



Annual Review 2015/16

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UCL IEDE's Central House building

Cover image:
Here East, Queen Elizabeth Olympic Park

DIRECTOR'S REPORT

The Institute for Environmental Design and Engineering (IEDE) has come to the end of its second year. Although a relatively new Institute, our history dates back 50 years and we were delighted to celebrate this key anniversary earlier this year.

Our body of 80 academics, doctoral and postdoctoral researchers are developing a critical mass of work in vital areas of research. This year we made excellent progress on the initiatives detailed in this review.

We have two exciting new programmes starting in 2017:

- MEng Engineering and Architectural Design — our first undergraduate programme. It is jointly created and delivered by a team of experts drawn from the Bartlett School of Architecture, UCL IEDE and UCL Civil Environmental and Geomatic Engineering.
- MSc Health, Wellbeing and Sustainable Buildings — a new programme underpinned by multi- and inter-disciplinary approaches and integrated design principles. It aims to drive innovation for health, wellbeing and human performance in the design, assessment, retrofit and operation of buildings.

Linked to these is our expansion into the Here East facility in the Queen Elizabeth Olympic Park, displayed on the front cover of this review. In alliance with the Bartlett School of Architecture and UCL Engineering, this space will allow us to better integrate our research and teaching. To support this we will be relocating our laboratories to Here East.

Earlier this year we launched the UK Centre for Moisture in Buildings (UKCMB), which aims to develop a moisture-safe built environment in the UK. The Centre works with partners from academia, government and industry to improve the understanding and management of moisture risk in the UK.

Our research programme continues to grow. We were pleased, for example, to begin a new alliance with Tsinghua University (China) via our EPSRC/NCRF funded TOP Project (The Total Performance of Low Carbon Buildings in China and the UK). The inter-linked issues of Energy/Indoor Environmental Quality (IEQ) present an important and complex challenge for both the UK and China and we look forward to working together on this particular project, but also more widely, in the future.

It is essential that both our teaching and research engage effectively with our diverse body of stakeholders. Faced with the challenges of health, wellbeing, productivity, comfort, energy use and climate change, we continue to generate and exchange knowledge in the sustainable development of buildings and the urban environment and to train the future leaders in the field. This commitment was displayed by the recent publication of the key Climate Change Risk Assessment Report, including contributions from a team of IEDE staff.

We look ahead to our third year with optimism, excited by the opportunities to build on existing partnerships and collaborate with new colleagues from within our school (the Bartlett School of Environment, Energy and Resources), the Bartlett Faculty, UCL and national and international institutions.



Professor Mike Davies

Director

UCL Institute for Environmental Design and Engineering

KEY HIGHLIGHTS

50 years of EDE at UCL

To mark the 50th anniversary of the appointment of Professor Ralph Hopkinson as the Bartlett's first Chair in Environmental Design and Engineering, in February 2016 IEDE hosted *Building Better Buildings: 50 years of Environmental Design and Engineering at the Bartlett*. The celebratory conference was jointly run with Zero Carbon Hub and Innovate UK.

The event was attended by more than 250 delegates from a range of industries in the built environment sector, with attendees including architects, building service engineers, local government officials and academics.

The conference discussed the successes of the Innovate UK Building Performance Evaluation programme, answered questions about the energy performance gap and looked to the future of built environment education, while celebrating 50 years of EDE at the Bartlett.

See pages 6 and 7 for an anniversary timeline.



A photovoltaics workshop

Research collaboration with Tsinghua University

In April 2016, 14 colleagues from the School of Architecture at Tsinghua University, China, took part in a joint workshop and stakeholder event at UCL as part of the collaborative TOP Project (The Total Performance of Low Carbon Buildings in China and the UK).

The concept of the performance gap with regards to the energy performance of buildings is now well established and useful work to begin to understand this challenging issue has been undertaken.

However, potential unintended consequences relating to the inter-linked issues of energy/Indoor Environmental Quality (IEQ) present an even greater and more complex challenge — one of increasing importance for both the UK and China.

There are exciting opportunities to address the issue of 'total performance' in order to reduce the energy demand and carbon emissions of buildings, while safeguarding productivity and health.

As part of the event attendees met with their British counterparts to promote understanding and help the integration of the project, helping to achieve its goal of addressing the shared causes of the energy performance gap in both Chinese and British buildings.

Here East expansion

The Bartlett and UCL Engineering will be expanding into premises at Here East on Queen Elizabeth Olympic Park in summer 2016. UCL will take possession of 3,000m² of studio space, to be used for research in architecture, infrastructure, transport, robotics, healthcare, manufacturing and environmental measurement.

Here East will enable IEDE to implement the UCL 2034 strategy by fully-integrating research and teaching/learning. It will also help develop research-based teaching programmes. As part of this, IEDE will relocate both its thermal and lighting labs, including the state-of-the-art Lighting Simulator and multi-sensory Indoor Environment Quality Chamber, to a new custom space.

UKCMB launches

In May 2016, the UK Centre for Moisture in Buildings (UKCMB) held its launch conference at UCL.

The UKCMB is an independent, not-for-profit organisation run by UCL IEDE and UCL Civil, Environmental and Geomatic Engineering, the Building Research Establishment, Heriot Watt University and the London School of Hygiene and Tropical Medicine.

The UKCMB works with partners from academia, government and industry to improve the understanding and management of moisture risk in the UK. The UKCMB's aim is to develop a moisture-safe built environment in the UK.

See page 14 for further details.

IEDE launches its first undergraduate programme

From September 2017, UCL IEDE will co-run a new four-year integrated Master's degree in Engineering and Architectural Design. The programme aims to help students develop a critical, independent, experimental and technically-rigorous approach to architectural, environmental and structural design and engineering in buildings. Graduates will have the knowledge, understanding and skills to be world-leaders in designing and developing resilient buildings that deliver both excellence in use and low environmental impact.

The programme is jointly created and delivered by a world-class team of experts drawn from the Bartlett School of Architecture (host department), UCL IEDE and UCL Civil Environmental and Geomatic Engineering.

See page 18 for further details.

IEDE launches new, innovative MSc programme

Also starting in 2017, the MSc Health, Wellbeing and Sustainable Buildings is a new Master's degree that aims to provide a new generation of students with the knowledge, critical understanding and skills needed to drive innovation for health, wellbeing and human performance in the design, assessment, retrofit and operation of residential and non-domestic buildings.

The curriculum is underpinned by multi- and interdisciplinary approaches, and integrated design principles.

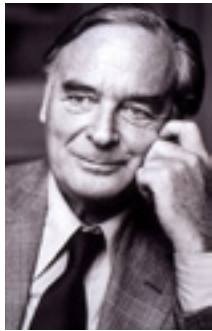
See page 17 for further details.

TIMELINE

Celebrating 50 years of Environmental Design and Engineering at UCL

1960

Richard Llewelyn-Davies joins The Bartlett



1965

Richard Llewelyn-Davies' planning practise works on the design of Milton Keynes



1975

Water House opens



1978

John Musgrove is appointed as Haden-Pilkington Professor of EDE



1989

Pat O'Sullivan is appointed as Haden-Pilkington Professor of EDE and Head School and Dean of the Faculty of the Built Environment at The Bartlett School of Architecture, Building, Environmental Design and Planning



1965

Ralph Hopkinson is appointed as first Chair in EDE

1969

Ralph Hopkinson receives RIBA Honorary Fellowship for establishing lighting as a core architectural skill

1978

MSc in EDE is launched

1987

MSc in Light and Lighting is launched

1992

The Bartlett School of Graduate Studies is founded

1992

MSc in Facility and Environment Management is launched

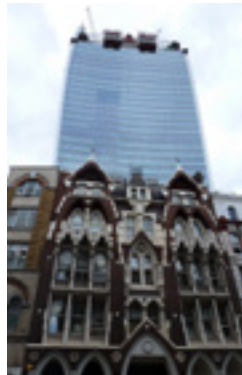


2006

EPSRC Platform Grant awarded for the Complex Built Environment systems project

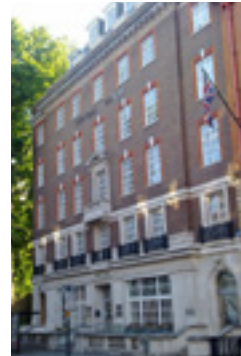
2010

MSc EDE is awarded Happold Brilliant award for best accredited course by CIBSE



2014

The UCL Institute for Environmental Design and Engineering is established



2017

UCL IEDE acquires premises at Here East on the Queen Elizabeth Olympic Park, to be used for groundbreaking research and teaching. Thermal and lighting labs will move to Here East, joining new custom-designed research spaces



2001

May Cassar establishes the Centre for Sustainable Heritage

2009

Tadj Oreszczyn establishes the UCL Energy Institute

2011

EPSRC Platform Grant awarded for The Unintended Consequences of Decarbonising the Built Environment project

2017

MSc in Health, Wellbeing and Sustainable Buildings is launched

2017

MEng in Engineering and Architectural Design is launched

RESEARCH

UCL IEDE's body of 80 academics, doctoral and postdoctoral researchers undertake world-leading research in the field of sustainable building design and engineering.

The Institute's research is original, influential and relevant to the biggest practical and scientific challenges facing industry, policymakers and academia.

At the heart of this is a commitment to working across disciplines, drawing knowledge and skills from across the Bartlett and UCL more widely.

The Institute is involved with addressing UCL's cross-disciplinary Grand Challenges in Sustainable Cities, Intercultural Interaction, Wellbeing and Global Health.

Research themes

UCL IEDE's main research themes are:

- The Built Environment: Building Energy and Environment (**see page 9**)
- The Built Environment: Health Wellbeing and Performance (**see page 10**)
- The Built Environment: Systems Thinking (**see page 11**)
- Light and Lighting (**see page 12**)

"Our themes are interdisciplinary and overlapping, and in a constant state of evolution. Underpinning them all is a formidable range of expertise in the form of outstanding problem- and curiosity-driven research by teams and individuals."

Professor Dejan Mumovic
UCL IEDE Deputy Director



The Bartlett Lighting Simulator

RESEARCH: THE BUILT ENVIRONMENT — BUILDING ENERGY AND ENVIRONMENT

A core focus of UCL IEDE's work is how to improve the design, operation and environmental quality of buildings.

This includes providing expert information and advice on design technologies and techniques to industry, as well as developing innovative engineering tools.

With the time available for planning and design reducing, the science behind building performance is becoming increasingly important.

IEDE works closely with Government departments, including the DBEIS and the DfE, and professional bodies, including CIBSE and RICS, to develop evidence for policy decisions and to help develop further programmes to improve building processes.

Project case study

The Total Performance of Low Carbon Buildings in China and the UK (TOP) — 2016-2019

Funding body: EPSRC and NCRF

Partners: Tsinghua University, China; project partners from industry, government and NGOs.

Meeting carbon emission targets will require a major shift in the performance of buildings. To help achieve this, IEDE is exploring how policy and regulation can be used to improve the total performance of buildings, using both the UK and China as case studies.

By evaluating the most successful and cost-effective methods and examining wider influences, this project aims to reduce CO₂ production, ensure energy security and boost the British and Chinese economies.

Research news

July 2016: Senior Research Associate Johnathan Taylor receives CIBSE Napier Shaw Bronze medal for paper on indoor temperature and air quality.

May 2016: EngD Researcher Chris van Dronkelaar co-authors 'Delivering Building Performance' report, published by the UK Green Building Council as part of a project addressing industry issues.

March 2016: Research Associate Angela Vanhoozer and team wins first place in the Digital Catapult's Building Data Exchange Hackathon with ACTif — their performance evaluation entry.

December 2015: Lecturer Rokia Raslan leads chapter in new CIBSE Application Manual.

November 2015: Research Associate Sung-Min Hong publishes analysis of the Business Energy Challenge.

Live research projects

Full detail of all projects can be found at:

bartlett.ucl.ac.uk/iede/research/project-directory

1. The Total Performance of Low Carbon Buildings in China and the UK (TOP)
2. Building Performance and Decision Making Research Programme
3. Assessment of the Energiesprong Model
4. Post Occupancy Evaluation of Marks and Spencer's flagship sustainable store
5. Post Occupancy Evaluation of Hub67
6. Setting Energy targets for Old Oak Park Royal Development Corporation
7. Circular Economy Lab
8. CIBSE Energy Benchmarking

RESEARCH: THE BUILT ENVIRONMENT — HEALTH, WELLBEING AND PERFORMANCE

IEDE is a global leader in researching the links between building design and performance and health and wellbeing outcomes.

This extensive theme includes examining the impact of greenhouse gas reductions on public health, indoor air quality in schools and the health effects of moisture in buildings.

This research has influenced London's Climate Change Adaptation Strategy, the Building Regulations for England and Wales and World Health Organisation guidance. It has also involved developing a tool used by the government to inform its Energy Efficiency Strategy.

Project case study

Sustainable Healthy Urban Environments (SHUE)

Funding body: Wellcome Trust

Partners: LSHTM, the Federal University of Bahia (Brazil) and the Energy and Resources Institute (India).

As cities continue to grow and expand, regional and national policymakers face increasing pressure to shape the environments and governance of their areas to boost, rather than harm, the health and health-related behaviours of their citizens. Yet despite this, the evidence base remains slim.

This project will develop clear evidence on the relationships between population, energy use and health outcomes in cities across the world. The resulting database will be an open access resource for wider research and policy use.

Research news

Ongoing: SHARPER findings included in the Greater London Authority's plan for managing heat risk, informing discussions on implementing its findings across the city.

July 2016: Mike Davies, Anna Mavrogianni, Clive Shrubsole and Jonathon Taylor contribute to the Committee on Climate Change Adaptation Sub-Committee's report on the risks of climate change.

October 2015: Research Associate Claire McAndrew's project 3x4 featured at South Korea's Gwangju Biennale.

Live research projects

Full detail of all projects can be found at:

bartlett.ucl.ac.uk/iede/research/project-directory

1. Health Protection Research Unit in Environmental Change and Health
2. The Unintended Consequences of Decarbonising the Built Environment
3. Integrated decision-making about Housing, Energy and Wellbeing (HEW)
4. The Total Performance of Low Carbon Buildings in China and the UK (TOP)
5. Sustainable Healthy Urban Environments (SHUE)
6. Air Pollution and Weather-related Health Impacts: Methodological Study based On spatio-temporally disaggregated Multi-pollutant models for present day and futurE (AWESOME)
7. Active Buildings: modelling physical activity and movement in office buildings
8. Seasonal Health, Ageing and Resilience in urban Populations and EnviRonments (SHARPER)
9. Optimization of health and sustainability goals for low income housing (Optihouse)

RESEARCH: THE BUILT ENVIRONMENT — SYSTEMS THINKING

In addition to researching the scientific and practical issues facing design and the environment, IEDE also conducts research to improve the decision-making systems of policymakers, regulators and industry.

The Institute is developing this theme with an initial focus on the housing system. This includes looking at refining decision-making systems so that they account for a broader range of factors, including wellbeing, society and culture, the economy and the environment.

Four new people joined this theme in 2015/16 — Research Associates Sibel Eker and George Papachristos and PhD students Helen Pineo and Kaveh Dianati. This year saw the first teaching of the EDE master elective ‘System Dynamics in the Built Environment’, and the start of the UCL System Dynamics Group, a lunchtime seminar series held every other Monday.

Project case study

Integrated decision-making about Housing, Energy and Wellbeing (HEW)

Funding body: EPSRC

Partners: UCL-Energy, project partners from industry, government, NGOs and the community.

With households contributing 26% of the UK’s carbon emissions, it is important for housing policy to fully consider greenhouse gas reduction efforts. Simultaneously, policy-makers must avoid creating unintended problems with climate change policies.

This project will seek to address how these are handled by analysing the long-term effect of climate change policies on a wide range of external factors. It is creating

causal maps and policy assessment tools, which will help contribute to more considered policy-making.

Research news

Ongoing: Sibel Eker and Nici Zimmermann lead a system dynamics workshop for DBEIS, forming the basis for collaboration on home energy efficiency.

July 2016: Nici Zimmermann, Sibel Eker, Kaveh Dianati and visiting MSc student Shane Carnohan present five papers to the 34th International Conference of the System Dynamics Society in Delft, Netherlands.

July 2016: Nici Zimmermann presents on the HEW project to the WholeSEM conference in Cambridge.

March 2016: Nici Zimmermann presents paper by Alex Macmillan and co-authors covering the first phase of UCL IEDE’s HEW project, which involved 37 organisations, to a Healthy-Polis workshop.

Live research projects

Full detail of all projects can be found at:

bartlett.ucl.ac.uk/iede/research/project-directory

1. Platform Grant: Unintended consequences of decarbonising the built environment
2. Integrated decision-making about Housing, Energy and Wellbeing (HEW)
3. The ‘Total Performance’ of Low Carbon Buildings in China and the UK (TOP)
4. Interactive Simulation Environment (HEW-WISE)
5. Housing in Nairobi’s Informal Settlements — a Complex Systems Perspective (HINIS)

RESEARCH: LIGHT AND LIGHTING

In addition to buildings and the indoor environment, IEDE undertakes a substantial level of research into issues relating to light and lighting, both inside and outside of buildings.

This theme studies a range of light-related issues, including street lighting, commercial lighting, energy-use and efficiency.

This is a growing research area with ongoing projects researching issues that have a real-life, practical impact on everyday lives, notably a renewed project to investigate the way people navigate streets at night-time to find out how to best deploy street lighting.

Project case study

MERLIN 2 (Mesopically Enhanced Road Lighting, Improving Night-Vision)

Funding body: EPSRC

Partners: University of Sheffield

Road lighting is essential to ensure the safety of pedestrians and drivers at night. This project will explore the possibility of reducing the energy usage and cost of lighting while maintaining its effectiveness.

The previous MERLIN project investigated people's use of streets at night to assess what role lighting should play. This project will build on this by further analysing the data and making detailed lighting policy recommendations.

Led by Senior Lecturer Peter Raynham, MERLIN 2 aims to create a clear evidence base for reducing the energy costs of road lighting by reducing lighting levels in a way that maintains positive social effects.

Research news

June 2016: IEDE's Peter Raynham, Jemima Unwin, Navaz Davoodian and Longyu Guan present research on daylight metrics and street lighting to the Professional Lighting Summit in Brighton.

June 2016: Associated VEIV and PhD candidate Moritz Behrens' Sentiment Cocoon, a physical architecture structure that uses light to reflect the mood of those engaging with it, wins a prestigious Media Architecture Award at a ceremony in Sydney, Australia.

April 2016: Navaz Davoodian and Jemima Unwin host a seminar on street lighting research at the LightFair International show in San Diego, U.S.

Live research projects

Full detail of all projects can be found at:

bartlett.ucl.ac.uk/iede/research/project-directory

1. MERLIN 2 — Mesopically Enhanced Road Lighting, Improving Night-Vision
2. Lighting for Cosmetic Sales — a collaboration between UCL, lighting designers Paul Naulty, light source company Xicato and cosmetic house Estee Lauder studying which colours of light people prefer when buying cosmetics
3. Lighting Energy Use — a project to develop a standard methodology to calculate the energy used by lighting so that a European Standard can be developed to support the recast of the Energy Performance of Buildings Directive

EPSRC PLATFORM GRANTS

Over the last decade, IEDE has received two five-year Engineering and Physical Sciences Research Council (EPSRC) Platform Grants.

These prestigious awards of funding are given to what the EPSRC calls 'well-established, world-leading research groups' and are designed to ensure researchers are underpinned by a solid base of resource.

These grants have given the Institute a flexible foundation, ensuring key staff can be retained, networks developed and the creation of a longer-term research strategy.



Work supported by the Platform Grant has allowed policy-makers and other stakeholders to better understand the links between housing, energy and wellbeing.

EPSRC Platform Grant (2006-11): Complex Built Environment Systems

The Institute's first Platform Grant enabled the establishment of a multidisciplinary research group that was able to grow, evolve and innovate while carrying out pioneering research, publishing influential papers and books and winning international prizes.

EPSRC Platform Renewal Grant (2011-16): The Unintended Consequences of Decarbonising the Built Environment

The Institute's second Platform Grant (in collaboration with UCL-Energy, UCL ISH and UCL ISR) enabled the establishment of a strategic programme of research to transform the understanding of the system-level effects of climate change policies.

Conventional scientific approaches designed to analyse systems into simple components are limited in their ability to predict potential system outcomes. This grant is allowing new models to be developed to minimise the unintended consequences of future climate change policies.



UK CENTRE FOR MOISTURE IN BUILDINGS

This year saw the launch of the UK Centre for Moisture in Buildings (UKCMB) — an independent not-for-profit organisation dedicated to furthering the understanding of the risks posed by moisture in buildings.

The centre is a collaboration between UCL, the Building Research Establishment (BRE), Heriot Watt University and the London School of Hygiene and Tropical Medicine. It engages widely with academia, policymakers, industry and the public to improve the way moisture in buildings is managed and understood.

Excessive or insufficient moisture can pose many substantial problems for buildings — yet the evidence base for understanding and tackling this is limited.

The UKCMB is led by Managing Director Neil May and Academic Director Ljiljana Marjanovic-Halburd.

Launch event

UKCMB launched in May 2016 in front of industry and academic guests at a conference hosted by UCL.

The aims and structure of the UKCMB were explained, along with plans for engaging stakeholders and experts from across the UK and Europe. The UKCMB's current research projects (sponsored by St Gobain Research and Polygon UK) were also presented.

Guests also viewed presentations by the directors of the Swedish Moisture Centre (FuktCentrum), international partners of the UKCMB.

Guests formed five discussion groups and explored topics of particular importance to the development of a moisture safe built environment. These groups helped to inform plans for Technical Working Groups.

UKCMB's activities

- High-quality research to define problems and identify possible solutions. This work will focus on real-world issues and practical outcomes.
- Engaging with academia and industry to ensure that moisture risk is understood in its full context.
- Developing consistent methodologies and metrics for assessing moisture problems.
- Providing advice to policymakers, planners, regulators and standards and certification bodies.
- Developing clear and valuable information, guidance, training and consultancy for stakeholders.

Live research projects

- Mould growth testing and benchmarking in 'dry' and 'wet' buildings. This project has financial and in kind support from Polygon UK and Mycometer. It has also received an additional IAA grant from EPSRC.
- Moisture and health in buildings: A scoping study of the effects of moisture in buildings upon occupant health, supported by Saint-Gobain Research.
- Moisture guidance for new homeowners. This project is supported by NHBC.
- Moisture guidance for existing homeowners. This project is supported by MIMA.

For further detail please visit ukcmb.org

TEACHING AND LEARNING

IEDE's postgraduate and research programmes help students to make our buildings, towns and cities healthier, more sustainable and more efficient places in which to live.

The Institute explores exciting, emerging themes in built environment study and reflect the joined-up, interdisciplinary ways of thinking, communicating and working that are increasingly in demand in industry. It takes place at the centre of London, an inspirational world capital of the building design industry.

Undergraduate taught programmes (pg 18):

- MEng Engineering and Architectural Design

Postgraduate taught programmes (pg 16, 17):

- MSc Environmental Design and Engineering (EDE)
- MSc Health, Wellbeing and Sustainable Buildings
- MSc Light and Lighting

Doctoral research programmes (pg 20, 21):

- MPhil/PhD Built Environment
- EngD Engineering Doctorate

For further detail please visit bartlett.ucl.ac.uk/iede

"The EDE course supports students to move onto a variety of career paths backed by sound technical knowledge.

"In my case, it was a crucial career moment, which enabled my transition from architecture into environmental design and engineering.

"Our company employs a large and growing number of EDE alumni, evidence of the course's relevance and recognition in the industry."

Ricardo Moreira
XCO2 Energy



MSc EDE trip to Wales, 2014

MASTER'S PROGRAMMES: EDE AND L&L

MSc Environmental Design and Engineering

First taught four decades ago, the MSc EDE is a world-leading programme that turns students from across the globe into high-achieving graduates sought after by the biggest names in design and construction.

It is geared towards professionals looking to enhance their careers in environmental design and engineering.

Areas covered by the programme typically include smart energy systems, building simulation software, noise control and lighting design — but every year it is adapted to meet the needs of its intake, drawing on always-developing connections to expertise through the help of alumni in senior positions in academia and industry.

"Would I do the MSc EDE if I had the time again? Yes, Yes Yes! The issues that the programme covers are of particular importance to the world."

Professor Emeritus Michael Corcoran
Professor of Building Services Design, Strathclyde University



MSc EDE students

MSc Light and Lighting

This graduate programme — Europe's longest-running and most-respected in lighting — brings together the technical and creative sides of lighting design to solve the many problems and questions posed by lighting both inside buildings and outdoors.

Since 1987, the MSc L&L has continually produced some of the world's leading lighting engineers and designers — and has greatly contributed to solving some of society's most practical problems, from how best to light indoor spaces to how to efficiently light streets.

The programme covers topics ranging from lighting design to the scientific research and engineering behind lighting, providing a uniquely comprehensive package of knowledge and skills to students.

"The MSc Light and Lighting course offers a solid foundation for both lighting design and lighting research. It covers theoretical, practical, artistic and technical aspects, perfectly complementing my architectural skills."

"My lecturers and fellow students have been incredibly supportive throughout, which made the course not only more productive but also more manageable and enjoyable. The course has been enriching — not only on an educational level but also on a personal level; together we have shared enjoyable, unforgettable moments."

Simone Bonavia
MSc Light and Lighting student 2015/16

MSc HEALTH, WELLBEING AND SUSTAINABLE BUILDINGS

Recent decades have seen an increasing focus placed on the impact that buildings, and the built environment in general, have on the health and wellbeing of the people who interact with them.

The MSc Health, Wellbeing and Sustainable Buildings is a new programme, which will be first taught from September 2017. It aims to create a new generation of experts with the skills required to innovatively tackle health and wellbeing issues relating to the design, assessment, retrofit and operation of residential and non-domestic buildings.

This course builds on IEDE's strong links with industry and health- and wellbeing-related research projects, including examining the impact of greenhouse gas reductions on public health, indoor air quality in schools and the health effects of moisture in buildings.

The course is supported by an Advisory Group made up of key stakeholders from industry, policy and academia. It includes representatives from Arup, Hoare Lea, Public Health England, CIBSE, Skanska and Saint Gobain.

Why choose the MSc HWSB?

The programme builds on IEDE's strong links with industry, throughout which demand for professionals with relevant expertise is expanding rapidly.

The Bartlett has the country's highest percentage of 'world-leading' architecture and built environment projects — with students learning alongside true experts.

London is a global design hub providing unrivalled networking opportunities, with alumni in many major London firms.

"We are looking to the MSc Health, Wellbeing and Sustainable Buildings to nurture a new generation of designers, engineers, analysts and clients who can seize the huge opportunity presented by our renewed focus on wellbeing."

"Clients increasingly want design teams that truly understand how the built environment impacts health, happiness and productivity. It is an interdisciplinary challenge requiring new skills and collaboration between industry and academia."

Edward Garrod

Principal, UK Head of Sustainability + Integrated Design Elementa Consulting



Course director and Senior Lecturer Dr Marcella Ucci

MEng ENGINEERING AND ARCHITECTURAL DESIGN

UCL IEDE is building on its successes by launching its first undergraduate programme — the four-year integrated Masters in Engineering and Architectural Design.

For first teaching from September 2017, this innovative, multidisciplinary programme will challenge students from numerous angles — combining a solid base in engineering with transferable skills in architecture and environmental design.

Graduates will develop the knowledge and skills required to be global leaders in designing and developing resilient buildings that both maximise practical excellence and minimise environmental impact. The programme will place creativity and design at the centre of engineering, creating experts in understanding, developing and designing buildings with exceptional performance.

The merging of engineering with creative design will mean that students will be capable of undertaking built-environment projects from their very inception to their final design and application.



'Welcoming Shelter' by BSc Architecture student Charlie Redman

Created by experts

The programme will be delivered by a world-class team of experts drawn from across UCL — with the Bartlett School of Architecture and UCL Civil Environmental and Geomatic Engineering joining IEDE in its delivery.

Its development is involving influential bodies including AKT II, Arup, Buro Happold, CIBSE — the Chartered Institution of Building Services Engineers, EI — the Energy Institute, Feilden Clegg Bradley Studios, Foster + Partners, Hoare Lea Consulting Engineers, ICE — the Institution of Civil Engineers, IStructE — the Institution of Structural Engineers, Laing O'Rourke, Price & Myers and RIBA — the Royal Institution of British Architects.

"Our industry needs to evolve to respond to pressures we all face to improve effectiveness and efficiency, in terms of resources, time and cost."

"What better place to start than training a whole new group of engineering and architectural designers who think and work collaboratively with cross disciplinary skills."

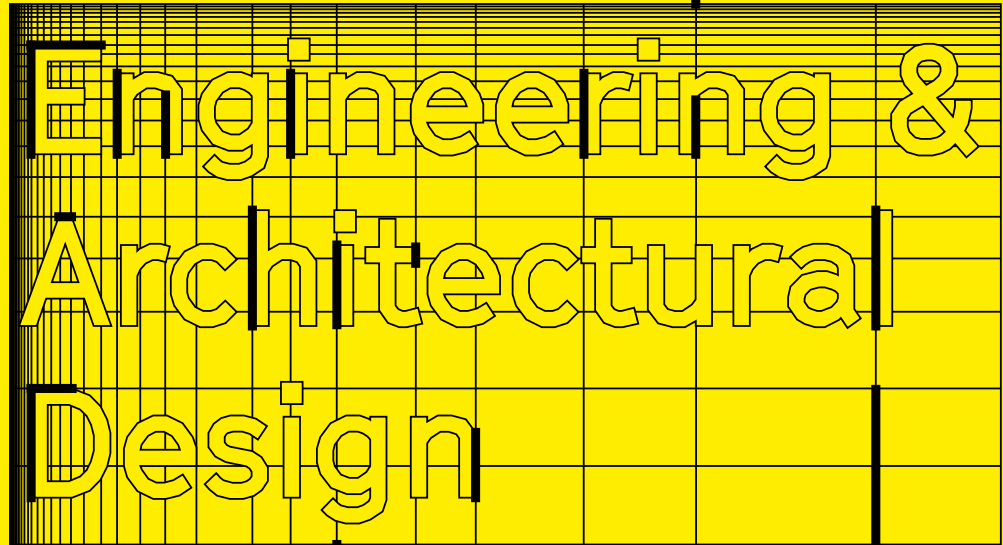
Ian Durbin BSc(Hons) CEng MCIBSE FconsE
Partner, Hoare Lea

"The Engineering and Architectural Design course at UCL offers undergraduates the opportunity to be taught in a project- and design-focused format, in collaborative settings."

"This course promises to deliver new professionals set to engage in these criteria to define our future built environment."

Ian Taylor BA(Cantab) DipArch RIBA
Managing Partner, Feilden Clegg Bradley Studios

Structural Environmental Architectural
Three disciplines
One degree



Engineering &
Architectural
Design

MEng Programme

The Bartlett School of Architecture, UCL
UCL Institute for Environmental Design & Engineering
UCL Civil, Environmental & Geomatic Engineering
UCL Robotics

Apply now for courses
starting October 2017



DOCTORAL RESEARCH

IEDE offers research degrees in a range of built environment-related areas, through which students demonstrate the capacity to organise, undertake and write-up an original and substantive piece of research.

Research areas offered include energy use in buildings, building stock modelling, healthy buildings, environmental policy and performance, light and lighting and workplace innovation.

IEDE also offers Engineering Doctorates (EngD) — enhanced PhDs designed by the EPSRC. These projects involve a one-year technical MRes course followed by three-years' full-time work with a sponsor.

PhD projects live in 2015/16 involving IEDE staff

Riham Mohammed Jaber Ahmed: Educational buildings' design and female students' cognitive performance: the role of temperature and ventilation rates in the hot dry climates

Alaa Alfakara: Using agent-based modelling to simulate occupants behaviour in response to overheating in residential buildings during hot seasons

Carrie Behar: Understanding ventilation practices; how residents adapt to living with whole house ventilation in low energy housing

Yekatherina Bobrova: UK housing policies — moving towards the achievement of shared objectives using System Dynamics

Dominique Cannavina: Matching and managing demand, behaviour and expectation for carbon reduction

Miguel Casas-Arredondo: Building fit-outs and the circular economy

Nina Glover: Investigating the impact of trees on airflow within street canyons through the use of CFD and field measurements

Virginia Gori: The estimation of thermal parameters of real building elements by using experimental data collected during in-situ monitoring campaigns

Evan Greenberg: Adaptive environments through the design of urban microclimates

Madalina Hanc: Workspace choice, cognitive performance and wellbeing

Shih-Che Hsu: Human-oriented spatial assessment on climate change risk and policy benefit: from energy use to health status

So Young Hyun: Development of information delivery manual to identify information exchange requirements for building performance analysis

Badria Jaffar: An examination of the residential building stock in Kuwait to inform energy efficiency policy

Ivan Garcia Kerdan: An exergy-based modelling tool for retrofit analysis in non-domestic buildings

Dong Hyun Kim: Light for well-being: the characteristics of psychophysiological pathway

Michelle Lakeridou: The potential for setting limits on cooling set-points for air-conditioned UK office buildings

Eleni Oikonomou: The energy and environmental impacts of heat pumps for cooling and heating in the UK residential sector

Sofie Pelsmakers: Pre-1919 suspended timber ground floors in the UK: estimating in-situ U-values and heat loss reduction potential of interventions

Helen Pineo: Use of evidence about the built environment and health by policy and decision-makers

Rochelle Schneider dos Santos: Exploring temperature data enhancement through remote sensing techniques to better understand the location-based effects on human health

Alexia Sawyer: The interaction of the social and built environment in the generation of physical activity

Clive Shrubsole: Changes in exposure to PM2.5 in dwellings in England: An unintended consequence of energy efficient refurbishment of the housing stock

Piyachat Sirivan: Indoor air quality design — Risk perception of indoor particulate matter and ventilation behaviour in air-conditioned dwellings in hot and humid climate

David Veitch: Developing improved methods for measurement of ventilation rates in occupied dwellings

Daibin Xie: Cultural influences on Chinese workplace: Regional and organisational effects

Hartini Yahya: Water management in buildings

Paulina Zakrzewska: BIM in Healthcare: exploration of BIM as managerial and operational tool in healthcare building projects. Can BIM effectively deliver estate related projects within NHS?

EngD projects live in 2015/16

Ruhul Amin: Data driven predictive maintenance optimisation for the intelligent management of assets

Ciro Bevilacqua: An imaging tool for energy efficient communities of the future

Roderic Bunn: Occupant satisfaction performance metrics for soft landings projects, supported by a graphical user interface and visualised training modules

Lucy Zarina Campbell: Healthy vending in healthcare, applying communications techniques and technologies to deliver public health policy

Chris van Dronkelaar: Discrepancy in predicted and actual performance in non-domestic buildings

Stathis Eleftheriadis: BIM integrated optimisation framework for environmentally responsible and structural efficient design systems: a holistic cloud based approach

Valentina Marincioni: A holistic approach to moisture management in buildings

Kieran Mulholland: Planning for obsolescence within long-term real estate contracts

Amir Nabil: Visualising the intelligent management of assets (VIMA)

Yair Schwartz: Creative reuse: visualisation of life cycle carbon calculations for new and existing commercial buildings

Gurdane Virk: The urban climate: an integrated approach to building performance and urban design

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Giannakis, G.I., Lilis, G.N., Garcia, M.A., Kontes, G.D., Valmaseda, C., Rovas, D.V. (2015). An extraction and transformation methodology to automatically generate geometry and material inputs for energy performance simulation from IFC BIM models. 14th Conference of IBPSA. India: IBPSA.

Hyun, S., Marjanovic Halburd, L., & Raslan, R. M. (2016). Bridging The Performance Gap: Information Delivery Manual Framework To Improve Life-Cycle Information Availability. Building Simulation & Optimization 2016-Third IBPSA — England Conference. UK: IBPSA.

Jones, B., Das, P., Chalabi, Z., Davies, M., Hamilton, I., Lowe, R., Mavrogianni, A., Robinson, D., Taylor, J. (2015). Assessing uncertainty in housing stock infiltration rates and associated heat loss: English and UK case studies. *Building and Environment*, 92, pp. 644-56.

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SPECIAL ISSUES

This year IEDE edited and contributed to a number of influential Special Issue publications.

Both well-regarded by industry and academically prestigious, these issues highlight the key role IEDE staff are playing in spreading their expertise across the built environment sector.

Mike Davies: BSER&T Special Issue on Overheating

In 2015, CIBSE's Building Services Engineering Research & Technology (BSER&T) journal published a Special Issue on Overheating and Indoor Air Quality, co-edited by IEDE Director Professor Mike Davies.

This Special Issue explores how to ensure buildings that are strongly insulated can maintain a positive Indoor Air Quality and comfortable level of heating.

Dejan Mumovic: Designing Intelligent School Buildings

In 2015, Intelligent Buildings International published a Special Issue on Designing Intelligent School Buildings, edited by IEDE Deputy Director Dejan Mumovic.

The complex nature of education-related buildings — in part due to a steady flow of pupils, changing lighting requirements and the need for strong acoustics — presents unique issues for engineers and designers.

This Special Issue summarises the existing research on school building design, while suggesting that much more work is needed to improve our understanding of the design of learning environments.

Marcella Ucci: People and Energy Use in Buildings

In 2015, Indoor and Built Environment journal published a Special Issue on People and Energy Use in Buildings, co-edited by IEDE Senior Lecturer Marcella Ucci.

This issue marks an important contribution to the important debate around energy-use reduction by outlining how the interactions between people and the built environment can be improved. It explores issues including technology, the role of landlords, building management and the social context of energy-use.

CIBSE Special Issues

CIBSE, the prime source of expertise in the building services industry, regularly publishes Technical Memoranda (TM) and Application Manuals (AM) to help industry practitioners with their work.

In 2015, CIBSE published **TM57: Integrated School Design**, edited by Dejan Mumovic. Aimed at engineers, architects, contractors and clients, this publication offers clear guidance on improving school design. Covering acoustics, lighting, ventilation, heating, energy-use and facilities management, TM57 is helping industry design safer, more comfortable and ultimately more productive environments for pupils.

In 2015, CIBSE also published **AM11: Building Performance Modelling**, an update of a two-decades-old manual. IEDE Lecturer Rokia Raslan was a lead author for a chapter on building performance modelling, covering regulation compliance, modelling for building assessment and rating schemes and design modelling. This influential manual is helping designers to integrate the latest modelling systems into their work.

INDUSTRY PARTNERS

IEDE has an established record of translating its world-leading research into competitive advantages for partners in industry, policy and charity.

The Institute works with companies of all sizes, government departments, NGOs and charities.

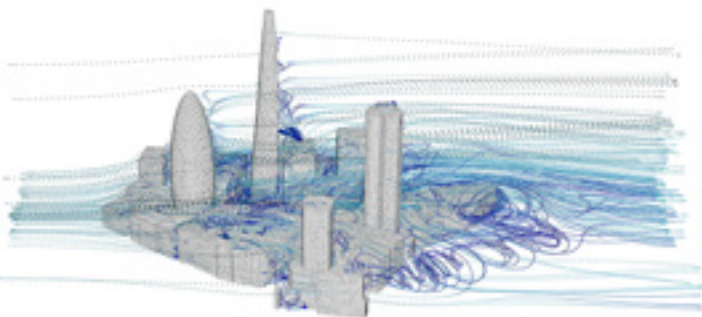
Work can take the form of a Knowledge Transfer Partnership (KTP), an R&D Partnership, Research Engineers, consultancy or CPD training.

Case study: Ventive KTP

This two-year KTP between IEDE and Ventive Ltd, a ventilation company, began in July 2015.

Its main objective is to develop and implement an engineering design protocol and database that will enable Ventive to embed indoor air quality and ventilation effectiveness in their product development.

Extensive monitoring in social housing and school buildings in which Ventive systems are installed has been carried out, with the results currently being processed. This project is being led by IEDE's Dr Vivian Dorizas.



Wind simulation around London

Case study: Property Care Association KTP

This two-year KTP between the Property Care Association (PCA) and IEDE will help to standardise current methods used in the prevention, management and remediation of moisture in buildings.

The project aims to develop novel moisture assessment protocols and innovative diagnostic tools to deal effectively with moisture-related problems in buildings.

As a result, the project will increase the market potential of the PCA and its members. This project is being led by Lecturers Hector Altamirano and Dimitrios Rovas.

Case study: Faithful+Gould

During 2013, Dr Ben Croxford led a UCL team that carried out the soft analysis of Cheshire Oaks, Marks and Spencer's flagship sustainable store, as part of a larger project to evaluate building performance. The team carried out BUS surveys and focus groups of staff, customers and community representatives from Cheshire Oaks and Warrington Gemini, a control store.

In 2016, a team from Faithful+Gould, advised by Dr Ben Croxford, won a competition to develop Housing Sustainability targets for a large forthcoming development at Old Oak Common. This development will include around 25,000 homes and offices for around 65,000 jobs.

For more details on all consultancy work, please contact Peter Raynham.

OUTREACH

IEDE regularly interacts with external stakeholders, including the public, media, industry and policy. Our regular events attract hundreds of guests, while our media outreach efforts have helped to bring our research to the attention of thousands of those interested in the built environment.

This year, more than 500 people attended IEDE events, which included the 50th Anniversary of EDE at The Bartlett event (see page 4) and the popular UCL IEDELearn Lectures.

The lecture series offers academics, students, stakeholders and the public the opportunity to engage with experts from both IEDE and elsewhere.

UCL IEDELearn Lectures this year included:

- *Enabling the circular economy* by Eric Logtens, Director of Noble Environmental Europe AG
- *A renewable UK* by Mark Barrett, Senior Lecturer at UCL-Energy
- *Using Systems Thinking in Public Policy* by David C Lane, Professor of Business Informatics at Henley Business School



IEDE PhD event, April 2016

Digital outreach

This year saw IEDE increase its digital media efforts, using social media platforms, blogs and newsletters to reach more stakeholders than ever before.

This year saw **100% more** Twitter followers, **192 hours** viewed on YouTube and **22,000** unique web visitors.

The IEDE blog continued to thrive this year, with contributed posts covering COP21, air pollution in London and a history of the MSc EDE programme. The most popular blogs this year include:

- *Every Breath We Take: Indoor Air Pollution and Health* by Clive Shrubsole
- *An Egg-cellent Day for British Science Week* by Emily L Nix
- *Buildings, Health and Wellbeing: A New Emphasis* by Clive Shrubsole

Please find our blog at blogs.ucl.ac.uk/iede/

Case study: Flood House

April 2016 saw the launch of Flood House, a mobile prototype structure used to investigate flooded landscapes. This project, a collaborative effort between IEDE and the Bartlett School of Architecture, travelled along the Thames Estuary for five weeks as part of the Radical Essex project, and was moored at sites along the estuary that are prone to flooding.

Flood House had significant press coverage including articles in **Observer Magazine**, **Hyperallergenic**, **Art Monthly** and **Fast Company**.

See more detail at www.flood.house

UCL IEDE STAFF 2015/16



Visualisation and Projection Party in celebration of ten years of UCL EngD VEIV

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