

ES2G8-15 Materials for Net Zero

25/26

Department

School of Engineering

Level

Undergraduate Level 2

Module leader

Elia Gironacci

Credit value

15

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

Materials for Net Zero

Module aims

The aims of the module are to introduce students to a range of materials (concrete, steel, timber, masonry, asphalt, fibre reinforced polymers and strawbale/rammed earth) in terms of structural behaviour, analysis and design. Primarily focusing on 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. Furthermore, this module will focus on the impact of the production and use of materials for civil engineering on global carbon emissions and on how such emissions can be reduced in different ways including reusing/repurposing where possible, contributing to a more sustainable development and reducing waste by saving primary resources.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

- Introduction to construction materials (with links to durability, sustainability, H&S, construction)
- Portland Cement: Manufacture, Composition and Hydration
- Other Cements: Classification, Modified PC, CRMs, non-Portland cements
- Aggregates and admixtures
- Fresh Concrete and Curing
- Hardened concrete: Strength, testing and variation
- Durability of Concrete
- Sustainability and Concrete
- Structural steel: properties, production and sustainability
- Introduction to Timber, Glass, Masonry, Fibre Reinforced Polymers and strawbale/rammed earth

Learning outcomes

By the end of the module, students should be able to:

- Appreciate the sustainability and ethical issues and latest regulatory framework surrounding the production, use, management, disposal and reuse of materials to minimise the impact of carbon emissions. [M4(M), M7(M), M8(D)]
- Critically evaluate the structural behaviour of a range of civil engineering materials including concrete, steel, timber, masonry and fibre reinforced polymers.[M4(M), M7(M)]
- Analyse the effects of material and process variables on the mechanical properties and durability of concrete. [M12(M), M13(M)]
- Cast, de-mould, cure and test concrete samples to assess the property and quality of concrete. [C9-M9(D), M12(M), M13(M)]

Indicative reading list

Domone, P. and Illston J. (Eds.), Construction Materials: Their Nature and Behaviour, 4th Ed., Spon Press, Abingdon, Oxon, New York, 2010. 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.

Subject specific skills

Knowledge and understanding of the need for a high level of professional and ethical conduct in engineering and the use of technical literature, other information sources including appropriate codes of practice and industry standards Ability to apply relevant practical and laboratory skills

Transferable skills

Communicate (written and oral; to technical and non-technical audiences) and work with others
Appreciation of the global dimensions of engineering, commerce and communication Plan self-learning and improve performance, as the foundation for lifelong learning/CPD

Study

Study time

| Type | Required |
|-------------------|-----------------------------|
| Lectures | 21 sessions of 1 hour (14%) |
| Seminars | 5 sessions of 1 hour (3%) |
| Practical classes | 2 sessions of 3 hours (4%) |
| Private study | 118 hours (79%) |
| Total | 150 hours |

Private study description

118 hours of guided independent learning

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group A

| | Weighting | Study time | Eligible for self-certification |
|--|-----------|------------|---------------------------------|
| Written Lab Report | 30% | | Yes (extension) |
| Laboratory report (6 pages length) | | | |
| Written Reflective Report | 70% | | Yes (extension) |
| Reflective report on materials for net zero and sustainability (maximum 15 pages length) | | | |

Feedback on assessment

Laboratory report and reflective report: Individual oral and written comments.

Availability

Courses

This module is Core for:

- Year 2 of UESA-H216 BEng Civil Engineering
- Year 2 of UESA-H217 MEng Civil Engineering