Institution: University of Hertfordshire

Unit of Assessment: 12 Engineering

1. Unit context and structure, research and impact strategy

Context and structure

Engineering research at the University is carried out within the Centre for Engineering Research (CER) and the interdisciplinary Centre for Research in Biodetection Technologies (CRBT). They both sit in the new School of Physics, Engineering and Computer Science (SPECS), which has been established to facilitate deeper collaborations between these three disciplines. There are 34.8 FTE (35 staff) in this Unit, a 135% increase on the REF2014 submission as a result of a commitment to achieving a significant increase in research capacity. The Unit is made up of 4 Professors, 7 Readers/Associate Professors, 21 Lecturers and 3 Research Fellows. Early Career Researchers (ECRs) account for 37% of the submission.

CER and CRBT encompass four research groups:

Microfluidics and Microengineering (MMRG): A multidisciplinary group within CER and CRBT, MMRG brings together research expertise in microfluidics, sample processing and handling, biological particle collection and detection, engineering design and system development. Through collaborations with government agencies and industry, it carries out fundamental research into the development of novel microengineered devices and techniques that underpin fully integrated systems for the detection of biological threats in military, crop protection and clinical settings. CRBT exploits the interfaces between MMRG and the Particle Instrumentation & Diagnostics (PID) research group (submitted to Physics) to better address research challenges facing partners that include Defence Science and Technology Laboratory (Dstl).

Materials and Structures (MAST): MAST concentrates its research on the development of composite materials for the design, repair and strengthening of concrete civil structures and the optimisation of advanced materials and structures for applications in extreme environments such as aerospace. The Group has developed fast, energy-efficient processes based on electropulsing and high magnetic field treatment to reduce residual stress and optimise mechanical properties in metallic materials. Within aerospace, it has explored biomimetic morphing wing concepts to offer alternatives to fixed-wing aircraft and investigated ways to increase the resilience of carbon-carbon composite aircraft brakes.

Energy and Sustainable Design (ENESD): ENESD carries out research into the development and commercial exploitation of sustainable energy systems. This includes renewable energy, energy harvesting, energy storage, thermal and cooling management, two phase and multiphase flow, fuel cells, batteries, additive manufacturing and sustainable transportation. Specifically, it applies its research to the design of wind energy systems for both urban and remote rural environments, energy harvesting systems based on vehicle suspension and piezoelectric flooring, ultra-efficient internal combustion engines, electric and hybrid vehicles, efficient cooling systems and heat transfer enhancement.

Communications and Intelligent Systems (CIS): CIS' research expertise lies in optical and wireless communications, electronic circuits and systems and information processing. It specialises in the development of algorithms and protocols for next generation wireless and mobile communications and the application of software defined networking for network softwarisation, especially within satellite and 5G networks. In radio access technologies CIS undertakes work in physical layer technologies, signal processing and RF circuits for next generation wireless and mobile communications. Its work in information processing includes speech and audio processing, facial and voice biometrics, machine learning and IoT applications. CIS carries out intelligent systems research in its Smart Systems Laboratory, which

explores the development of connected system technologies and how they can increase automation in people's homes.
Notable improvements and successes for the Unit in comparison with REF 2014 are:

- Experiential balance of staff for both vitality and sustainability with 31% professors and readers/associate professors, 32% lecturers and 37% ECRs.
- 35% growth in the number of doctoral research students.
- Positive student response to the 2019 Postgraduate Research Experience Survey with research culture and skills ranking 3rd, responsibilities (supervisors and student) ranking 4th and professional development 6th among 42 HEIs submitting in Engineering.
- 110% increase in average research income per annum.

Strategy
The Unit's mission is to benefit society, the environment, the UK and global economy through high-quality fundamental research that can be applied to the development of technological solutions to critical business challenges. Four main strategic aims identified in the REF 2014 submission were pursued by the Unit over this period:

Strengthen research excellence and increase critical mass in priority areas: The Unit realigned the focus of each research group to meet evolving UKRI funding priorities and the Industrial Strategy's four Grand Challenges: artificial intelligence and data (CIS); ageing society (CIS, MAST, MMRG); clean growth (ENESD, MAST, MMRG); future of mobility (MAST, CIS, ENESD). To achieve this, the Unit invested over £4M in building new and improving existing laboratory facilities. It made 13 new research staff appointments, which were spread almost evenly across four research groups; eight of the new roles were senior and mid-career level, supported by three promotions to professorships. The Unit invested £600k in three five-year ECR research fellows to work with Kourtessis, Chrysanthou and McCluskey, respectively. In addition, 18 postdoctoral fellows each typically of three-year duration were funded through successful grant applications from the Unit during the REF 2014 period.

Increase and diversify research income through international collaborations and industry partnerships: Research income has almost trebled from £3.95M to £11.64M from REF 2014 to REF 2021. The figure comprises funding from 212 grants, research and industrial contracts from the EU, the European Space Agency (ESA), UKRI Dstl, and industry. This significant increase was achieved through a greater focus on winning higher value awards; participating in international consortia of academic and industry partners; securing 32 fully or match funded PhD studentships from industry worth £960k; £760k in alumni donations for advanced manufacturing and biodetection research.

Expand interdisciplinary research: The Unit has facilitated deeper interdisciplinary research collaborations both internally and externally over the assessment period. A key strategic objective was realised in 2016 with the establishment of CRBT, which united the research expertise of MMRG and PID to respond to the research needs of collaborators like Dstl with greater speed and effectiveness. The subsequent development of CRBT has facilitated further interdisciplinary collaborations within the University. This includes a study alongside the University Centre for Topical Drug Delivery and Toxicology Research, funded by the Health and Safety Executive (HSE), to design an aerosol and droplet sampler to measure virus generation from COVID-19 infected cases. Over the period, the Unit co-shaped the strategic plan for the University's latest new interdisciplinary research initiative, the Centre for Climate Change Research; 17 research staff from the Unit, out of a total of 50, are members of this new centre.

Increase research impact through closer engagement with industry and government: The Unit has increased its number of regional and national research collaborations with academic and non-academic partners; it has undertaken funded research with more than 130 organisations and enterprises over the assessment period. A core mechanism for maximising impact on business is the translation of fundamental engineering science through Knowledge

Transfer Partnerships (KTPs), particularly with SMEs. A key government collaboration was a four-year £1.4M framework agreement with Defence Science Technology Laboratory (Dstl) through which MMRG progressed the Technology Readiness Levels of next generation biodetection technologies for military and civilian use. MMRG is now the preferred supplier to Dstls' Critical National Infrastructure for Detection and Sampling. As a result of CIS research into smart home systems, the Unit entered into a formal 'collaborative partner' agreement with Building Research Establishment (BRE), providing researchers from both organisations with mutual access to laboratory facilities at the Unit and the BRE site in Watford. BRE has sponsored, a research-focused senior lectureship, an Engineering Doctorate and three PhD studentships.

Interdisciplinary research

Much of the research in the Unit is interdisciplinary and involves collaborations with partners within and outside the University. This is supported via several mechanisms.

University interdisciplinary research themes: In 2015, research in the University was centrally restructured around six Research Themes: (1) Information and Security; (2) Health and Wellbeing; (3) Food; (4) Space; (5) Global Economy and (6) Heritage, Cultures and Communities. These global-challenge focused themes were created specifically to foster interdisciplinary research across research centres and groups. Each theme is led by a Champion who interacts with the other Theme Champions and Associate Deans (Research) to stimulate new interdisciplinary initiatives internally and externally. Research Theme Champions design and implement operational plans, arrange networking activities and organise workshops to exploit interdisciplinary research funding opportunities. As an example, the Unit's CRBT cuts across three of the research themes: Information and Security, Space and Health and Wellbeing.

Interdisciplinary research groups and centres: CRBT is an exemplar of the Unit's approach to interdisciplinary research. With the aim of translating fundamental research into deployable biodetection systems, it has brought together atmospheric physicists, electronic, mechanical and software engineers, and combinatorial chemists. The structure of the research team is akin to an agile SME, where each staff member applies a distinct specialism to address multiple research questions. ENESD and MAST also benefit from multidisciplinary teams comprising mechanical engineers, materials specialists and systems engineers. MAST researchers Ren and Cheong led a three-year, EPSRC-funded interdisciplinary research project, in collaboration with UCL, Queen Mary, The Pirbright Institute, Great Ormond Street Hospital and Nankai University, as well as the Unit's MMRG, to design cost-effective, durable air and water filters containing antimicrobial nanoparticles that kill bacteria and viruses.

Interdisciplinary doctoral programmes: The Unit was an active partner in the University Alliance Doctoral Training Alliance in Energy (DTA Energy), forming new interdisciplinary research partnerships with other HEIs. Over four years, eight of the Unit's ECRs participated in the scheme, integrating the research areas of intelligent signal processing, power electronics, engines, materials, batteries, grids, system engineering and civil infrastructures. Funding was obtained from the Clean Energy strand of the Horizon 2020 DTA3/COFUND programme, which supports international, interdisciplinary and industry focused PHDs. The Unit, through CRBT's research expertise, is also a key partner of the EPSRC Centre for Doctoral Training in Aerosol Science, led by the University of Bristol and also involving the Universities of Bath, Cambridge, Leeds, Manchester, and Imperial College. This Centre brings together the disciplines of chemistry, physics, biological sciences, mechanical engineering, life and medical sciences, pharmacology, and earth and environmental sciences to provide foundational and comprehensive training for doctoral students in aerosol science. The Unit additionally participates in the ERDF (European Regional Development Fund)-funded Agri-Tech Research & Innovation Accelerator. This supports interdisciplinary PhD projects with local SMEs, which are supervised jointly by Unit staff and the University's Centre for Agriculture, Food and Environmental Management Research.

Strategic use of internal funding to facilitate interdisciplinary research: The Unit was successful in obtaining University funded five-year interdisciplinary Research Fellowships. Research Fellow Kesieme was recruited by Chrysanthou for an interdisciplinary project with Hertfordshire Business School and industrial partner C4 Carbides, a Cambridge-based manufacturer of advanced cutting tools, that focused on life cycles of materials and digital supply chains. Senior Research Fellow Dimov was recruited to work in MMRG, in collaboration with the University's School of Life and Medical Sciences, to develop research in novel lab-on-a-chip biodetection systems.

Co-location of research staff: Interdisciplinary research in data science within the Unit is facilitated by the co-location of data mining and AI applications research with communication networks research in the CIS group. The research students' open-plan hub houses researchers across materials, energy systems, civil and aerospace structures and thermodynamics in an environment conducive to interdisciplinary research discussion and interaction.

Impact strategy

The Unit's approach to impact is to work with the public sector and industry partners to provide technological solutions to critical policy and business challenges. The strategy is to:

Develop sustainable partnerships with industry and public sector collaborators: The Unit has focused on developing collaborative relationships that have deepened over the full seven-year REF 2021 period. Each of the Unit's three case studies reflect the outcomes of longstanding external partnerships that began before the assessment period and continued to evolve throughout the whole period. The value that the Unit's government and industry collaborators place on these partnerships is evidenced by a series of follow-on grants, resulting in the Unit's research expertise becoming embedded in collaborators' R&D processes.

In one impact case study, a longstanding strategic partnership between MMRG/CRBT and Dstl led to the development of next generation biodetection technologies that delivered a significant leap in the UK's defence capabilities. This enabled the deployment of Biological Surveillance and Collector Systems by the Royal Air Force to protect British troops overseas from biological attacks. The relationship allowed the Unit to form fruitful collaborations with industry, for example with defence company Thales and Williams Advanced Engineering and apply microfluidics principles to the field of food security through the development of an early warning crop disease system with Fera Science, Bayer CropScience and SME, Optisense.

A ten-year partnership with C4 Carbides, including contiguous KTP projects worth £800k over the period, is the basis of the Unit's impact case study that describes the translation of novel metal-ceramic joining technologies into specialist cutting tools, resulting in at least £50M of third-party retail sales globally. The closeness of this relationship has transformed C4 Carbides from a niche manufacturing SME into a global leader in the diamond cutting sector, with the company directly attributing £11.5M of its gross profits over the period to the Unit's research. As further evidence of the sustainability of this relationship, another follow-on KTP has been awarded that runs to 2023.

The Unit's partnership with leading satellite equipment provider Global Invacom began in 2013 and underpins the impact case study on Broadcast WiFi. Initial joint research led to a sponsored PhD and a KTP to explore the development of a new technology that could deliver uninterrupted, high-quality video content to thousands of smartphones simultaneously. Successive European Space Agency grants followed that enabled the Unit and Global Invacom to collaborate with the BBC to commercialise this technology for use at large-scale events to enhance the audience experience.

Accelerate and sustain the development of research that offers clear promise of commercial success: The Unit's research staff are encouraged to apply to the University Innovation Team's Proof of Concept fund (grants up to £15k) to develop early-stage research with commercial potential and the Research Office's centrally managed impact fund (grants from

£4k to £8k) to further engagement with end users. A key focus of the Unit is to sustain research collaborations along the route to full commercialisation, actively participating in bringing products to market.

This support is evidenced in all three impact case studies. As described in the biodetection case study, the Unit's research shaped the technical specification of the Ministry of Defence's commercial tender for the Biological Surveillance and Collector System. Thales, as lead partner of the industry consortium awarded the contract, commissioned further research from CRBT to optimise the performance of its export product Spinnaker, an adapted biodetection system for civilian use.

As part of the commercialisation of the crop disease forecasting system, alongside Fera Science and Optisense, the Unit's McCluskey showcased pre-production systems at Cereals 2017, 2018 and 2019 (Europe's leading technical event for the arable industry) and at Latin America's Expo Agrofuturo in 2018 and 2019. In developing the C4 Carbides impact, Chrysanthou made regular visits to the Cambridge company's manufacturing facilities over the assessment period to ensure that his materials research was aligned with C4's production processes. For the Broadcast Wi-Fi impact case study, the research team led by Kourtessis provided technical support at the live BBC and RAI (Italian television network) events at which the video stream technology was introduced to public audiences for the first time.

Leverage the University's strategic engagement within the East of England region: The Unit has deepened its engagement with local businesses and industry through its participation in new frameworks established at University level. This includes the Hertfordshire Science Partnership, a £6M collaboration between the University and the Local Enterprise Partnership launched in 2018 to fund basic collaborative research with SMEs that has commercial potential. It also includes the £1.1M, UKRI-funded University of Hertfordshire Enterprise Zone, which enables businesses to access the Unit's research facilities, and the ERDF-funded KEEP+ scheme, a knowledge exchange scheme that facilitates partnerships between researchers from six HEIs (including Hertfordshire) and SMEs.

Use KTPs, match-funded PhDs and doctoral programmes to establish research collaborations with industry: The Unit's staff work with the University's Enterprise and Business Development (EBD) team to identify opportunities for new KTPs with industry. A key component of the Hertfordshire Science Partnership is the Hertfordshire Knowledge Exchange Partnership scheme. Under this initiative, the Unit's ECRs undertake a one-year industrial placement during which they develop a PhD project that can deliver the fundamental research necessary to attract later stage commercial translational funding for the host company. The Unit offers an Engineering Doctorate for research engineers working in industry, which facilitates the formation of strong relationships with the business community.

Develop and implement an industry and policy engagement programme: In 2017, an Events, Guest Lectures and Research Seminar Series was established with the aim of sharing the Unit's research with local industry and partners. The termly guest lectures attract audiences in excess of 200 people. In 2018 an Annual Conference was established to bring together professional and regulatory bodies, alumni, regional government, and the Hertfordshire and Eastern region's engineering communities to promote the Unit's research to stakeholders. In 2018, the conference showcased externally funded PhD projects spanning all four of the Unit's research groups. In 2019, the conference focused on the impact of the Unit's external research collaborations and in 2020 it centred on doctoral training programmes relating to energy and sustainable futures, together with the promotion of Open Research.

Open Research Environment and Integrity

An important aspect of the Unit's interdisciplinary research is the sharing of research data and tools; datasets, code and results from experiments are made freely accessible. As an example, CIS deposits its datasets and code in recognised, publicly available repositories such as Dryad

or Figshare. The Unit facilitates the sharing and re-use of simulation models and code developed with its industrial software such as OPNET and VPIphotonics in the CIS group, Ansys in the ENESD, MAST and MMRG groups and COMSOL in the ENESD group. As a result, these data are shared with leading HEIs and industry in the UK, Europe and the US. In addition, the Unit's research equipment and facilities are made openly available via the University's website. It also contributes to Equipment.Data, a one-stop shop for accessing UK-wide research equipment developed by University of Southampton.

Kourtessis, in his role as Associate to the Director of the Doctoral College and member of the UK Research Integrity Office, has been an advocate, and is responsible, for the co-development (with research groups) of the Unit's ORI policy. The Unit is fully committed to the University's policy to make all research outputs at least Green Open Access, by providing access to them through the University Research Archive. An increasing number of outputs are published as Gold Open Access; researchers in the Unit are regular users of the University's Article Processing Fund that provides resources for Gold OA, and the Unit provides additional support for open access publishing from internal Engineering QR funding. Furthermore, the University's Ethics Committee and Intellectual Property and Contract Support (IPACS) team ensure that research follows ethical and legal obligations and standards. The University is a signatory to the Concordat to Support Research Integrity and there is centrally provided mandatory training on research integrity for all researchers, including workshops and an annual seminar, in addition to bespoke training on the Doctoral College's Researcher Development Programme. Seminars have been organised with EPSRC's Observatory for Responsible Research and Innovation in ICT, promoting responsible research and innovation across the discipline of engineering.

Future Strategy

The Unit's strategy is to:

a) increase research income by a further 40% by 2026 through the submission of high quality, high-value grant applications to strategically selected calls for research, and industrial innovation and knowledge transfer in partnership with national and international academic groups and specialist industries;
b) improve opportunities to engage with the EU in future programmes such as Horizon Europe by building on a recently established formal innovation partnership with TWI Hellas, an Athens-based wholly owned subsidiary of TWI, Cambridge. This will facilitate the development of collaborative EU research bids focused on 5G, computer science and engineering with the 600 industrial companies and SMEs that are members of the TWI innovation network. A key aim is to grow research income through the submission of at least 10 collaborative research proposals per year with new industrial partners;
c) double KTP funding from Innovate UK by 2026 with at least 10 KTPs in place at any specific time across all research areas by building on established, and developing new, industrial partnerships;
d) grow and strengthen the Unit's research infrastructure including the establishment of new research laboratory facilities in light manufacturing and Internet of Things as part of the University Enterprise Zone funding framework. Over the next REF period, the Unit will benefit from a university-agreed plan to invest in a new £85.5M building for the School by 2025. The Unit will participate in a new interdisciplinary Doctoral Training Alliance in Future Societies and fund 15 new four-year PhDs with local SMEs using LEP and industry investment of £1M. It will seek to forge another EPSRC Centre for Doctoral Training (CDT) future call application with partner HEIs, using the Unit's experience from the EPSRC CDT in Aerosol Science;
e) facilitate a further expansion of interdisciplinary research via the University's newly established Centre for Climate Change Research. The Unit's researchers will co-lead four of the new research groups within the Centre focusing on: climate monitoring; climate prediction; societal impact of climate change; climate change mitigation.
f) build on the work since 2014 to extend the current high level of self-deposit of journal outputs to all output types, including a focus on open data, non-periodical conference papers, and early career work typified by posters and seminar presentations.

2. People

Staffing Strategy

The Unit's staffing strategy since REF2014 has been to strengthen areas of expertise within the four research groups through investment in new appointments typically from research intensive universities and enhance the research culture by providing an environment in which research by both staff and students can thrive.

Since 2014,13 new staff have been appointed, of whom 9 (2 senior positions, 2 mid-career researchers and 5 ECRs) are permanent academic staff and 4 are research fellows. New appointments in the period demonstrate the Unit's commitment to targeted research growth balanced across the four research groups. Mporas joined CIS from the University of Patras (Greece) to work on information engineering and data mining for health systems; Kanellopoulos came from the University of Cambridge to work on advanced construction materials in MAST; Thomas, also from the University of Cambridge, joined MAST to further his work in nonlinear aerodynamics; Cao joined CIS from the University of Edinburgh to undertake research in signal processing for 5G; Asef from the University of Surrey joined ENESD to research automotive electrical and electromechanical systems; De Vuyst joined MAST as Reader in aerospace structures from Cranfield University; Papazafeiropoulos joined CIS from the University of Edinburgh on a five-year fellowship in wireless communications; Dimov joined MMRG from University College London on a five-year fellowship in molecular assays on microfluidic devices; Zhang joined ENESD from the University of Warwick to carry out research into carbon capture and storage and thermal energy storage; Paykani from ETH Zurich joined ENESD to undertake research on advanced thermal propulsion systems; Kesieme, as an ECR from Newcastle University, joined MAST to focus on resource recovery and recycling; De Santos from Imperial College London joined MAST to work on structural engineering.

Staff development

The University is a signatory to the Concordat to Support the Career Development of Researchers**.** All ECRs are aligned to one of the four research groups and they are allocated time to develop their research. In their first year they each have access to a £7k budget to support the continuation of their research with external collaborators, ensuring the sustainability of these relationships and maximising opportunities for further research collaborations to be taken forward by the Unit. ECRs are mentored in the Unit by experienced staff who support their development, including assignment to research student supervision teams to gain supervisory experience. They are also involved in research progression assessments and Doctoral-level examinations as internal examiners alongside experienced assessment teams and external examiners.

All research fellows and academic staff undergo an annual appraisal and a six-month review encompassing all aspects of their work including publication and grant application strategies. They are encouraged to make use of the central academic staff development programme and the Doctoral College Researcher Development Programme. These programmes include courses in specialist research skills as well as career development, personal effectiveness, leadership and management. Direct support is provided to both research fellows and academic staff to attend leading international conferences and workshops using a dedicated annual budget of up to £50k, in addition to funding that is made available through externally funded projects.
As part of the annual appraisal process, staff are encouraged to apply for promotion. The promotion criteria and procedures are explained in regular workshops that are offered centrally by the University. The success of the Unit's policy of rewarding staff success in research and innovation, including outputs, income generation and research standing, has resulted in 14 academic promotions since 2014, including 6 ECRs to senior lectureships, 5 senior lecturers to readerships and associate professorships, and 3 readers to professorships.

To support staff, research groups are provided with budgets for networking (attending conferences, industrial visits, professional activities), collaborative exchanges with research and

industrial labs, and the organisation of workshops. There is also a process for granting new staff additional research time for the publication of high-quality outputs and the scoping of new research bids based on ongoing work with their previous institutions.

In addition to the Proof of Concept and Impact Grant schemes outlined under 'impact strategy', a member of EDB is embedded within the Unit to support academic staff to engage with industry and maximise the impact of their research. This 0.7FTE post is funded by the Higher Education Innovation Fund.

Research students

Since 2014 there has been a significant increase in research student numbers, successful awards and overall satisfaction. In two consecutive (2015, 2017) postgraduate research experience surveys (PRES), the Unit scored above 80% for overall satisfaction (including 93% for supervision, 86% for research progress and 84% for professional development). In the 2019 PRES the University was ranked 21st overall from 103 HEIs, with research culture ranked 4th of 103. At the local level, the Unit was ranked 3rd out of 42 HEIs for both research culture and research skills, 4th for responsibilities (supervisor and student) and 6th for professional development.

The Unit offers PhD and MSc study in aerospace, materials technology, microfluidics and microengineering, optical networks, and radio and mobile communications systems. Its successful Engineering Doctorate (EngD) programme is offered part-time to research engineers working in industry. Companies provide employees on the EngD programme with dedicated time to carry out research projects that address a specific business challenge; the Unit's research staff supervise the EngD students, who have access to the Unit's research facilities. There are 81 PGRs currently enrolled in the Unit, up 35% on the previous REF period. This includes 14 research engineers on the EngD programme, who are based in the UK and overseas (e.g. Australia, the US, East Asia).

The Unit recruits students with high quality research potential, including self-funded applicants. The acceptance rate in the REF period is 24%, with an average of more than 140 applications received each year. A key objective was to put in place fully funded PhD studentships. In the last three years, 28 new studentships have been established, which are funded by a variety of sources including the EPSRC CDT on Aerosol Science, the Horizon 2020-funded DTA Energy and fully or match-funded industrial PhD studentships. The Unit also receives funding from Hertfordshire LEP through the Hertfordshire Science Partnership for 3 four-year PhDs with industry to help accelerate innovation focused on research in Agri-Tech.

The Unit allocates a budget of £60k per annum to support research students to attend conferences and workshops, summer schools and training. Student applications to this fund are appraised based on their PhD progress and their participation in, and attendance at, the Unit's annual events and research seminar programme. Students are provided with funding for equipment and consumables and access to high performance computing, industrial standard simulation software covering all research disciplines, a working space in one of the research labs/offices and a desktop PC or laptop for remote working. Students can become corporate members of IEEE, providing them with free access to the IEEE Xplore digital library.

The Unit participates in external opportunities for doctoral student internships (for example, The Catapult Network, the Alan Turing Institute, L'Oréal-UNESCO Fellowship), providing funding to support students' networking opportunities and training. It offers sponsored scientific laboratory exchanges as part of the Herts/TWI-Hellas innovation partnership, Royal Academy International exchanges, and bilateral exchange opportunities with research students from the University of Naples, Salento and Catania (Italy) and Aalborg (Denmark), funded by Erasmus.

All postgraduate research (PGR) students are appointed a supervisory team consisting of a principal supervisor, a second supervisor and, in many cases, an industrial/external supervisor.

Supervisory teams have both technical expertise and experience of at least two successful supervisions at doctoral level. Supervisors with industrial experience are often assigned to the EngD students.

Supervisors attend bespoke training sessions at the University's Doctoral College. The principal supervisor is available to advise and support PGR students regularly, with meetings taking place every one-to-two weeks (every four weeks for the part-time EngD students). Meetings involving the whole supervisory team are held twice a term. The University has invested in a Research Student Monitoring System (RSMS), an online platform that facilitates record keeping and interaction between students, supervisors and the Doctoral College. Detailed records of all supervision meetings and progression assessments are entered into RSMS by students and their supervisors and are accessible throughout the course of the doctoral study, providing a robust mechanism to record progress, achievements and challenges.

Research engineers studying on the EngD attend regular online meetings and are visited by their supervisors at their place of work. They have an industrial supervisor with whom they engage regularly. The supervisory teams are confirmed by the University Doctoral College whilst the Unit research admissions tutor participates in prospective applicants' interview panels.

PGR students in the Unit go through an annual monitoring process in addition to the procedures available to assess their progress, leading to a vigorous, whole programme review. It is mandatory for all students to complete an annual monitoring form and use it as the basis for an effective discussion with all members of their supervisory team. The monitoring process reviews all aspects of PGR progress against external and internal indicators. This includes a record of progress to date and future plans, ethics, health and safety, and the availability of appropriate resources for their research and supervision arrangements. PGR students are also encouraged to publish their work in appropriate journals and attend peer-reviewed conferences.

Equality and diversity

Kourtessis is the School of Physics, Engineering and Computer Science's Associate Dean for Research and Enterprise. He is a member of the Race Equality Charter (REC) mark self-assessment team, the Athena Swan group, which achieved the Bronze award in 2018 and is now working towards Silver. The remit of the School's Equality, Diversity and Inclusion (EDIT) Team is to ensure that Athena Swan and REC principles are embedded in the Unit's strategic plans. Women now comprise 20% of the Unit's staff, where there were none at the end of the previous REF period, and the Unit's BAME staff has increased from 50% to 60%, demonstrating growing diversity that reflects the student body.

All staff have undergone equality training, including at away-days, and new staff have mandatory training in their induction. All staff have also attended training on Unconscious Bias, and the University offers regular awareness-raising events throughout the year and during Black History and LGBTQ months.

Actions taken to implement Equality, Diversity and Inclusion in the School include the provision of a series of training/support events, including the Aurora Leadership programme (supplemented by the University Leadership Potential scheme). In 2018, the Unit participated in the Women Leaders in Higher Education survey, informing policy and highlighting best practice for supporting women to progress through leadership roles. Since 2017 the Unit has actively promoted the L'Oréal-UNESCO for Women in Science UK & Ireland Fellowship Awards. To date 7 applications have been submitted from among women early-career engineers.

In recent recruitment rounds, 45% of those appointed to new PhD studentships have been women with over 62% identified as BAME.

3. Income, infrastructure and facilities

Income

The Unit has achieved substantial growth in research income over the REF 2021 assessment period; income has risen by an average of 110% per annum, that being a total of £3.95M for the REF 2014 period in comparison to £11.64M for REF 2021, which is in line with the growth in submitted staff. Funding sources include the European Union, the European Space Agency, EPSRC, BBSRC, the Royal Society, the Newton Fund and the Global Challenges Research Fund (GCRF); successive research grants through the Unit's collaboration with Dstl; knowledge transfer projects funded by UK industry and Innovate UK; research contracts from industry and enterprise in the UK and overseas; sponsorships and donations. Since 2014 the Unit has received over 212 grants and industrial contracts through collaborations with 130 organisations.

MMRG has generated £3.8M in research income over the period. Following the reorganisation of its research within CRBT, the Group has worked with Dstl throughout the assessment period, securing its status as preferred supplier for biodetection research and successfully delivering 12 discrete projects. This work led directly to research income from Thales Group to optimise the resulting Biological Surveillance and Collector System now in use by the British military. BBSRC funding of £248k facilitated collaborations with a broad range of industrial partners (Bayer, Fera Science, Optisense Ltd) to apply these biodetection principles to the field of precision agriculture and the development of the commercially viable crop disease forecasting system. A further £351k BBSRC grant enabled the Group to explore new approaches for the detection of tree health pests and pathogens. Based on similar underlying microfluidics principles, the Group won £499k in EU FP7 funding to collaborate with SMEs and academic institutions across Europe on a project called ENVIGUARD. This involved the development of a prototype biosensor technology for environmental monitoring and disease prevention in aquaculture, with the aim of ensuring food safety. MMRG is one of the delivery partners in the EPSRC's National Centre for Doctoral Training in Aerosol Science led by University of Bristol and involving five other partner institutions.

CIS has generated £3.1M in research income over the period. It has been funded by the EU through the FP7 and Horizon 2020 programmes, the European Space Agency, Innovate UK and EPSRC, the Royal Academy (through its research exchange grants) and ERDF. It has also won £690k in knowledge transfer and exchange projects (KTP, KEEP+). Significant projects include a £447k EU FP7 ACCORDANCE grant (partly counted in this period), which developed a novel ultra-high-capacity and extended-reach optical access network architecture based on OFDMA (Orthogonal Frequency Division Multiple Access) technology. A £311k grant under Horizon 2020 OCTAVE project involved the development of speaker verification software tools for a voice-based biometric authentication technology. CIS researchers were part of a European Cooperation in Science and Technology (COST) action (IC1206) on digital privacy; a £280k grant allowed them to participate in the development of technologies that can conceal the identities of individuals captured in multimedia data (e.g. online images, video, audio, text) for privacy protection. An initial KTP with Global Invacom for the early development of the Broadcast WiFi video streaming platform led to a cumulative £662k in funding from the European Space Agency and an opportunity to collaborate with the BBC's R&D team (as described in the impact case study). A £120k EPSRC/IUK grant enabled CIS researchers to work on smart solar panel project DAEDALUS; the aim was to develop an encryption and security protocol that can be attached to solar panels to validate their provenance and ensure the legitimacy of the energy source. Other key Innovate UK-funded KTPs include a £279k collaboration with AIM-TTi (Thurlby Thandar Instruments) to develop a real-time spectrum analyser, and a £195k partnership with IDscan Biometrics Limited to optimise face verification technology. CIS also received full funding for six PhD and EngD studentships.

ENESD has generated research income of £2.8M most significantly from Innovate UK. This included a £500k Advanced Propulsion Centre/IUK grant with Caterpillar, Punch Flybrid and Productiv for the design and development of a patented advanced powertrain system which also fully funded two PhD studentships. The Group secured total funding of £745k through four KTPs

with industrial partners, including a project to develop an energy harvesting flooring system with manufacturer Altro, and projects relating to air pollution control and fuel cells. The group received a £204k EPSRC First Grant to build research capacity in computational ammonia combustion and won four Royal Academy and British Council awards to form new and develop existing international research partnerships. The British Council award provided the group with £45k from the Researcher Links Workshop programme.

MAST has generated £ 1.9M in research income over the period. Principal grants include: £219k EPSRC project to design antimicrobial filters for protection against viruses and bacteria in clinical settings; two IUK-funded projects in smart manufacturing worth £273k; two IUK-funded projects in metal-ceramic and metal-plastics joining worth £245k; a £112k UK Supply Chain for Biocomposites (UK-BIOCOMP) project funded by Birmingham City Council, which sought to develop high-performance flax tapes and fabrics for the manufacture of thermoplastic and thermoset composites for use in sporting goods and automotive products. MAST also engaged in a succession of KTPs with power tool manufacturer C4 Carbides. This partnership generated £700k in research income, one PhD studentship and four patent applications. A longstanding relationship with MBDA resulted in several fully funded EngD studentships focused on the characterisation of carbon-carbon composites that are intended for hypersonic flight. It also led to £60k research funding from MBDA to develop numerical methods to monitor the condition of air-carried missiles.

Infrastructure and facilities

Since 2014 the Unit has benefitted from investment of £ 3.1M in new and existing laboratory facilities from both the University's Capital and Revenue funds. In addition, the Unit has received £760k in donations and £450k in in-kind contributions from IBM, as well as £820k sponsorship for PhD researchers to support the expansion of the Unit's experimental capacity and £560k from the University to fund three five-year ECRs to help build the research base. Over the assessment period, the Unit has provided 11 specialist technical staff to support research and innovation. Technical staff are either employed permanently by the School to support specific research areas or are funded by HEIF, the Hertfordshire UEZ, research overheads and external funds.

In this period each research group has benefitted from significant investment in facilities as follows:

MMRG: Facilities include six laboratory spaces for research including a class 1000 microfabrication clean room; a BioMEMS laboratory dedicated to the development and testing of microfluidic and biodetection instrumentation; a dedicated fluorescence microscopy dark room; microbiology preparation and biodetection evaluation facilities; a test facility for launching and testing particulate matter and bioaerosols. These laboratories have received £520k of institutional funding since 2014; this was crucial to the ensuring the Unit had sufficient capacity to meet the requirements of key collaborator Dstl. A new investment of £125k has also been made with the receipt of a 3D Polyjet multimaterial printer.

CIS: Over the period, the four CIS research laboratories VR and Robotics; Smart Systems; Cognitive Networks (incorporating optical); Wireless Communications and RF systems) have received £1.5M in investment from internal and external sources. This investment has been key to the delivery of the European Space Agency-funded projects in collaboration with Global Invacom and the BBC. New facilities include:

- Real-time emulated variable topology Ethernet distribution network custom written SDN controller applications, and real-time satellite topology emulator for the implementation of SDN control and orchestration for bespoke one-to-many video service applications, intelligent WiFi control, and high throughput satellite based 5G links for SDN enabled massive video delivery.

- Quality of experience optimisation for video delivery using new swarm intelligence and combinatorial optimisation algorithms.
- FPGA acceleration capabilities for wireless digital telecommunication using an array of SDRs and application-specific radio hardware in the DC – 6GHz range.
- Array of End Users (50x Raspberry Pis) capable of testing wireless networks (2.4GHz and 5GHz WiFi), orchestration algorithms and clustered applications.
- Latest generation Xilinx RFSoC FPGAs with integrated 8x 10GSamp/s DACs, 8x 5GSamp/s ADCs and very large DSP resources; used for Phased Array Gateway design.
- Six new large computer nodes (AMD EPYC chips with 64 cores each and 256 GB of RAM) sitting on a single fast Infiniband switch.
- Experimental devices for EEG monitoring and brain-computer interfacing, acoustic and ultrasound microphones, wearable motion sensors and a prototype smart grid consisting of solar panels, wind turbines and a Tesla Powerwall.
- Acquisition systems (3D cameras, head/eye/motion trackers), visualization systems (3D/VR/AR displays and headsets) and application systems (robotic platforms and medical prototypes).
- Shared access to two Interactive VR Powerwalls for visualisation and data innovation.

ENESD: Facilities include the Energy Harvesting and Storage and the Metrology research laboratories, and the Advanced Powertrain laboratory supported by a specialist facility in Noise, Vibration and Harshness. These facilities have benefitted from investment of £920k over the period. This has enabled the development of advanced flywheel capabilities for energy storage applications in the automotive and off-highway sectors, including low carbon energy efficient powertrain, complete optical diagnostic measurement for combustion analysis and the development of dual-combustion systems. The Group has secured an investment commitment of £900k for new facilities that include a hot disk and thermal conductivity measurement test rig for research into functional materials, together with the upgrade of the diesel and petrol dyno test cell facilities.

MAST: The Group has benefitted from a £1.2M investment in research facilities. In 2019 a state-of-the-art Materials Characterisation research laboratory was established to fully exploit the group's expertise in nanoparticles and metal-ceramic and metal-polymer interfacial relationships. A new JEOL 1400 transmission electron microscope is used for analysis of anti-bacterial and anti-microbial nanoparticles and for studying the effect of external fields on metallic defects. A new Bruker Advance D8 X-ray Diffractometer supports research into the effects of external fields on residual stresses. New equipment in the Innovative Construction Materials Laboratory includes non-destructive testing apparatus; a humidity-controlled carbonation chamber; a fully automatic conditioning chamber for freeze-thaw analysis; thermoregulated Vicat apparatus; conditioning vacuum chambers; ultrasonic and water baths; a rapid chloride ion migration testing facility and a high-definition stereomicroscope. The laboratory has a 3D printing assembly that consists of a programmable robotic arm and a specialised pumping/extrusion system for 3D printing of cement-based composites and ceramics. MAST has also established a new Virtual Manufacturing (VM) laboratory which provides an immersive virtual reality suite that simulates manufacturing processes, operations and controls for rapid testing and process optimisation.

4. Collaboration and contribution to the research base, economy and society

Research Collaborations and User Partnerships

The Unit collaborates with universities and research users internationally, through funded research projects particularly from the EU and participation of staff in academic communities and industrial research platforms. Examples of key international collaborations include:

- The FP7 project MAAT – Multibody Advanced Airship for Transport (completed 2015). Chen collaborated with the Universities of Modena (Italy), Beira (Portugal), Southern Federal University of Russia, Lincoln, Bologna (Italy), the Polytechnic of Torino and VU

Brussels to explore the design of a new radical kind of airship that remains permanently aloft, with a vertical take-off/landing shuttle for ground access.

- In the FP7 project ACCORDANCE (completed 2014), Kourtessis worked with Deutsche Telecom, Telefonica, Bell Labs Germany, UPC (Spain), AIT (Greece) and Karlsruhe Institute of Technology (Germany) to demonstrate end-to-end transmission over optical and wireless networks.
- For the H2020 project OCTAVE (Objective control of talker verification), Mporas collaborated with Aalborg University, the University of East Finland, and industrial partners that included ATOS and Eurocom.
- For the FP7 project ENVIGUARD (Biosensor technology for food safety), McCluskey and Johnston collaborated with the Alfred Wegener Institute (Germany), the University Polytechnic of Madrid (Spain), Istanbul University (Turkey) and aquaculture SMEs in Europe, including North Bay Shellfish Ltd and FAI Aquaculture Ltd in the UK.
- Three projects funded by the European Space Agency (ESA). The SatIP WiFi Hotspot project investigated multicasting of video over satellite and WiFi networks in collaboration with Global Invacom and the BBC R&D. In the same year, the SAT>IP WiFi Live Mobile TV project, again in partnership with BBC R&D and Global Invacom, and also Canadian company Edgewater Wireless, developed adaptive video transmission over satellite and WiFi, incorporating user telemetry through software defined networking. The successful delivery of the ESA projects led to an invitation to join the consortium for the ESA/UK Space Agency-funded Satin5G project; Kourtessis and Mporas are collaborating with the University of Surrey, world leading satellite operator Avanti, Airbus, iDirect and the Satellite Applications Catapult.
- Collaboration with the University of California (UCLA) in the field of electrowetting (Coudron).
- Collaboration with Macquarie University and the University Technology Sydney on a project funded by the Australia Research Council on self-powering wireless circuit design (Sun).
- Collaboration with the University of Luxembourg in 5G networks (Kourtessis and Papazafeiropoulos).

Nationally, significant academic collaborations include:

- The EPSRC CDT in Aerosol Science with Bristol (lead), Bath, Cambridge, Imperial, Leeds and Manchester. The Unit is involved in the training of 10 researchers out of a total of 80.
- H2020 DTA3 COFUND (with 14 other HEIs including Coventry, Brighton, Nottingham Trent, Liverpool John Moores and the Open University) in Energy. The Unit supervises the doctoral training of six researchers out of a total of 98. This followed on from a similar partnership: the University Alliance-led Doctoral Training Alliance Network in Energy.
- The EPSRC-funded project with UCL and Great Ormond Street Hospital on antimicrobial filters for hospital air and water systems (Ren, Cheong).
- The BBSRC project on early detection of tree health pests and pathogens with the Centre for Ecology & Hydrology (NERC), the Rutherford Appleton Laboratory (STFC), Forest Research, the James Hutton Institute and Oxford, Aberdeen, St Andrews, Exeter, Worcester and Greenwich (McCluskey, Johnston Coudron).

Several projects funded by EPSRC, Innovate UK (including KTPs) and ESA have facilitated partnerships with a broad range of industry partners, from large multinational companies to SMEs. Key collaborations include:

- BBSRC/IUK project (McCluskey) with Bayer, Fera Science and Optisense Ltd to develop a commercially available crop disease forecasting system.
- EPSRC project TUPROOFS (Thermal Solar under Photovoltaic Roofing Structures) (Ren) with three UK SMEs to integrate thermal solar and PV in large-scale roof panels that can be placed directly on to new or refurbished buildings.

- EPSRC project DAEDALUS with UK SME Trusted Renewables Ltd and digital security specialists Multos to embed blockchain technology in smart solar panels.
- EPSRC project with aerospace company Meggitt to investigate ways to address the catalytic oxidation of carbon-carbon composite aircraft brakes.
- A £1.4M framework agreement with Dstl to advance the UK's national biodetection capabilities, leading to a partnership with Thales to deliver the Biological Surveillance and Collector System to the British military.
- A research contract with defence company MBDA to explore alternatives to fixed-wing aircraft.
- Several KTPs that include partnerships with UK companies in the fields of electronic instrumentation, biometrics, energy harvesting and specialist cutting tools (as detailed earlier in this document).

Contribution to economy and society

Through partnerships with the public and private sectors, the Unit's wider contribution to the economy and society is captured under five themes:

Defence and cyber security: The Unit's deepening collaboration with Dstl has advanced the Ministry of Defence's biodetection capabilities, leading to field-deployable systems that protect British troops and civilians overseas. A longstanding relationship with MBDA has evolved over the period through a number of funded EngDs focused on the characterisation of carbon-carbon composites capable of withstanding the extreme conditions created by hypersonic flight. The Unit's partnership with Hertfordshire Constabulary resulted in two EngDs in the field of Automatic Number Plate Recognition (ANPR). This research addressed the limitations of standard approaches to implementing ANPR technology and provided recommendations to form the basis of a new *de facto* international ANPR standard. Further EngDs involved advances in cyber security technologies. A head engineer at the National Cyber Security Centre has carried out research within the Unit to develop an IT system that can handle sensitive information with a higher level of assurance. A research engineer with CCL Forensics Ltd, a company that works closely with the National Crime Agency, is researching the use of Charging Detail Records of mobile users in forensic applications and potentially as evidence in court. The Horizon 2020 OCTAVE project on voice biometric technology delivered prototypes that were validated in 'real-world' trials in banks and airports. Research as part of the EU COST Action on de-identification in multimedia content has provided an effective means to support the EU's Data Protection Directive. The KTP with IDscan Biometrics Ltd (awarded an 'outstanding' rating) to develop biometric technology capable of identifying occluded faces resulted in the publication of a European patent.

Food security: Two BBSRC grants resulted in the development of the SporeSentry crop disease monitoring system. This has been made compatible with the CropMonitor Pro platform, which provides real-time data about crop pest and disease prevalence to farmers and growers. The efficacy of the biosensor probes developed through the EU FP7 ENVIGUARD project was demonstrated for the monitoring of water pollution in aquaculture. The technology is being taken forward commercially following interest from Mediterranean fish farmers in using it for the detection of pathogens.

Healthcare: The ESPRC project to design antimicrobial air and water filters in hospitals resulted in a patented nanotechnology that is being taken forward for commercial exploitation by the business development team at UCL (project partner). CRBT researchers led by McCluskey were awarded a grant from the Health and Safety Executive to design an aerosol and droplet sampler capable of measuring viable virus generation from COVID-19 infected cases. CRBT became a member of a network for organisations interested in the role of the environment in infection control, facilitating collaborations with Great Ormond Street Hospital and Public Health England to apply research principles underpinning military biodetection systems to hospital settings.

Low carbon economy: The Unit's research has supported the transition to a low carbon economy. The FP7 MAAT airship project proposed a system that is zero carbon. The ESPRC TUPROOFS (Thermal Solar under Photovoltaic Roofing Structures) project demonstrated how a circulated cooling water system can reduce the working temperature of solar PV roofing panels and therefore significantly increase the electric output efficiency; the Unit's industry partners are working on taking the system to market. The Unit (Herfatmanesh) secured an ICURE grant to explore routes to commercialisation for its energy harvesting patents developed in partnership with manufacturer Altro under a KTP (another awarded an 'outstanding' rating). The aim of the Innovate UK/APC-funded Advanced Powertrain project is to improve the fuel economy of Caterpillar's off-highway small wheel loaders by up to 30%. The smart solar panel technology developed through Project DAEDALUS won the IoT category at the 2017 Trustech Awards in Cannes, the global event for payments, identification and security.

Business innovation: Several of the Unit's research collaborations with industry partners have involved the development of market-first technologies. The partnership with Thurlby Thandar Instruments (TTi) has produced the first-to-market handheld real-time spectrum analyser, used for RF measurements and signal tracking. The collaboration with C4 Carbides throughout the period has led to the best-performing diamond drill globally and market-leading additive manufacturing techniques that have enabled the company to develop a novel product range. The patented Bx-WiFi technology, commercialised by Global Invacom through a partnership with the Unit, is being adopted by broadcasters to transform the audience experience at large-scale live events. A KTP with manufacturer RGH Rubber & Plastics Ltd delivered a market-leading materials testing capability; the Unit's KTP associate (Zhu) won one of five national KTN Future Innovator awards in 2019.

Contribution to sustainability of the discipline

Over the period, the Unit has grown significantly and ECRs make up 37% of this submission. Established staff are active across a range of professional activities including:

Members of advisory boards:

- Chrysanthou is on the Board of Governors of the European Virtual Institute on Knowledge-based Multifunctional Materials (KMM-VIN) and coordinator of the Institute's Intermetallics research.
- Kanellopoulos is co-chair of the KMM-VIN Working Group 5 on Graphene & 2D Materials and on the Board of the Institute of Concrete Technology (MICT).
- Herfatmanesh is Advisory Panel member of the Iranian automobile manufacturer Irankhodro and the National Iranian Oil Company.
- Chen is Advisory Board member of the Centre for Mechanical and Aerospace Sciences and Technologies of the Beira Interior University in Portugal and board member of the first China (Shenzhen) Innovation & Entrepreneurship International forum.
- Kourtessis is committee member of the NetWorld2020 European Technology Platform. He is also on the 5GPPP expert group and the SATellite Network of EXperts IV committee of the European Space Agency (ESA).
- Sun is IEEE Society Committee Member of IEEE Circuits and Systems on Analogue Signal Processing and on Circuits and Systems for Communications.

Editorships:

- Sun has been Editor of IEEE Transactions on Circuits and Systems-I: Regular Papers, Editor of the Journal of Sensor and Actuator Networks, since 2018, Guest Editor (lead) of a special issue on Cognitive and AI-enabled Wireless and Mobile Communications at IET Communications, Guest Editor (lead) of Special Issue on Software Defined Radio Transceivers and Circuits for 5G Wireless Communications at IEEE Transactions on Circuits and Systems-II (2016).
- Kourtessis is Area Editor of the EAI Endorsed Transactions on Cognitive Communications.

- Mporas is Editor of the International Journal on AI Tools and a Guest Editor of the Journal of Multimodal User Interfaces.
- Wu is Editor of the Journal of Advances in Mechanical Engineering.
- Chrysanthou is Editor of MDPI's Metals.
- Chen is Editor of the Chinese Journal of Mechanical Engineering.
- Denai has been a Guest Editor of IEEE Access, the Computer & Electrical Engineering Journal, (Elsevier) and the Artificial Intelligence in Renewable Energetic Systems (Springer).
- Ren has been a Guest Editor for Nanomaterials with two special issues: Antimicrobial Nanomaterials and Nanotechnology (2016) and Novel Antiviral and Antimicrobial Nanoparticles for Healthcare Applications (2021).
- Tan and Dimov are Guest Editors of the special Issue "Microfluidics for Biodetection and Sensing" of the Micromachines Journal.
- Duan is Guest Editor for Sensors with a special issue: Sensors Fusion in Non-Destructive Testing Applications (2020).
- Kanellopoulos is Guest Associate Editor of Self-healing Construction Materials at the Frontiers in Built Environment International Journal, member of the editorial board of Elsevier's Heliyon and Elsevier's Developments in the Built Environment.
- Papazafeiropoulos is Review Editor in Frontiers in Communications and Networks.

Keynote/invited speakers (KS) and international conference technical programme chairs (TPC):

- Kanellopoulos KS at The Sino-UK workshop on Self-healing Materials, Shenzhen, 2015.
- Chen KS at 7th International Conference on Modelling, Identification and Control, Tunisia, 2015.
- Papazafeiropoulos TPC at IEEE International Communications Conference (ICC), 2015,2016.
- Sun TPC at IEEE Vehicular Technology Conference, since 2014; also, IEEE GLOBECOM since 2016; IEEE International Symposium on Personal, Indoor and mobile Radio Communications, since 2014.
- Asef KS at International Conference on Green Energy, Las Vegas, USA, 2017.
- Mporas TPC at SPECOM (Speech and Computer), 2015 to 2020; also, IEEE International Conference on Data Mining, USA, 2017.
- Kourtessis TPC at IEEE ICC 2015 to 2020; also, IEEE GLOBECOM, 2016 to 2020; IEEE 5G World Forum 2018 to 2020; IEEE International Conference on Wireless Networks and Mobile Communications, 2019,2020; IEEE Wireless Communications and Networking Conference, 2018 to 2020; IEEE International Conference on Transparent Optical Networking (ICTON), 2015 to 2020.
- Duan KS at 5th International Conference on Maintenance Engineering, Manchester, 2020 (Won ECR Keynote speech award).
- Kourtessis invited debater at the IBM Think London Summit, 2019.
- Ismail KS at the Global Submit and Expo on Mechanical and Mechatronics Engineering (Portugal 2020) and the Global Submit on Polymer Science and Composite Materials (Spain 2020).
- Mporas KS at the international webinar 'COVID-19 Pandemic in Critically ill Patients' organised by the Hellenic Society of Infections in Critically ill Patients and the Spanish Network of Excellence in Respiratory Diseases, 2020.

Notable membership of academic and scientific bodies:

- Three staff are members of the EPSRC college (McCluskey, Paykani, Wu).
- Kanellopoulos is member of the Institute of Materials Minerals and Mining (IoM3) and senior member of the International Union of Laboratories and Experts in Construction Materials, Systems and Structures (RILEM).

- De Vuyst is member of the UK Fluids Network Smoothed Particle Hydrodynamics Special Interest Group committee and the NAFEMS Manufacturing Process Simulation Working Group.
- Kanellopoulos is senior member of the European Structural Integrity Society (ESIS) and member of the British Standards Committee B/517/08.
- Ren is a member of the National Biofilm Innovation Centre.
- Asef is European region (R8) lead of IEEE Power and Energy Society-Young Professionals since 2018.
- Kanellopoulos is registered evaluator for EPSRC, EUREKA, the Greek Scholarship Foundation, the Danish Innovation Fund and the Flanders Research Foundation.
- Mporas is a registered evaluator for the Swiss National Science Foundation and assessor for Spinal Research UK.
- Kesieme is a member of the National Fund for Scientific and Technological Development (FONDECYT) and of the national research agency of Chile.
- Sun is a member of the evaluation panel for the Academy of Finland (Natural Sciences and Engineering Research) and an evaluator for the Austrian Science Fund, the Ministry of Education of China, Singapore's Government Fund and the Leverhulme Trust in 2018.
- Kourtessis is a registered evaluator for EPSRC and IET.
- Herfatmanesh is a registered evaluator for MRC and EPSRC.
- Papazafeiropoulos is a registered evaluator for EPSRC.