MONASH University
Engineering

Postgraduate Program in Infrastructure Engineering and Management

CIV5264: Management of Water Resources and Related Infrastructure

Background and Aims

The unit aims to develop the student's awareness and broad understanding of the issues encountered in water resources management of both rural and urban catchments. Learning in this subject area will be supported by course notes on introductory and background material, supplemented by directed study of referenced resource material. The introductory material will cover typical issues related to catchments/stream complexes; rural and urban land uses and their potential water quantity and quality impacts. Basic principles of water quantity modelling will be addressed and developed through use of spreadsheet tools and industry computer models. Water resource management options will be outlined, including improved land management, water demand management, planning frameworks and environmental and social aspects.

After completing this unit participants will understand the:

- major elements of catchment water balance/cycle and their relationships with land use, surface water – groundwater interactions
- rural/urban land uses and water resources developments, and their potential impacts on water quantity and quality
- water quantity and quality management options through land use and water allocation planning, water use management, water treatment etc
- water quality background through knowledge of the sources, pathways and impacts of pollutants in rural and urban catchments
- environmental and social aspects; eg. beneficiaries of projects and adversely affected parties, community participation mechanisms etc
- how risk management principles are applied to the management of water resource infrastructure

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

Belinda Hatt is a Lecturer in the Department of Civil Engineering, Monash University and is a member of the Institute for Sustainable Water Resources. She undertook her PhD at Monash University, where she investigated the potential for using filtration technologies in stormwater harvesting systems. Her research interests are in integrated urban water management, stormwater treatment technologies and aquatic ecosystem responses to urbanization.

Enrolment or General Course Enquiries:

Ms Brenda O'Keefe:
Tele: +61 (0)3 9905 9627
Fax: +61 (0)3 9905 4944
Email: brenda.okeefe@eng.monash.edu.au
Website:
civil.eng.monash.edu.au/courseworkdegrees/infrastructure

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

ABN 12 377 614 012 CRICOS provider number 00008C

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	• be aware of the main issues the world's water resource managers are facing currently and in the future • understand how the issues and their relative importance vary depending on the specific geographic, hydrologic, socio-economic and political setting of a country or region • be able to identify common elements among the diversity of issues in different settings • have an appreciation of the desirable broad directions of future water management to achieve equitable and sustainable outcomes
2. Water Resources Management Principles and Practices	• summarise the challenges facing Australian water resource management agencies • explain the basic principles that underlie contemporary water resource management in Australia • understand some key elements of the legislative and regulatory framework for water resources management, particularly in relation water allocation for different beneficial uses, based on the example of Victoria • discuss selected issues in water resource management, and current Australian or Victorian approaches to dealing with them
3. Water Balance in Hydrologic Systems	• understand the concept of a *hydrologic system* and the most important *hydrologic processes* involved in producing runoff and streamflow • apply this knowledge to *catchments and simple water supply systems*, to define the system boundaries and the principal system inputs and outputs, and to identify the system characteristics that have a major influence on the relationship between inputs and outputs • formulate *water balance equations* for the analysis of catchments and simple water supply systems • be familiar with the basic principles of *hydrologic catchment modelling* • use the *AWBM model* to derive streamflow sequences for water supply yield estimation
4. Streamflow Analysis and Streamflow Characteristics	• explain the concept of a streamflow regime, the factors determining the regime of a specific stream, and the implications of modifying these factors • understand the important role played by streamflow data in hydrological investigations, and how streamflow data is obtained • describe the main streamflow statistics used to summarise a streamflow regime, and the methods used for more detailed analysis of streamflow characteristics • explain the derivation of flow duration curves from basic streamflow data and how the the curves can be applied in a range of water resource management studies
5. Storage Yield Analysis (1)	• apply water balance computation principles to the analysis of water supply systems with and without storage • understand the basis of the storage behaviour analysis method and develop a spreadsheet to estimate yield and reliability in a simple water supply system • discuss how key factors such as demands, physical supply system characteristics and operation rules affect the relationship between system inputs, demands, supply (yield) and reliability
6. Stochastic Data Generation Methods	• summarise the main characteristics of rural and urban water supply systems and how they can be represented in system simulation models • explain the features of REALM and IQQM and the main differences between these modelling systems • describe typical applications of water resource system simulation models

7. Storage Yield Analysis (2)	• explain the role of stochastic data generation methods in yield estimation studies • understand basic time series analysis concepts and their application in time series modelling • describe the principles applied in a number of commonly used stochastic data generation methods
8. Water Quality Issues in Waterways	• list key water quality management documents • list major water quality issues and describe their importance • list possible management interventions for particular water quality issues • understand the difference between point and diffuse sources of pollutants and implications for managing these different sources
9. Water Quality - Key Processes, Nutrient Cycles	• understand the concept of the nitrogen cycle and its importance • understand the process of eutrophication and related algal blooms • understand the process of self purification of rivers • sketch and calculate dissolved oxygen sag curves in rivers resulting from pollution input
10. Monitoring	• understand the framework for designing a water quality sampling network • understand the various factors related to sampling site selection • understand the various types of sampling equipment • dDesign a water quality sampling network for various scenarios
11. Environmental Flows	• define environmental flows • list the common types of flow changes that occur because of water resource development • list and describe the consequences of changing the flow regime of a river • list and describe possible outcomes from implementing environmental flows • list and discuss approaches to designing environmental flows
12. Infrastructure Risk Management	• describe the objectives of risk management and the main steps in a generic risk management framework • understand important concepts and methods in risk assessment, including how to undertake qualitative risk assessments and how to prepare ‘event trees’ • explain broadly how these concepts and methods are applied in the specific case of dam safety risk management