# AR7407 Module Specification

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| **Module Title:** Technical Research Report (TRR) | **Module Code: AR7407**<br><br>**Level: 7**<br><br>**Credit: 30**<br><br>**ECTS credit: 15** | **Module Leader**: Gwyn Stacey |
| **Pre-requisite:** AR7400 and AR7403 | **Pre-cursor:** None | |
| **Co-requisite:** None | **Excluded combinations:** None | **Suitable for incoming study abroad?** N |

**Location of delivery: Other**
**If 'Other' please insert location here:** Centre for Alternative Technology

**Summary of module for applicants:**

This module offers students the opportunity to systematically and rigorously develop the technical research required to reach design solutions associated with their Final Design Project. Whilst the technical research needs to be approach comprehensively and to a high level of resolution, the outputs for this module will inform further development of FDP. By doing the technical research required by this module students will be able to draw from previous learning, synthesise and expand this understanding and develop the ability to apply this in an integrated manner as part the design process in a way that enhances the architecture.

**Main topics of study:**

**Structure and construction:**

- Structural principles and design strategies, advantages and challenges of systems
- Construction materials, including external and internal finishes, and their assembly and characteristics including durability and sustainability
- Introduction to elemental costing calculation and financial implication of design choices and construction systems

**Energy and environmental design and assessments:**

- Thermal design strategies
- Calculation of the relative heat loss through the different construction elements, heat loss through infiltration and ventilation and heat gains from passive sources.
- Estimates of the whole-building specific heat loss
- Daylight design and assessment methods
- Principles for estimating electrical loads and the annual electricity consumption.

**Comfort & Users:**

- Principles of accessible environments
- Indoor air quality and ventilation and thermal comfort.
- Principles of acoustics

**Services:**

- Principles of heating, cooling and ventilation.
- Principles of artificial lighting strategy, lighting layouts.
- Renewable energy and FiT and RHI.
- Strategies for water supply and sewage, grey water and rainwater disposal.
- Principles of fire prevention and resistance and safe escape configurations

**This module will be able to demonstrate at least one of the following examples/ exposures**

***Live, applied project*** ☒
***Company/engagement visits*** ☒
***Company/industry sector endorsement/badging/sponsorship/award*** ☐

**Learning Outcomes for the module**

***Where a LO meets one of the UEL core competencies, please put a code next to the LO that links to the competence.***

- *Digital Proficiency - Code = (DP)*
- *Industry Connections - Code = (IC)*
- *Social & Emotional Intelligence - Code = (SEI)*
- *Physical Intelligence - Code = (PI)*
- *Cultural Intelligence - Code = (CI)*
- *Community Connections & UEL Give Back - Code = (CC)*
- *Cognitive Intelligence – Code = (COI)*
- *Enterprise and Entrepreneurship (EE)*

At the end of this module, students will be able to:
*(note reference numbers e.g. GC3.1, relate to ARB criteria for prescription at Part 2)*

*Thinking skills*

1. Understand the principles associated with designing optimum visual, thermal and acoustic environments (GC9.1) and evaluate systems for environmental comfort realised within relevant precepts of sustainable design (GC9.2)
2. Develop strategies for building services and ability to integrate these in a design project (GC9.3) and the impact of buildings on the environment, and the precepts of sustainable design (GC5.2)
3. Investigate and critically appraise the selection of alternative structural, constructional and material systems relevant to architectural design (GC8.1) the role of the architect within the design team and construction industry, recognising the importance of current methods and trends in the construction of the built environment (GC6.2)
4. Develop strategies for building construction, and the ability to integrate knowledge of structural theories and construction techniques (GC8.2) including the physical properties and characteristics of building materials, components and systems, and the environmental impact of specification choices (GC8.3)

*Subject-based practical skills*

5. Understand the constructional and structural systems, the environmental strategies and the regulatory requirements that apply to the design and construction of a comprehensive design project (GC1.2)
6. Evaluate materials, processes and techniques that apply to complex architectural designs and building construction, and to integrate these into practicable design proposals, including critical examination of the financial factors implied in varying building types, constructional systems, and specification choices, and the impact of these on architectural design (GC10.1)
7. Understand the cost control mechanisms which operate during the development of a project (GC10.2)
8. Prepare designs that will meet building users' requirements and comply with UK legislation, appropriate performance standards and health and safety requirements (GC10.3)

**Teaching/ learning methods/strategies used to enable the achievement of learning outcomes:**
**For on campus students:**

- Key principles will be conveyed to students in lectures, seminars and workshops
- Group and one-to-one tutorials with specialist industry professionals and academic staff will support students in their development of their technological design
- Students will be required to further their understanding of the subject areas introduced by academic staff through self-direct research and learning
- Interim formative submissions will enable students to learn and apply the lessons learnt from the feedback to their technology design and final submission

| **Assessment methods which enable students to demonstrate the learning outcomes for the module; please define as necessary:** | **Weighting:** | **Learning Outcomes demonstrated:** |
|---|---|---|
| Technical report aligned with strategy for Final Design Project [5000 word equivalent] | 100% | 1 - 8 |

**Reading and resources for the module:**

**Core**

HARRIS, C. & BORER, P. 2005. The whole house book : ecological building design & materials, Machynlleth, Centre Alternative Technology.
MCMULLAN, R. 2017. *Environmental science in building,* London, England, Macmillan Education.
PELSMAKERS, S. 2015. *The environmental design pocketbook,* London, RIBA Publishing.

**Recommended**

BELL, V. B. & RAND, P. 2014. *Materials for architectural design 2,* London, Laurence King Publishing.
BERGE, B. 2009. The ecology of building materials, Amsterdam ; Oxford, Elsevier/Architectural Press.
COTTERELL, J. & DADEBY, A. 2012. The Passivhaus Handbook : A practical guide to constructing and retrofitting buildings for ultra-low-energy performance, New York, UIT Cambridge Ltd.
HAWKES, D. 2012. *Architecture and climate : an environmental history of British architecture, 1600-2000,* London ; New York, NY, Routledge.
JANKOVIC, L. 2012. *Designing zero carbon buildings using dynamic simulation methods,* London, Routledge.
KWOK, A. & GRONDZIK, W. *The Green Studio Handbook,* S.l, Routledge.
STANWIX, W. & SPARROW, A. 2014. *Hempcrete Book : Designing and Building with Hemp-Lime,* Cambridge, UIT Cambridge Ltd.
WOOLLEY, T. 2013. *Low impact building: housing with renewable materials,* Chichester, West Sussex, UK, Wiley-Blackwell.

**Provide evidence of how this module will be able to demonstrate at least one of the following examples/ exposures**

***Live, applied project***

There is opportunity through this research project for students to engage with community and a live project scenario.

***Company/engagement visits***

Depending on their research focus students will have opportunity to directly engage with companies, including research involving practice and/or industry.

***Company/industry sector endorsement/badging/sponsorship/award***

| **Indicative learning and teaching time (10 hrs per credit):** | **Activity** |
|---|---|
| 1. Student/tutor interaction: **70** | Tutorials, Workshops, Lectures, Seminars, Studio work, Reviews |
| 2. Student learning time: **230** | Background research and preparation, Assignment preparation |
| Total hours (1 and 2): **300** | |

**For office use only.** (Not required for Programme Handbook)

| **Assessment Pattern for Unistats KIS (Key Information Sets)** | **Weighting:** |
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| Coursework *(written assignment, dissertation, portfolio, project output)* | |
| Practical Exam *(oral assessment, presentation, practical skills assessment)* | |
| Written Exam | |

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| **HECoS Code:** | |
| **UEL Department:** | |