Canterbury School of Architecture
Interior Architecture Design / Stage 3
Technology 05: High Tech "Design, Technology and Spatial Practices"

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Content and Syllabus

This module is fundamentally interested in research concerning the impact of advanced technology in architectural design. It explores a new paradigm that has emerged within contemporary architectural design where significant change in emphasis can be detected – a move away from an architecture based on purely visual concerns towards an architecture justified by its performance. There is a shift from traditional formal and deterministic approaches to architectural performance to a generation of dynamic "analogue and digital hybrids" that melds together computer technology and architectural tailored materials. With the advance of technology these processes will consistently create tangible and physical transformation contributing and enriching the experience of space in functional and performative levels. The use and application of computation in Architecture carries significant potential for the development of novel methods and approaches in the design disciplines. Design computational media is becoming integral to the design processes. Generative design approaches facilitate an integrated approach to design assimilating analog material properties with digital applications in the early stages of design. This module explores such approaches that generally support the integration of material, structure, and form as inseparable parts of the design process as they may relate to matter, performance and geometry respectively.

This module working format is divided in two phases. In the first phase a series of lectures divided by research themes will be presented aiming to introduce and engage the students into the theoretical discourses of new digital and emergent technologies in architecture. They demonstrate a wide range of theories, concepts, methods and techniques to think practice, use, representation and experimentation of contemporary practices in different adjacent fields to architecture ranging from robotics, fashion, and nano and biotechnology. Case studies will be presented of today's revolutionary new materials and methods of fabrication, and the profound impact they're having on the continuing evolution of architecture.

The second part of this module will provide the opportunity for self initiated exploration of several topics presented and discussed in the lectures of the 1st phase of the module. It aims to make student realize that the canon of 21st architecture and technology is not neutral or stable; it is more intuitive, speculative and experimental. That the concept of material is broad and evolving in this post-digital age. The students will develop their skills, explore across the boundaries of contingent disciplines and practices, and reveal the ways in which 'design' and the 'technical' exist within the general culture of architecture, the processes leading to technological innovation in material objects and the particular role of the protoype in the design and production of artefacts at different scales.
The theme to be explored via the construction of a full scale prototype will be: *"Ephemeral Materialies"*. This exercise is designed to be experiential through its connection of physical space, materials, exploration and celebration of intense effects of immateriality, and speculation about the coming era of smart materials. It opens many directions for exploration where juxtapositions of Material and Immaterial and/or Static and Transient environments are investigated and co-exist.

Four groups of students will focus on the themes of "Surface", "Boundary", "Event", and "Matter". The outcome can be a theoretical essay or a full scale prototype that will represent the ongoing research for their project in the Design Unit. The four groups have the choice to focus on one material of their choice such as: thin plywood, rubber, foam, felt, latex, homosote, cardboard,etc. Teams explore the anonymous quality of the materials to rework it in ways they are unperceived so far together with an invisible material, a sensory component such as light, sound and smell. They borrow techniques from other materials like textiles or origami techniques for example, such as darting, pleating, and tabbing, to focus on themes such as edges, junctions, and corners, and to augment the materials' spatial, physical and tactile, and experiential qualities.

Content and Structure of the Lectures:
Phase 1

Week 1 - 15th Sep
Presentation
Objectives, aims, assessment requirements, and reference material.

Week 2 – 22nd Sep
Design and Technology
The relations of material forms and formulations of thought in architectural projects in the 20th century will be set out, and a discussion will be opened up around the ways material practices today are undergoing a substantial reconfiguration. The historical context of these forces will be examined, through the work of Buckminster Fuller, Frei Otto, Charles and Ray Eames, and Prouvé. The identification of their material agendas is focused on the contradictions and oppositions of the universal and the individual, of the mass-produced object and the 'tailored' craft product. Contemporary and historical positions, projects and procedures are compared, with particular attention given to the origin and relations of prefabrication and modular construction, and the associated design practices and drawing techniques.

Week 3 - 29th Sep
Emergence and Design
Self-organising structures' and 'bottom-up systems'
The conceptual structures and philosophies of Emergence in Evolutionary Computation and Artificial Life will be reviewed, and a series of digital experiments in algorithmic design will be discussed .
Generative methods in computation: shape grammars, cellular automata, Lindenmeyer systems.
Intelligent systems and machine learning systems: evolving algorithms, neural networks, applied from agent simulation to structural engineering.

Week 4 – 6th Oct
Natural Systems and Biomimetics
This lecture examines the ways in which biological organisms achieve complex 'emergent' structures and performances from simple components, relating this to an exploration of current architectural/industrial component design, prototyping and production.

Week 5 – 13th Oct
Time-Based Architecture
Cybernetics, Adaptive Architecture, Physical Computing, Interactive Design, Tangible interfaces, Haptic Interfaces, Wearable technologies, Local/Global

Week 6 – 20th Oct
The Performative Skin
Smart Materials, Nano materials, New Textiles, Interactive Membranes, Pneumatic Structures, New Media Facades, etc
It explores the concepts that are driving the implementation of new materials, particularly in 'smart' or adaptive structures, and examines these materials for potential contributions to new agendas.

Week 7 – 27th Oct
Tectonics and Realisation
Digital Materiality in Architecture
Synthesis of contemporary CAD/CAM and rapid prototyping technologies.
Presentation of the brief for group project

Reading Week

Phase 2

Week 8 – 3rd Nov
Ephemeral Materialities
Phenomenology and the Senses
Embodied interfaces, performance art
Immaterial elements: smell, light, sound

Week 9 – 10th Nov
Experimentation and Construction
Tutorials

Development of the group's projects.

Week 10 – 17th Nov (Joint Interim Review – design studio unit)
Experimentation and Construction
Tutorials
Development of the group's projects.

Week 11 – 24th Nov
Experimentation and Construction
Tutorials
Development of the group's projects.

Week 12 – 1st Dec
Experimentation and Construction
Tutorials
Development of the group's projects.

Week 13 – 8th Dec (Joint Interim Review – design studio unit)
Experimentation and Construction
Tutorials
Development of the group's projects.

Christmas Break

Week 14 – 5th Jan
Experimentation and Construction
Tutorials

Week 15 – 12th Jan
Final Review

Aims
A1 To review the relationship between design and technology within a historical framework
A2 To increase understanding of the role of technology in design through a critical analysis of past and present case studies
A3 To initiate and carry out a technology lead research/design study

Learning Outcomes
On successful completion of the component, the students will be able to:
LO1 Conduct research into contemporary technological issues relating to spatial design/practice
LO2 Demonstrate, through a self initiated study, an understanding of the role of technology in the design process.
LO3 Use technology to generate concepts/ideas that can lead to design programmes

Teaching and Learning Methods
Lectures, tutorials, workshops and independent study.

Tutorials are given by Design unit tutors so that technical outcomes relate directly to that unit. Help is provided by workshops, staff and the facilities of the University's workshops.

Assessment Requirement
A technical report that describes the design concept, development, and conclusions of the proposal for the "Ephemeral Materialities" exercise. The report can be presented in various types of output: articles, drawings, video, web blog, etc.
This module requires the integration of technical understanding with design. Students must demonstrate an ability to identify key technical issues in their design project, and research these while the project is being developed, so that a synthesis between design and its realisation can be demonstrated.

Assessment Criteria
Knowledge of:
Contemporary technological issues (LO1)
Understanding of:
The role of technology as a thinking tool in the design process (LO2)

Demonstrating, through a design programme:
The ability to question the conventional way of using technology in the design process. (LO2, LO3)

Reference Material:

Addington, M., Schodeck, D.L. (2004) Smart Materials and New Technologies: For the Architecture and Design Professions. London: Elsevier.

Braddock, S., O'Mahony, C., (2007) Techno Textiles 2, Revolutionary Fabrics for Fashion and Design, Thames & Hudson Revised Edition.

Brownell, B., (2005) Transmaterial: A Catalog of Materials that Redefine our Physical Environment. New Haven: Princeton Architectural Press.

Brownell, B., (2007) Transmaterial 2: A Catalog of Materials that Redefine our Physical Environment. New Haven: Princeton Architectural Press.

Bullivant, L. (2007) 4dsocial: Interactive Design Environments (Architectural Design) published by Wiley-Academy.

Bullivant, L. (2005) 4dspace: Interactive Architecture (Architectural Design) published by Wiley-Academy.

Bullivant, L. (2006) Responsive Environments: Architecture, Art and Design (V&A Contemporaries).

Diller, E., Scofidio R., (2002) Blur, The Making of Nothing, Abrams.

Frazer, J.: 1995, An Evolutionary Architecture, AA Publications.

Gramazio& Kohler (2007) Digital Materiality in Architecture, Lars Muller Publishers.

Hagan, S., (2007) Digitalia, Architecture and the Digital, the Environmental and the Avant-Garde Routledge.

Hensel M., and Menges A., Weinstock, M., Guest Edited (2006) AD 180: Techniques and Technologies in Morphogenetic Design Wiley-Academy.

Hensel, M. & Menges, Achim (2006) Morpho-Ecologies Towards Heterogeneous Space in Architectural Design. AA publications.

Matério (compiler) (2005) Material World 2: Innovative Materials for Architecture and Design. Basel: Birkhäuser.

Mori, T (Ed.) (2002) Immaterial | Ultrammaterial, George Brazillier Publisher.

Mc Quaid, M., (2005) Extreme Textiles: Designing for High Performance. London: Thames & Hudson.

Pallasmaa, J.: 1996, The Eyes of the Skin: Architecture and the senses, London: Academy Editions.

Ritter, A., (2007), Smart Materials in Architecture, Interior architecture and Design, Birkhauser.

Sheil, R., Edited (2008) AD 194 Protoarchitecture Analogue and Digital Hybrids, Wiley-Academy.

Spiller, N. Edited (2002) Cyber Reader, Critical Readings for the Digital Era, London Phaidon.

Spiller, N. Edited (2002) Reflexive Architecture, published by Wiley-Academy.

Hodge, B., Mears P., Sidlauskas S. (2006) Skins+Bones: Parallel Practices in Fashion and Architecture, Thames & Hudson.

Thomas, K., Edited (2006) Material Matters, Architecture and Material Practice, Elsevier.

Weston, R., (2008) Materials, Form and Architecture. Lawrence King.

Wigginton, Michael and Harris, Jude (2002). Intelligent skins. London: Architectural Press.

Complementary Material:

Brooker, G. and Stone, S. (2008) Basics Interior Architecture, Context + Environment, Ava Publishing.

Brooker, G. and Stone, S. (2007) Form + Structure (Basics Interior Architecture), Ava Publishing.

Chapman, J., (2005) Emotionally Durable Design. London: James & James/Earthscan.

Genetic Architectures / Arquitecturas Geneticas, (2003), Lumens Books/Site Books.

Hensel M., and Menges A., Guest Edited (2008) AD Versatility and Vicissitude Performance in Morpho-Ecological Design Wiley-Academy.

Leydecker, S., (2008) Nano Materials in Architecture, Interior Architecture and Design, Birkhauser Verlag.

Schittich, Christian (Ed.) (2008) In Detail: Materials for Interiors, Aesthetics, Techniques, Execution, Series: In Detail (english), Jointly published with Edition Detail, Munich, Germany ISBN: 978-3-7643-8810-2, Birkhäuser,

Schittich, Christian (Ed.) (2008) In Detail: Building Skins, Series: In Detail (english), New enlarged ed., 2006, 198 p. 397 illus., 184 in color., Hardcover, ISBN: 978-3-7643-7640-6, Birkhäuser.

Shonfield, K, (2000). Walls have feelings. London: Routledge.

Steele, J., (2005) Ecological architecture: A critical history. London: Thames and Hudson.

Watts, A. (2005) Modern Construction Facades Vienna: Springer-Verlag.

Links to relevant online reading:

Technology:
http://blog.wired.com/
http://blog.makezine.com/
http://www.boingboing.net/
http://uk.gizmodo.com/
http://www.engadget.com/
http://www.metafilter.com/
http://www.wristfashion.com/

Design:
http://www.reluct.com/
http://mocoloco.com/
http://www.sensoryimpact.com/
http://www.core77.com/
http://www.idfuel.com/
http://www.joshrubin.com/coolhunting/
http://www.halfbakery.com/
http://feed.proteinos.com/
http://www.dezain.net/
http://www.landliving.com/
http://www.designsponge.blogspot.com/
http://www.jnd.org/ Don Norman's website (design writing)

Eco-design:
http://www.worldchanging.com/
http://www.treehugger.com/
http://www.inhabitat.com/
http://www.eco.barkingcrickets.org/
http://www.cfsd.org.uk/ The Centre for Sustainable Design
http://www.02.org/
http://www.pre.nl/links/ecodesign_links.htm ecodesign links
http://www.branchhome.com/ sustainable design retail

Biomimicry:
http://www.biomimicryinstitute.org/
http://www.biomimicry.net/
http://database.biomimicry.org/
http://www.rdg.ac.uk/Biomim/
http://www.extra.rdg.ac.uk/eng/BIONIS/
http://www.bath.ac.uk/mech-eng/biomimetics/

Interaction design/ art:
http://transition.turbulence.org/blog/
http://www.we-make-money-not-art.com/
http://www.interactivearchitecture.org/
http://futurefeeder.com/
http://infosthetics.com/
http://beverlytang.com/
http://twenty1f.com/
http://www.textually.org/

http://www.eyebeam.org/reblog/
http://lib.fo.am/
http://www.processingblogs.org/
http://yg.typepad.com/
http://www.rhizome.org/
http://www.generatorx.no/
http://www.haque.co.uk/
http://www.spatialrobots.com/

Theory:
http://www.ctheory.net/home.aspx
http://bldgblog.blogspot.com/
http://marynowsky.wordpress.com/