Course Outline (Higher Education)

School: School of Engineering, Information Technology and Physical Sciences

Course Title: SURFACE WATER HYDROLOGY

Course ID: ENGIN5201

Credit Points: 15.00

Prerequisite(s): (ENGIN2201)

Co-requisite(s): Nil

Exclusion(s): Nil

ASCED: 039999

Description of the Course :
This course provides students with an advanced body of knowledge in the area of surface water hydrology. Topics important to civil and environmental engineering will be covered and will include the hydrological cycle, water quality in engineered and natural systems, stream flow measurement and floodplain hydraulics, hydrology in water supply and drainage, advanced analysis methods (statistics, probability and time-series analysis), flood hydrology and concepts of integrated water cycle management. The course also equips participants with skills for research and enquiry in the hydrological sciences and engineering.

Grade Scheme: Graded (HD, D, C, etc.)

Work Experience:

No work experience: Student is not undertaking work experience in industry.

Placement Component: No

Supplementary Assessment: Yes

Where supplementary assessment is available a student must have failed overall in the course but gained a final mark of 45 per cent or above and submitted all major assessment tasks.

Program Level:

Level of course in Program	AQF Level of Program					
	5	6	7	8	9	10
Introductory						
Intermediate					✔	
Advanced						

Learning Outcomes:

Knowledge:

K1. Explain all fundamental elements of the hydrological cycle.

K2. Describe the hydrological processes which control the occurrence, movement and distribution of surface water in the environment.

K3. Explain the methods for collection and analysis of rainfall and stream flow information.

K4. Infer the implications of different runoff quality and identify the methods of characterising and improving runoff quality.

K5. Evaluate methods in statistics and probability to select appropriate hydrological data analysis and associated design tasks.

K6. Recommend methods for the assessment of river and reservoir yield.

K7. Reflect on the methods of flood routing and concepts of flood risks, in the context of flood mitigation methods.

K8. Identify and categorise contemporary issues in hydrology spanning subjects such as water resource sharing, eco-hydrology and interdisciplinary matters.

Skills:

S1. Critically analyse water quality data and interpret water quality conditions of water systems.

S2. Apply advanced methods in statistics, probability and time series analysis for the understanding of complex hydrological problems.

S3. Critically examine and apply expert judgement when assessing and establishing the design philosophy to be adopted for stormwater drainage systems, flood mitigation problems and water resources systems generally.

S4. A basic level of proficiency with specialised hydrological modelling software.

Application of knowledge and skills:

A1. Outline all fundamental elements of the hydrological cycle and apply these to practical situations.

A2. Utilise rainfall and streamflow data to model and estimate floods.

A3. Select appropriate engineering solutions to maintain or restore water quality and hydrological regimes and carry out appropriate design calculations.

A4. Apply a critical understanding of water quality to determine water resource system condition and shortlist possible solutions.

A5. Apply advanced methods in statistics, probability and time series analysis to complex problems in surface water hydrology.

A6. Calculate design storms and partial storms, and use flood frequency analysis to estimate the magnitude of floods at given probabilities of occurrence.

A7. Analyse and design major components of stormwater systems, focussing on traditional detention basin design, but with alternative contemporary solutions stemming from integrated water cycle management (such as grass swales and wetlands) understood.

A8. Apply advanced methods of hydraulics and hydrology for the solution of complex water resources problems including reservoir yield analysis and flood routing.

A9. Use computer-based models, together with hydrological principles, to solve complex problems related to surface water hydrology.

Course Content:

Topics may include:

- The hydrological cycle (surface water and groundwater) and key hydrological concepts (rainfall, evaporation, etc.)
- Water quality in engineered and natural systems (including water quality testing and analyses).
- Streamflow measurement and floodplain hydraulics
- Water supply (reservoir analysis, yield and system operation).
- Hydrological data and time-series analysis (data collection, rainfall and streamflow data, statistics and probability in hydrology).
- Flood hydrology (design estimations, flood frequency analysis).
- Flood routing and detention basin design
- Concepts of integrated water resource management.
- Water resource sharing, including entitlement and allocation frameworks.
- Advanced time-series analysis for hydrology (flow duration curves, recession curves, residual mass curves, peak counts, spells analysis)
- Concepts of eco-hydrology and interdisciplinary issues (natural flow paradigms, environmental flow regimes and habitat engineering)

Values:

V1. Recognise current principles and best practices in water supply, water resource management (including stormwater) and flood management.

V2. Recognise the importance of incorporating the concept of sustainability in water resources engineering design.

V3. Appreciate social and environmental issues in water resources engineering planning and design and be able to integrate these complex elements into the final engineering solution.

V4. Appreciate the role water resources engineering can have on the short, medium and long-term impact and performance of urban and rural systems.

V5. Develop an integrated understanding of hydrological system variables (including rainfall and streamflow) and their impact on the overall performance of engineering systems.

V6. Appreciate the importance of understanding how integrated hydrological systems behave, through modelling, simulation and testing.

V7. Appreciate learning as a lifelong process.

Graduate Attributes

The Federation University FedUni graduate attributes (GA) are entrenched in the Higher Education Graduate Attributes Policy (LT1228). FedUni graduates develop these graduate attributes through their engagement in explicit learning and teaching and assessment tasks that are embedded in all FedUni programs. Graduate attribute attainment typically follows an incremental development process mapped through program progression. **One or more graduate attributes must be evident in the specified learning outcomes and assessment for each FedUni course, and all attributes must be directly assessed in each program**

Graduate attribute and descriptor	**Development and acquisition of GAs in the course**			
	Learning Outcomes (KSA)	**Code** A. Direct B. Indirect N/A Not addressed	**Assessment task (AT#)**	**Code** A. Certain B. Likely C. Possible N/A Not likely

Graduate attribute and descriptor		Development and acquisition of GAs in the course			
		Learning Outcomes (KSA)	**Code** A. Direct B. Indirect N/A Not addressed	**Assessment task (AT#)**	**Code** A. Certain B. Likely C. Possible N/A Not likely
GA 1 Thinkers	Our graduates are curious, reflective and critical. Able to analyse the world in a way that generates valued insights, they are change makers seeking and creating new solutions.	K1-K8, S1-S4, A1-A9	A	1-3	A
GA 2 Innovators	Our graduates have ideas and are able to realise their dreams. They think and act creatively to achieve and inspire positive change.	K1-K8, S1-S4, A1-A9	B	1-2	B
GA 3 Citizens	Our graduates engage in socially and culturally appropriate ways to advance individual, community and global well-being. They are socially and environmentally aware, acting ethically, equitably and compassionately.	K1-K8, S1-S4, A1-A9	B	1-2	B
GA 4 Communicators	Our graduates create, exchange, impart and convey information, ideas, and concepts effectively. They are respectful, inclusive and empathetic towards their audience, and express thoughts, feelings and information in ways that help others to understand.	K1-K8, S1-S4, A1-A9	B	1, 2	B
GA 5 Leaders	Our graduates display and promote positive behaviours, and aspire to make a difference. They act with integrity, are receptive to alternatives and foster sustainable and resilient practices.	Not applicable	Not applicable	Not applicable	Not applicable

Learning Task and Assessment:

Learning Outcomes Assessed	Learning Tasks	Assessment Type	Weighting
K1-8, S1-4, A1-9	Problem based questions and design tasks pertinent to civil engineering hydrology.	Assignments	20 - 40%
K1-8, S1-4, A1-9	Using hydrology software to estimate any combination of catchment runoff, flood flows, streamflow depths, reservoir system operations and water quality.	Computer simulation project	10 - 30%
K1-8, S1-4, A1-9	A combination of quantitative and qualitative problem solving, design calculations and crtical analysis of hydrological issues and subject matter.	Examination	40 - 60%

Adopted Reference Style:

Other (IEEE-Refer to the library website for more information.)