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	01/10/2018
If new, does this module replace another? If so, enter module code and title:	
If revised/discontinued, please outline the rationale for the changes:	Updated Teaching and Learning Hours, introducing more tutorial sessions. Additional learning outcome to consider contracts. Addition of Steronet analysis, moved from ES95C-Rock Mechanics
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)	ES94W
2. Module Title	Geological Investigation and Ground Characterisation
3a. Lead department:	School of Engineering (100%)
3b. Teaching Split (if known):	100% Engineering
4. Name of module leader	Dr Gary Fowmes
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

Module Summary	
7. Principal Module Aims	To understand the geological and hydrogeological properties of the ground and how these are determined though site investigation, *in situ* testing and laboratory testing. The module aims to equip students with the necessary knowledge to collect, evaluate and interpret this data which is frequently complex because of the variability inherent in the ground.
8. Principal Learning Outcomes	By the end of the module students should be able to: • Evaluate a project proposal and plan an appropriate strategy for a site investigation; • Interpret data gained through site investigation and make appropriate recommendations for a specified project; • Conceptualise complex 3D ground structure • Determine the environmental impact of underground works due to the nature of the ground. • Understand the relationships of ground investigations and contracts and evaluate the sharing of ground risk between parties to the contract
9. Timetabled Teaching Activities (summary)	12 hrs lectures, 11 hrs tutorials, 10 hrs fieldwork/visits and a 1 hr laboratory. **Total of 34 hours.**
10. Departmental Web-link	http://www2.warwick.ac.uk/fac/sci/eng/eso/modules/year4/es94w/
11. Other essential notes	The module is taught in a five-day intensive block (excluding Wednesday afternoon). Pre reading is required before the module with an unseen written test at the beginning of the module. A feedback session is included on this test. Advice and feedback hours are available for answering questions on the lecture material. The module is available as a standalone CPD course for external attendees.
12. Assessment methods (summary)	Written test 1-hour 20% 3-hour Written examination 80%
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, 100%

14. Availability of module

Degree Code	Title	Study Year	C/OC/ A/B/C	Credits
H214	MSc Tunnelling and Underground Space FT	M1	C	15
H214	MSc Tunnelling and Underground Space PT	M1	OC	15
H214	MSc Tunnelling and Underground Space PT	M2	OC	15

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

1

16. Pre- and Post-Requisite Modules

Module Content and Teaching

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

Module duration (weeks)	1
Lectures	12 hours
Seminars	
Tutorials	11 hours (incl. 2 advice and feedback and 2hr revision)
Project Supervision	
Demonstration	
Practical Class/Workshops	1 hour
Supervised time in studio/workshop	
Fieldwork	10 hours
External visits	
Work based learning	
Placement	
Year abroad	

Module Content and Teaching

Other activity *(please describe): e.g. distance-learning, intensive weekend teaching etc.*	116 hours of guided independent learning including group (around 5) syndicate work to study one of several nearby locations as a potential underground station, presented to the group in a tutorial as a formative exercise (with full feedback).

18. Assessment Method (Standard)

Type of assessment	Length	% weighting
Written Test	1 hr	20%
Written Examinations	3 hrs	80%
Practical Examinations	NA	NA
Assessed essays/coursework	NA	NA
18a. Final chronological assessment *(please see guidance*)	Examination	

19. Methods for providing feedback on assessment.

In Class Written Test: 1h feedback session for the whole class two days after test completed. Examination: publication of recent past examination papers and model solutions or mock paper and solutions where past papers do not exist. Cohort level feedback on examinations.

20. Outline Syllabus

- Geological, geotechnical and hydrological contexts
- Planning a site investigation for a tunnel
- Site investigation methods for tunnels in different ground conditions
- Geophysical methods
- Hydrogeological investigation
- Geological profiles
- In situ and laboratory testing
- Use of stereographic techniques and assessment of slopes
- Sustainability: reuse of materials, spoil and space
- Stress measurements
- Determination of design parameters and preparation of Geotechnical Interpretative Reports (GIR) and Geotechnical Baseline Reports (GBR)
- Contracts

21. Illustrative Bibliography

- David Chapman, Nicole Metje, Alfred Stärk, Introduction to Tunnel Construction, Spon Press, pp.390, 2010 (ISBN 978-0-415-46842-8)
- Vittorio Guglielmetti, Piergiorgio Grasso, Ashraf Mahtab, Shulin Xu (eds.), Mechanized Tunnelling in Urban Areas, Taylor & Francis, pp. 504, 2007 (ISBN 978-0-415-42010-5)
- Bhawani Singh & Rajnish K Goel, Tunnelling in Weak Rocks, Elsevier Science; 5th ed., pp.512, 2006 (ISBN 0080449875)

Module Content and Teaching

- Ratan Tatiya, Civil Excavations and Tunnelling – a Practical Guide, Thomas Telford, pp.322, 2005 (ISBN 978-0-7277-3340-5)
- Fred G. Bell, Engineering Geology and Construction, Taylor & Francis, pp.816, 2004 (ISBN 0415259398)

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 Gary Fowmes
25. Date of approval	25 April 2018
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering and WMG Course and Module Approval Committee (CMAC), Minute 261-17/18
27. Chair of Committee's signature	Professor Gillian Cooke
28. Head of Department(s) signature	Professor David Towers

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**
80	**20% 1-hour Written Test**	**3h**
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 paper	☐ 2 papers
A5. When would you wish the exam take place (e.g. Jan, April, Summer)?	**Jan**	
A6. Is reading time required?	☐ Yes	☒ No
A7. Please specify any special exam timetable arrangements.		
None		
A8. Stationery requirements		
No. of Answer books?	**1**	
Graph paper?	**Yes**	
Calculator?	**Yes**	
Any other special stationery requirements (e.g. Data books, tables etc)?	**Tracing paper**	
A9. Type of examination paper		
Seen?	☐ Yes	☒ No
Open Book?	☐ Yes	☒ No
Restricted?	☐ Yes	☒ 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)**
Evaluate a project proposal and plan an appropriate strategy for a site investigation.	Lectures, fieldwork, case studies, syndicate work	Written examination
Interpret data gained through site investigation and make appropriate recommendations for a specified project.	Lectures, fieldwork, case studies, syndicate work, laboratory	Written Test, Written examination
Conceptualise complex 3D ground structure	Lectures, fieldwork, case studies, syndicate work	Written Test, Written examination
Determine the environmental impact of underground works due to the nature of the ground.	Lectures, case studies	Written examination
Understand the relationships of ground investigations and contracts and evaluate the sharing of ground risk between parties to the contract	Lectures, case studies	Written examination