MONASH University
Engineering

Postgraduate Program in Infrastructure Engineering and Management

CIV5261: Flood Management in Urban & Rural Environments

Background and Aims

The unit aims to introduce students to risk management in water engineering, through the specific field of flood management. The unit will first introduce students to the factors causing or aggravating flooding in the Australian context, the benefits and impacts of flooding, and the risk management framework applied to reduce flooding and its impacts on the community. It will then cover the hydrologic background for estimating floods in a number of situations and for a range of purposes, including detailed treatment of flood frequency analysis methods and rainfall-based flood estimation methods. Students will also become familiar with the hydraulic methods used to determine flood levels, including water surface profile computation methods and methods to determine the hydraulic effects of various structures in the floodplain. Students will undertake assignments using industry-standard computer software. In the final part, students will be introduced to a number of measures to reduce flooding and its impacts, including flood mapping, planning controls, design of structural flood mitigation measures and emergency management measures.

After completing this unit participants will:

- apply the risk management approach to flood problems,
- estimate floods and flood levels in various design situations using a variety of hydrological and hydraulic methods,
- develop a basic flood management strategy for a specific flood situation,
- appreciate the need for flood management and its role in the broader context of integrated catchment, stream and wetland management,
- appreciate the concept of natural risk and the need for trade-offs in developing risk management strategies, and
- appreciate different value systems held by different members of the community and the need for consultation, negotiation and effective communication.

Details of the structure of the unit are provided over the page

Enrolment Options

Enrol as a single unit or as part of either the Graduate Certificate in Infrastructure Engineering and Management, Postgraduate Diploma in Infrastructure Engineering and Management, or Master in Infrastructure Engineering and Management.

Off-Campus Study Mode

This unit is offered by Off-Campus (distance education) and there is no requirement for participants to attend lectures. Study guides, comprising a comprehensive set of course notes, are sent following enrolment. Further support is provided through a unit web site and via e-mail. The lecturer is available to answer questions and to provide assistance as necessary throughout the semester. Assistance can be arranged by email, facsimile, mail, telephone or through the discussion groups on the unit web site. Assessment comprises two assignments and an examination (worldwide exam venues are available).

Unit Co-ordinator

Tony has more than 20 years experience in hydrology and water resource management and has worked on projects throughout Australia and in the US and Taiwan. He has a PhD from the University of Melbourne, a Master of Science from the University of Minnesota, a Graduate Certificate in Higher Education from Monash University, and also studied at Uppsala University in Sweden. Tony recently joined SKM from Monash University and retains associate status of both Monash University and the University of Melbourne.

Tony has more than 60 refereed publications and recently completed a book on Australian Hydrology for Oxford University Press.

Enrolment or General Course Enquiries:

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Offered through Department of Civil Engineering, Faculty of Engineering, Monash University

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Structure

The unit is structured around 12 topics which are generally associated with one week of study

Topic	*After completing this topic, participants will:*
1. Introduction to Flood Management Practices	• Understand basic flood concepts and flood management issues • Have an overview of flood management practices in rural and urban areas • Have an appreciation of flood management process and the role of hydrology/hydraulics • Understand basic risk management concepts
2. An Overview of Flood Estimation Methods	• Be able to define the role of design flood flow estimates within the context of flood management • Be able to give an overview of the design flood flow estimation methods most commonly applied in Australia, and the factors affecting the choice of an appropriate method for a specific application • Be able to describe and use the procedures in flood frequency analysis • Be able to describe and use the procedures of simplified flood estimation methods
3(a) & (b). An Overview of Open Channel Hydraulics	• Understand the basic concepts of continuity of mass and energy • Be able to apply these concepts to determine water levels and flows and describe flow behaviour
4(a) & (b). Hydraulic Basis of Flow Profile Computations	• Understand and apply the concept of conservation of momentum • Understand and apply the concept of flow resistance • Be able to compute uniform flow depths and non-uniform flow profiles
5. Flow Profile Computations with HEC-RAS	• Understand the hydraulic processes that occur in natural channels and their interaction with other elements of the floodplain • Understand the modelling approaches employed to solve hydraulic problems in natural channels and their limitations • Understand the procedures and assumptions used in the HEC-RAS model
6. Introduction to Runoff Routing	• Understand the factors that determine a design hydrograph • Understand and be able to apply runoff routing approaches to flood estimation
7. Introduction to RORB	• Understand the basic features of the RORB model • Understand issues around establishment, calibration and production of probabilistic flood estimates
8. Application of RORB in a Flood Study	• Be able to apply the RORB model • Be able to model the effect of channel modifications and/or loss parameters on deign flood hydrographs
9. Introduction to HEC-RAS	• Be able to apply the HEC-RAS model to determine water levels from flow and channel information
10. HEC-RAS Features	• Understand additional features of the HEC-RAS model: ineffective areas, encroachment options, horizontal variation of Manning's n and be able to analyse river junctions
11. Bridge Analysis with HEC-RAS	• Understand and be able to apply the bridge routines in HEC-RAS including estimation of bridge scour
12. Development of Flood Management Strategies	• Understand general risk assessment and risk management concepts relevant to floodplain management • Understand the specific aspects of risk management in detail including economic issues and development of flood studies, floodplain management studies and floodplain management planning.