HEC-RAS Applications Training Course

Professional Development Training Course Outline

Category	Construction Institute	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The HEC-RAS Applications Training Course is designed to develop advanced expertise in hydraulic modeling, river analysis, flood risk assessment, water resources engineering, and 1D/2D hydrodynamic simulation using the internationally recognized HEC-RAS software platform. The course equips participants with practical skills in steady-flow analysis, unsteady-flow modeling, floodplain mapping, bridge and culvert hydraulics, sediment transport analysis, dam breach simulation, and climate-resilient water management solutions. Through hands-on exercises and real-world engineering scenarios, participants learn how to transform field data, GIS datasets, and hydraulic parameters into reliable models that support sustainable infrastructure planning, disaster risk reduction, and smart water resource management.

This professional training program emphasizes practical HEC-RAS applications, digital engineering workflows, geospatial integration, and data-driven hydraulic decision-making. Participants will explore advanced modeling techniques, calibration approaches, model validation, and interpretation of simulation results through industry case studies covering urban flooding, river restoration, flood hazard mapping, transportation infrastructure, and watershed management projects. The course is ideal for professionals seeking to enhance their capabilities in hydraulic engineering, flood resilience, environmental assessment, and next-generation water modeling technologies.

Programme Curriculum

HEC-RAS Applications Training Course

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Course Objectives

By the end of the **HEC-RAS Applications Training Course**, participants will be able to:

1. Develop advanced skills in HEC-RAS hydraulic modeling and river system simulation.
2. Apply 1D and 2D hydrodynamic modeling techniques for complex flow conditions.
3. Perform floodplain delineation and flood risk mapping using modern workflows.
4. Understand steady-flow and unsteady-flow hydraulic analysis procedures.
5. Integrate GIS, remote sensing, and spatial datasets into hydraulic models.
6. Conduct accurate bridge, culvert, and hydraulic structure assessments.
7. Apply dam breach modeling and emergency flood analysis techniques.
8. Improve model accuracy through calibration, validation, and sensitivity analysis.
9. Analyze climate change impacts and extreme flood scenarios.
10. Generate professional hydraulic reports, visualization outputs, and decision-support maps.
11. Apply nature-based solutions and resilient water management strategies.
12. Use advanced modeling approaches for urban flood management and infrastructure protection.
13. Develop industry-ready expertise in digital water engineering and smart hydraulic solutions.

Target Audience

1. Hydraulic Engineers and Water Resources Engineers
2. Civil Engineers involved in river and infrastructure projects
3. Flood Risk Management Specialists
4. Environmental Engineers and Consultants
5. GIS Specialists and Remote Sensing Professionals
6. Government Water Management Authorities
7. Researchers, Academics, and Graduate Students
8. Disaster Risk Reduction and Climate Adaptation Professionals

Course Modules

Module 1: Introduction to HEC-RAS and Hydraulic Modeling Fundamentals

- Overview of **HEC-RAS capabilities, applications, and engineering workflows**
- Understanding river hydraulics, flow characteristics, and modeling concepts

- Introduction to hydraulic equations and computational methods
- HEC-RAS interface, project setup, and data management
- Case Study: **River flood simulation and floodplain analysis for watershed planning**

Module 2: HEC-RAS Data Preparation and GIS Integration

- Preparing terrain models, DEM data, and geometric information
- Importing GIS layers and spatial hydraulic datasets
- Creating river reaches, cross-sections, and computational meshes
- Integration with geospatial platforms for hydraulic analysis
- Case Study: **GIS-based flood hazard mapping for urban catchments**

Module 3: Steady Flow Hydraulic Modeling Applications

- Developing steady-flow hydraulic models
- Defining boundary conditions and flow parameters
- Performing water surface profile calculations
- Interpreting velocity, depth, and energy results
- Case Study: **River capacity assessment for flood protection design**

Module 4: Unsteady Flow and Advanced 2D Modeling

- Understanding unsteady flow simulation concepts
- Developing 2D flow areas and computational meshes
- Applying rainfall-runoff and flood hydrograph inputs
- Managing complex flood propagation scenarios
- Case Study: **Urban flash flood simulation using 2D HEC-RAS modeling**

Module 5: Hydraulic Structures Modeling

- Modeling bridges, culverts, weirs, and gates
- Evaluating structure impacts on river hydraulics
- Performing backwater and overtopping analysis
- Assessing infrastructure flood vulnerability
- Case Study: **Bridge hydraulic assessment for transportation resilience**

Module 6: Floodplain Mapping and Risk Assessment

- Creating flood inundation maps using HEC-RAS results
- Applying flood frequency analysis concepts
- Evaluating flood depth, velocity, and hazard levels
- Supporting emergency planning and disaster management
- Case Study: **Regional flood risk assessment and community resilience planning**

Module 7: Advanced Applications: Sediment, Dam Breach, and Climate Modeling

- Introduction to sediment transport modeling
- Dam breach parameter development and simulation
- Evaluating extreme flood events and climate scenarios
- Applying resilience-based hydraulic design principles
- Case Study: **Dam failure emergency response modeling**

Module 8: Model Calibration, Validation, and Professional Applications

- Hydraulic model calibration techniques
- Sensitivity analysis and uncertainty evaluation
- Quality control of simulation outputs
- Preparing professional engineering reports
- Case Study: **Large-scale river modeling project validation and decision support**

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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