

## EV7110 MODULE SPECIFICATION

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| <b>Module Title:</b><br><b>Sustainable Materials in the Built Environment</b>  | <b>Module Code: EV7110</b><br><b>Level: 7</b><br><b>Credit: 15</b><br><b>ECTS credit: 7.5</b> | <b>Module Leader:</b><br>Louise Halestrap<br><br><b>Additional tutors:</b><br>Alan Owen<br>Bryce Gilroy-Scott<br>Frances Hill<br>Jane Fisher<br>Ruth Stevenson<br>Tim Coleridge<br>Siobhan Maderson |
| <b>Pre-requisite:</b> none   | <b>Pre-cursor:</b> none   |   |
| <b>Co-requisite:</b> none  | <b>Excluded combinations:</b> none  |   |
| <b>Location of delivery: CAT / By distance learning</b>  |   |   |
| <p><b>The main aims of the module are to enable students to:</b></p> <p>Systematically evaluate the environmental impacts, wider social and health implications, in use performance and usability of materials, in order, that they can then apply well informed and sound judgement to the choice and use of materials in practice when applying adaptation and sustainability principles within the built environment.</p> <p>Obtain a thorough appreciation of how environmentally sustainable materials offer creative opportunities for the use and development of high quality, healthy, ecosystem enhancing, effective, and long lasting products.</p> <p>Critically discern how to utilise the advantages and overcome or minimise the disadvantages associated with the use of environmentally sustainable materials under an adaptation and sustainability ethos.</p> <p>Critically discern the implications that the availability, cost, physical properties, construction methods and general perceptions of environmentally responsive materials have in terms of ease of use, mainstream acceptance, design limitations, logistical considerations, and economic viability, when contemplating the use environmentally sustainable materials in general although with particular reference to materials used in practice related to the built environment.</p> |   |   |
| <p style="text-align: center;"><b>Main topics of study:</b></p> <p><b>Materials use for transformational adaptation planning</b></p> <ul style="list-style-type: none"> <li>• Resource Limitations to materials</li> <li>• Natural and synthetic Fibre Insulations</li> <li>• Moisture handling and materials in Renovation</li> <li>• Straw bale construction</li> <li>• Cementitious materials (limes and cements)</li> <li>• Hemp and Binder construction and use in renovation</li> <li>• Composite Materials and boards</li> <li>• Modular Pre-fabricated building components</li> <li>• Timber use</li> <li>• Earth and clay building (e.g. Rammed Earth, Light Earth)</li> <li>• Environmental Assessment methods for materials (e.g. Life Cycle Assessment, Embodied Energy, Embodied Carbon)</li> <li>• Modern methods of sustainable construction</li> </ul>   |   |   |

- Environmental Impacts of materials (CO<sub>2</sub>, biodiversity)
- Health impacts and safety issues of materials
- Material's testing
- Practical implications of use

### **Learning Outcomes for the module**

At the end of this module, students will be able to:

#### **Knowledge**

1. Demonstrate a critical and discerning approach to the environmental assessment of materials as regards to their environmental impact, social and health implications and sustainability under an adaptation transformation ethos;
2. Show a critical appreciation of the interdependency of all the aspects of consideration related to sustainability and adaptation planning as applicable to the use of materials and resources.

#### **Thinking skills**

3. Contextualise and thoroughly appreciate the potential for the use of environmentally sustainable materials;
4. Evaluate, assess and critique theories and designs related to environmentally responsive, materials under a transformational adaptation ethos.

#### **Subject-based practical skills**

5. Critically appraise and thus make sound judgement on information sourced from multiple resources regarding the properties and attitudes towards environmentally sustainable materials to assess how these affect the uptake and use of such materials in practice as related to the built environment;
6. Apply theoretical principles about material properties to building design.

#### **Skills for life and work (general skills)**

7. Effectively communicate to a wider audience;
8. Critically evaluate a range of relevant literature.

#### **Teaching/ learning methods/strategies used to enable the achievement of learning outcomes:**

There is a vast choice of materials and range of need within the built environment and the applicability of the assessment principles to any material under consideration. This module only introduces a number of example materials that are potentially sustainable, ecosystem enhancing building materials which can be used in isolation and combination with each other.

The factual content of the module is taught through a series of lectures, practical workshops, practical demonstrations, and tutorials, and throughout this process an active exchange of views and opinions is encouraged. Both theoretical and practical aspects are covered.

There is formative learning element to the module to allow the students to receive critical feedback on their work without the pressure of marked assessment.

For distance learning (DL) students, learning will be supported through Internet-based lectures (of the onsite lectures), situation related practical exercises, seminars and tutorials.

All students also have access to Moodle discussion boards and regular Skype surgeries, where they can meet with their peers and a tutor to discuss any academic issue.

Lectures onsite and through DL highlight key concepts, models and frameworks, and integrate additional resources (such as journal articles). They encourage deep learning through the use of self-assessment questions which encourage students to engage with the topic, to help students understand new topics and skills.

| Assessment methods which enable students to demonstrate the learning outcomes for the module:  | Weighting:   | Learning Outcomes demonstrated: |
|--|--|---------------------------------|
| On-site and DL:  |  |                                 |
| 1. Essay (2,400 words max.)  | 80%  | 1,2,3,4,5,6,7,8                 |
| 2. Individual visual presentation (600 words or equivalent)  | 20%  | 1,2,3,4,5,6,7,8                 |
| <b>Reading and resources for the module:</b>   |  |                                 |
| <b>Core:</b>   |  |                                 |
| Berge, B. (2009). <i>The ecology of building materials</i> . Oxford: Architectural Press.  |  |                                 |
| Pelsmakers, S. (2012). <i>The environmental design pocketbook</i> . London: RIBA.  |  |                                 |
| Ryan, C. (2011). <i>Traditional construction for a sustainable future</i> . Abingdon, Oxon: Spon Press.  |  |                                 |
| <b>Recommended:</b>  |  |                                 |
| Bevan, R. and Woolley, T. (2008). <i>Hemp lime construction: A guide to building with hemp lime composites</i> . Bracknell, IHS BRE Press.         |  |                                 |
| Galindo, M. (2012). <i>Wood: Architecture and design</i> . Salenstein, Switzerland: Braun.   |  |                                 |
| Holmes, S. and Wingate, M. (2002). <i>Building with lime: A practical introduction</i> , 2nd revised edition. London, ITDG Publishing.             |  |                                 |
| Minke, G. and Mahlke, F. (2005). <i>Building with straw: Design and technology of a sustainable architecture</i> . Basel: Birkhauser.              |  |                                 |
| Minke, G. (2006). <i>Building with earth: Design and technology of a sustainable architecture</i> . Basel: Birkhäuser.                             |  |                                 |
| Walker, P. et al. (2005). <i>Rammed earth: Design and construction guidelines</i> : BRE Press.   |  |                                 |
| Further relevant journals, websites and other relevant resources will be provided within reading materials that are made available for the module. |  |                                 |
| (*) Available as an e-book   |  |                                 |
| Indicative learning and teaching time (10 hrs per credit):   | Activity   |                                 |
| 1. Student/tutor interaction:  | Lectures, seminar, tutorial, presentation, practical / demonstration<br>30 hours                                       |                                 |
| 2. Student learning time:  | Seminar reading and preparation, Assignment preparation, Background reading, On-line research activities.<br>120 hours |                                 |
| Total hours (1 and 2):   | 150 hrs  |                                 |