UNIVERSITY OF WARWICK

Proposal Form for New or Revised Modules (MA1- version 7 - April 2014)

Approval information	
Approval Type	☐ New module ☒ Revised module ☐ Discontinue module
Date of Introduction/Change	02/10/2017
If new, does this module replace another? If so, enter module code and title:	
If revised/discontinued, please outline the rationale for the changes:	Revised as part of the Curriculum Refresh
Confirmation that affected departments have been consulted:	Changes were made in consultations between the School of Engineering and WMG.

Module Summary	
1. Module Code (if known)	ES3D5
2. Module Title	Water Engineering for Civil Engineers
3a. Lead department:	School of Engineering
3b. Teaching Split (if known):	School of Engineering = 100%
4. Name of module leader	Dr Jonathan Pearson
5. Level	UG: ☐ Level 4 (Certificate) ☐ Level 5 (Intermediate) ☒ Level 6 (Honours) PG: ☐ Level 7 (Masters) ☐ Level 8 (Doctoral) See Guidance Notes for relationship to years of study
6. Credit value(s) (CATS)	15 CATS
7. PrincipalModule Aims	Knowledge of water engineering is essential for good practice of civil and environmental engineering. This module provides background material on open channel hydraulics and engineering hydrology that serve as a sound base for other relevant civil and environmental modules and for future professional practice.

Module Summary	
8. Principal Learning Outcomes	To enable students to understand the principles of free surface flows and engineering hydrology applied to civil engineering problems. Students who have successfully completed this module will be able to: • explain the principles controlling open channel flows • summarise the differences between flow types • analyse free surface flow problems using friction, energy and momentum considerations • predict rainfall and runoff characteristics for UK catchments
9. Timetabled Teaching Activities (summary)	**30 hrs Lectures, 13 hrs tutorials and 1.5 hr of laboratory session Total 44.5 hrs**
10. Departmental Web-link	http://www2.warwick.ac.uk/fac/sci/eng/eso/modules/year3/es3d5
11. Other essential notes	Advice and feedback hours are available for answering questions on the lecture material (theory and examples).
12. Assessment methods (summary)	Unseen examination 90% (3 hour) Assessed design exercise 10%

For use by Strategic Planning and Analytics Office only -Do not fill in this section

Level	JACS3 Code	Teaching Split
		If not provided in 3b above

External Credit Level		Scheme	

Module Context

13. Please list all departments involved in the teaching of this module. If taught by more than one department, please indicate percentage split.

School of Engineering

14. Availability of module

Degree Code	Title	Study Year	C/OC/ A/B/C	Credits
H210	BEng Civil Engineering	3	C	15
H211	MEng Civil Engineering		C	
H212	MEng Civil Engineering with Intercalated Year		C	
H213	MEng Civil Engineering with a Year in Research		C	
H106	BEng Engineering		A	
H107	MEng Engineering		A	
H109	MEng Engineering with Intercalated Year		A	
H110	MEng Engineering with a Year in Research		A	

15. Minimum number of registered students required for module to run

1 (Core)

16. Pre- and Post-Requisite Modules

None.

Module Content and Teaching

17. Teaching and Learning Activities*(totals for module – please see guidance)*

Module duration (weeks)	25 weeks
Lectures	30x1 hrs
Seminars	
Tutorials	13x1 hrs
Project Supervision	
Demonstration	1.5 hr
Practical Class/Workshops	
Supervised time in studio/workshop	
Fieldwork	
External visits	
Work based learning	
Placement	

Module Content and Teaching		
Year abroad		
Other activity *(please describe): e.g. distance-learning, intensive weekend teaching etc.*	105.5 hrs of guided independent learning	
18. Assessment Method (Standard)		
Type of assessment	**Length**	**% weighting**
Written Examinations	3 hrs	90%
Practical Examinations		
Assessed essays/coursework	Assessed design exercise	10%
18a. Final chronological assessment*(please see guidance*)	Unseen examination	

19. Methods for providing feedback on assessment.
Oral feedback (as group and one-to-one if requested) in dedicated session and marked script
20. Outline Syllabus
Open Channel Hydraulics • Review of hydrostatics, pipe flow and Bernoulli equation • Laminar and turbulent flow in open channels • Laminar flow analysis • Principles of uniform flow • Development of friction equations - magnitude of friction coefficients • Channels with distorted cross-sections & “Best form” cross-sections • Development of energy concepts & specific energy • Critical flow considerations • Applications of the energy principle • Measurement structures and dilution gauging • Development of conservation of momentum principle • Specific force considerations • Analysis of hydraulic jump • Gradually varied flow equation & classification of gradually varied flow profiles • Methods for the calculation of gradually varied flow profiles • Location of hydraulic jump • Introduction to commercial numerical software **Engineering Hydrology** • The hydrological cycle

- Precipitation, initial losses, infiltration, percolation, evapotranspiration, surface runoff, groundwater flow
- Rainfall types and spatial variability of rainfall (UK)
- Rainfall. Intensity - duration - frequency (return period) analysis
- The Flood Estimation Handbook (FEH)
- Design storm rainfall. Uniform intensity and FEH rainfall profiles
- River flow analysis
- The unit hydrograph
- FEH techniques to estimate runoff from catchment characteristics; impacts of urbanisation
- Reservoir routing

21. Illustrative Bibliography

(1) Chadwick, A.J. & Morfett, J.C. Borthwick M. Hydraulics in Civil and Environmental Engineering (5th Edition) Spon 2013
(2) Chanson, H. The Hydraulics of Open Channel Flow Arnold (2nd Edition) 2004
(3) Douglas, J.F., Gasiorek, J.M., Swaffield, J.A. & Jack L., Fluid Mechanics (6th Edition) Wiley 2011
(4) Shaw E.M., Beven K.J., Chappell N.A. & Lamb R., Hydrology in Practice, Spon 2010

22. Learning outcomes

Successful completion of the module leads to the learning outcomes. The learning outcomes identify the knowledge, skills and attributes developed by the module.

Learning Outcomes should be presented in the format "By the end of the module students should be able to..." using the table at the end of the module approval form:

Resources

23. List any additional requirements and indicate the outcome of any discussions about these.

N/A

Approval	
24. Module leader's signature	Dr Jonathan Pearson
25. Date of approval	Teaching Policy Committee Chair's Action 30 March 2017
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering and WMG Teaching Policy Committee
27. Chair of Committee's signature	Professor Gill Cooke
28. Head of Department(s) signature	Professor Nigel Stocks

Examination Information		
A1. Name of examiner (if different from module leader)		
A2. Indicate all available methods of assessment in the table below		
% Examined	**% Assessed by other methods**	**Length of examination paper**
90%	Assessed design exercise 10%	3 hrs
A3. Will this module be examined together with any other module (sectioned paper)? If so, please give details below.		
No		
A4. How many papers will the module be examined by?	**1**	
A5. When would you wish the exam take place (e.g. Jan, April, Summer)?	**Summer**	
A6. Is reading time required?	☒ No	
A7. Please specify any special exam timetable arrangements.		
N/A		
A8. Stationery requirements		
No. of Answer books?	1	
Graph paper?	Yes	
Calculator?	Yes	
Any other special stationery requirements (e.g. Data books, tables etc)?	Engineering Data Book	
A9. Type of examination paper		
Seen?	No	
Open Book?	No	
Restricted?	No	
If restricted, please provide a list of permitted texts:		

LEARNING OUTCOMES		
(By the end of the module the student should be able to....)	**Which teaching and learning methods enable students to achieve this learning outcome? (reference activities in section 17)**	**Which summative assessment method(s) will measure the achievement of this learning outcome? (reference activities in section 18)**
explain the principles controlling open channel flows	Lectures, seminars	Unseen examination
summarise the differences between flow types	Lectures, seminars	Unseen examination and assessed design exercise
analyse free surface flow problems using friction, energy and momentum considerations	Lectures, seminars	Unseen examination and assessed design exercise
predict rainfall and runoff characteristics for UK catchments	Lectures, seminars	Unseen examination