:00	Review	1.5 Workshop

Tuesday, 6 March

8:00	9:00	2.1 Lecture	DETERMINATION OF DAM BREACH PARAMETERS Discussion of methods for estimating the parameters necessary for simulation of breaching earth dams.
9:00	10:15	2.2 Workshop	DEVELOPING DAM BREACH PARAMETERS This workshop will focus on estimating dam break parameters.
10:15	10:30	Review	2.2 Workshop
10:30	10:45	BREAK	
10:45	12:00	2.3 Lecture	HYDROLOGIC LOADING Role of hydrologic loading in the dam safety risk assessment process; development of hydrologic hazard curves; tools for hazard curve development.
12:00	13:00	LUNCH	
13:00	14:15	2.4 Lecture	HYDROLOGIC LOADING CASE STUDIES Examples and discussion of hydrologic hazard curve development; understanding level of effort for various study types.
14:15	14:30	BREAK	
14:30	15:30	2.5 Lecture	PERFORMING A DAM BREAK ANALYSIS WITH HEC-HMS Discussion of how to perform a dam break analysis using HEC-HMS. Discussions of antecedent conditions/event for dam safety studies and downstream routing techniques.
15:30	16:45	2.6 Workshop	DAM OVERTOPPING AND BREACHING ANALYSIS WITH HEC-HMS This workshop will demonstrate how to perform a dam break analysis and downstream routing using HEC-HMS.
16:45	17:00	Review	2.6 Workshop

Wednesday, 7 March

8:00	9:15	3.1 Lecture	DEVELOPING GEOMETRIC DATA WITH RAS MAPPER This lecture will describe how to use HEC-RAS Mapper to prepare input data to an HEC-RAS model in support of a dam break analysis.
9:15	9:30	BREAK	
9:30	12:00	3.2 Workshop	GEOMETRY DEVELOPMENT WITH RAS MAPPER Students will learn how to use HEC-RAS Mapper to prepare the geometric input data for HEC-RAS.
12:00	13:00	LUNCH	
13:00	13:30	Review	3.2 Workshop
13:30	14:30	3.3 Lecture	UNSTEADY FLOW MODELING WITH HEC-RAS This lecture will describe how to enter unsteady flow data and boundary conditions, perform the computations, and view results of an unsteady flow analysis.
14:30	14:45	BREAK	
14:45	16:30	3.4 Workshop	UNSTEADY FLOW MODELING FOR DAM SAFETY STUDIES Students will learn how to model a dam and the downstream area using unsteady flow routing in HEC-RAS.
16:30	17:00	Review	3.4 Workshop

Thursday, 8 March

8:00	9:00	4.1 Lecture	USING HEC-RAS TO PERFORM A DAM BREAK ANALYSIS This lecture will cover how to enter dam break parameters into HEC-RAS, performing the computations, and viewing pertinent results.
9:00	9:15	BREAK	
9:15	11:00	4.2 Workshop	PERFORMING A DAM BREAK ANALYSIS WITH HEC-RAS This workshop will have students entering dam break parameters, running the model, and viewing results. A range of breach parameters will be tested during the workshop.
11:00	11:30	Review	4.2 Workshop
11:30	12:30	LUNCH	
12:30	13:45	4.3 Lecture	COMMON MODEL STABILITY PROBLEMS WHEN PERFORMING A DAM BREAK ANALYSIS This lecture will discuss stability problems that are often encountered when applying an unsteady flow model to a dam break situation.
13:45	14:00	BREAK	
14:00	14:45	4.4 Lecture	DETECTING AND FIXING MODEL STABILITY PROBLEMS This lecture will discuss methods for identifying and fixing model stability problems.
14:45	16:30	4.5 Workshop	DIAGNOSING AND FIXING COMMON STABILITY PROBLEMS Students will be given several data sets that have at least one model stability problem. The goal is to identify the problem and to fix it.
16:30	17:00	Review	4.5 Workshop

Friday, 9 March

8:00	9:00	5.1 Lecture	USING RAS MAPPER FOR INUNDATION MAPPING This lecture will describe how RAS Mapper is used to develop inundation maps from HEC-RAS model results.
9:00	10:00	5.2 Workshop	INUNDATION MAPPING FOR DAM SAFETY STUDIES Students will gain hands on experience in using HEC-RAS results to develop inundation maps.
10:00	10:15	Review	5.2 Workshop
10:15	11:00		COURSE WRAP-UP Post-test, course critique and closing remarks.