

Module Code	Pre-requisite Module codes	Co-Requisite Modules code(s)	ISCED Code	Subject Code	ECTS Credits	NFQ Level
ENEN9106					5	9
Module Title	Thermal Bridge Calculation for Building Performance					

This Header should be repeated on each page of the Module

School Responsible:	Dublin School of Architecture
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Module Overview:

The Thermal Bridge Calculation for Building Performance module provides learners with an introduction to the applied building physics and conventions of thermal bridge calculation, and their use in creating high quality building performance designs to the Nearly Zero Energy Building (NZEB) standard.

The focus of the module is on the application of theoretical knowledge and mathematical calculation tools to the use of a 2D thermal modelling application.

The module enables the learner to engage in a critical analysis of the relevant standards through the use of validated 2D thermal modelling software. This requires the application of applied building physics and conventions of thermal bridge calculation in the creation of high quality building details which comply with 2D thermal modelling conventions and standards and the TGD Part L of the Building Regulations, and to know when specialist guidance is needed.

Learning Outcomes (LO):

On Completion of this module, the learner will be able to:

1	Use appropriate validated software to quantify the additional heat loss through the building fabric due to building junctions of the thermal envelope, and apply the results to the estimation of surface condensation risk in accordance with the requirements the Irish Building Regulations.
2	Mitigate risk in new-build and retrofit residential buildings designed to the NZEB standard through the application of international standards and conventions in the calculation of thermal bridges, using a critical understanding of construction assembly and applying relevant building physics principles.
3	Summarise, explain and advise a client on what constitutes low risk NZEB construction and determine when risks associated with thermal bridging performance may be adequately assessed by a design practitioner and when a specialist is required.

Indicative Syllabus:

Thermal modelling Physics and conventions:

- Introduction to applied building physics relevant to risks associated with thermal bridges in Irish dwellings;
- Conventions for thermal bridge calculation;
- Conventions for (f_{Rsi}) surface risk of condensation calculations.

Guidance and standards for calculation:

- Introduction to thermal bridge guidance and standards.

Computer applications & report writing

- Computer applications for 2D thermal bridge calculation
- Creating a formal assessment

Thermal bridge problem solving

- Construction details that exacerbate thermal bridge risks in traditional, retrofitted and contemporary construction assemblies;
- Low thermal bridging construction: guidance

Learning and Teaching Methods:

- Online lectures.
- Interactive online webinars.
- Web-based group work.
- On-line supportive community of learners and engagement with fellow learners.
- Formative on-line exercises exploring calculation tools and methodologies.
- Summative on-line assessment.
- Self-directed learning during and outside contact hours.

Total Teaching Contact Hours	
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Online lectures / Online webinar workshops	20
Total Self-Directed Learning Hours	80

Module Delivery Duration:

The module is delivered over 4 weeks within a 15 week Semester on DT9771 or over 8 weeks within a 30 week academic year on DT774b.

Assessment

Assessment Type	Weighting (%)	LO Assessment (No.)
Online computer assessments	70%	1,2
Project	30%	2,3

Module Specific Assessment Arrangements (if applicable)

(a) Derogations from General Assessment Regulations	50% pass mark for module. 80% pass mark for online multiple choice & calculation-based assessments.
(b) Module Assessment Thresholds	60% threshold for on-line multiple choice & calculation-based assessments. 40% threshold in project assessments.
(c) Special Repeat Assessment Arrangements	Online computer assessment repeat Week 15.

Essential Reading:

Building Regulations Part L: domestic

Anon, Department of the Environment, Heritage and Local Government, 2008. *Building Regulations 2008, Technical Guidance Documents* The Stationary Office.

U Value calc conventions and standards

Anderson B, Building Research Establishment Ltd (BRE), 2006, *BR 443: 2006 Conventions for U-Value Calculations* 2006 Edition, Watford: BRE Press

Linear Thermal Bridging conventions and standards

Ward T, Building Research Establishment Ltd (BRE), 2006, *IP 1/06: 2006 Assessing the effects of thermal bridging at junctions and around openings*, Watford: BRE Press.

Ward, T and Sanders, C, 2007. *Conventions for calculating linear thermal transmittance and temperature factors*, BR497. Watford: IHS BRE Press.

ISO 10211: 2007, *Thermal bridges in building construction – Heat flows and surface temperatures – Detailed calculations*.

Hygrothermal conventions and standards

BS EN ISO 13788:2002, *Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods*.

BS EN 15026:2007, *Hygrothermal performance of building components and building elements. Assessment of moisture transfer by numerical simulation*.

BS5250:2011, *Code of practice for control of condensation in buildings*.

Supplemental Reading:

DEAP workbook and associated manuals and guides

Anon, Sustainability Energy Authority of Ireland, September 2008. *Dwelling Energy Assessment Procedure*

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(DEAP) 2008 Edition, Version 3.1 Irish official method for calculating and rating the energy performance of dwellings. Wilton Place: SEAI

Anon, Sustainability Energy Authority of Ireland, January 2011. *Dwelling Energy Assessment Procedure (DEAP) Survey Guide*. Version 2.0. Wilton Place: SEAI.

General introduction to hygrothermal building physics and assessment

Little, J., Ferraro, C. and Arregi, B. (2015): *Technical Paper 15 – Assessing risks in insulation retrofits using hygrothermal software tools*. Historic Environment Scotland.

Version No:	1	Amended By	Simon McGuinness
Commencement Date	September 2017	Associated Programme Codes	DT775B DT9771

Modules that are to be offered as Stand-Alone CPD Programmes must have an NFQ level assigned

*Details of the assessment schedule should be contained in the student handbook for the programme stage.

Date of Academic Council approval