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	02/10/2018
If new, does this module replace another? If so, enter module code and title:	
If revised/discontinued, please outline the rationale for the changes:	As part of the curriculum review this module will be replaced by ES2C3 Civil Engineering Materials and Structural Analysis in 2018-19. However, both modules will run in 2018-19. There have been reductions in lecture and examples class hours.
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)	ES3D3
2. Module Title	Civil Engineering Materials and Structural Analysis
3a. Lead department:	School of Engineering
3b. Teaching Split (if known):	100% Engineering
4. Name of module leader	Dr S. Zivanovic
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 credits
7. Principal Module Aims	The aims of the module are to introduce the rationale behind appraisal and design of structures; the main activity of many professional civil engineers. The module will lay the foundations for more advanced and specific structure design modules, since it will review and more deeply explain fundamental structural analysis

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	concepts such as stress and strain, statical determinacy and bending moment/shear forces. A range of materials (concrete, timber, masonry and fibre reinforced polymers) will be investigated in terms of structural behaviour, analysis and design. Especially for concrete the module will provide knowledge and understanding on its constituent materials, their properties and those of fresh and hardened concrete. Variables that affect these properties in the short and long term will be identified.
8. Principal Learning Outcomes	By the end of the module the student should be able to... • Demonstrate detailed understanding of stress and strain states in structural elements. • Perform qualitative and quantitative structural analysis. • With the help of mix design software, analyse the effects of material and process variables on the mechanical properties and durability of concrete. • Cast, de-mould, cure and test concrete samples to assess the property and quality of concrete. • Appreciate the sustainability issues and latest EU regulatory framework surrounding the manufacture and use of cement and concrete. • Critically evaluate the structural behaviour of a range of civil engineering materials such as concrete, timber, masonry and fibre reinforced polymers.
9. Timetabled Teaching Activities (summary)	25 hours lectures, 5 x 1 hours examples classes, 2 hours revision lectures, 1.5 hours test and 3 x 3 hours of laboratory sessions. **Total of 42.5 hours.**
10. Departmental Web-link	http://www2.warwick.ac.uk/fac/sci/eng/eso/modules/year3
11. Other essential notes	Advice and feedback hours are available for answering questions on the lecture material (theory and examples) and past examination/test questions.
12. Assessment methods (summary)	Test (1.5 hours)=35%, Group Laboratory Report (6 pages)=10%, Written examination (2 hours)=55%

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
H210	BEng Civil Engineering	3	C	
New	BEng Civil Engineering with Intercalated Year	4	C	
H211	MEng Civil Engineering	3	C	
H212	MEng Civil Engineering with Intercalated Year	3	C	
H213	MEng Civil Engineering with a Year in Research	3	C	15
H106	BEng Engineering	3	A	
New	BEng Engineering with Intercalated Year	4	A	
H107	MEng Engineering	3	A	
H109	MEng Engineering with Intercalated Year	3	A	
H110	MEng Engineering with a Year in Research	3	A	

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

1 (core module).

16. Pre- and Post-Requisite Modules

ES3E1 Design Project with Construction Management
ES3D1 Concrete Structures
ES3D2 Steel Structures

Module Content and Teaching

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

Module duration (weeks)	10
Lectures	25 hours
Seminars	None
Tutorials	None
Project Supervision	None
Demonstration	None
Practical Class/Workshops	3 x 3 hours
Supervised time in	None

Module Content and Teaching		
studio/workshop		
Fieldwork	None	
External visits	None	
Work based learning	None	
Placement	None	
Year abroad	None	
Other activity *(please describe): e.g. distance-learning, intensive weekend teaching etc.*	• 5 x 1 hours Examples Classes • 1 x 2 hours Revision Lectures • 1 x 1.5 hours test • 107.5 hours of guided independent learning	
18. Assessment Method (Standard)		
Type of assessment	**Length**	**% weighting**
Written Examinations	Written examination 2 hours Test 1.5 hours	55 35
Practical Examinations		
Assessed essays/coursework	Group laboratory report (6 pages length)	10
18a. Final chronological assessment *(please see guidance*)	Written Examination (2 hours).	

19. Methods for providing feedback on assessment.
Laboratory report: provide individual written comments via data reveal page on module webpage. Written examination and test: Cohort level feedback.
20. Outline Syllabus
Structures: o Stress and Strain: combination and failure criteria o Elastic theory of bending and torsion o Linear elastic analysis of statically determinate and indeterminate structures o Qualitative structural analysis Materials: o Introduction o Portland Cement: Manufacture, Composition and Hydration o Other Cements: Classification, Modified PC, CRMs, non-Portland cements o Aggregates and admixtures o Fresh Concrete and Curing o Hardened concrete: Strength, testing and variation o Durability of Concrete o Sustainability and Concrete

- Introduction to Timber, Masonry and Fibre Reinforced Polymers

21. Illustrative Bibliography

Kassimali, A., *Structural Analysis*, International 5th Ed., Cengage Learning, 2015.
Megson, T. H. G., *Structural and Stress Analysis, Elsevier*, 3rd Ed., Oxford, 2014.
Millais, M., *Building Structures: from Concepts to Design*, 2nd Ed., Routledge, 2005.
Soutsos, M. and Domone, P. (Eds.), *Construction Materials: Their Nature and Behaviour,* 5th Ed., CRC Press, Boca Raton, London, New York, 2017.
Neville, A. M., *Concrete Technology*, 2nd Ed., Prentice Hall, 2010.
Internet based sites (such as MPA and UK government) for up-to-date sources on sustainable cements and concretes.

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 Stana Zivanovic
25. Date of approval	14 March 2018
26. Name of Approving Committee (include minute reference if applicable)	School of Engineering and WMG Course and Module Approval Committee (CMAC) Minute 134-17/18
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**
55% Written Examination	10% Group laboratory report 35% Test 1.5 hours	2 hours
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)?	**Summer**	
A6. Is reading time required?	☐ Yes	☒ No
A7. Please specify any special exam timetable arrangements.		
A8. Stationery requirements		
No. of Answer books?	2	
Graph paper?	Y	
Calculator?	Y	
Any other special stationery requirements (e.g. Data books, tables etc)?	Engineering Databook	
A9. Type of examination paper		
Seen?	☐ Yes	☒ No
Open Book?	☐ Yes	☒ No
Restricted?	☐ Yes	☒ No
If restricted, please provide a list of permitted texts:	N/A	

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)**
Demonstrate detailed understanding of stress and strain states in structural elements	Lectures, examples classes and private study.	Written examination and test.
Perform qualitative and quantitative structural analysis	Lectures, examples classes and private study.	Written examination and test.
With the help of mix design software, analyse the effects of material and process variables on the mechanical properties and durability of concrete.	Lectures, laboratory, and private study	Written examination Laboratory report
Cast, de-mould, cure and test concrete samples to assess the property and quality of concrete.	Laboratory	Laboratory report
Appreciate the sustainability issues and latest EU regulatory framework surrounding the manufacture and use of cement and concrete.	Lectures and private study	Written examination.
Critically evaluate the structural behaviour of a range of civil engineering materials such as concrete, timber, masonry and fibre reinforced polymers.	Lectures and private study	Written examination.