Lecturer in Regulatory and Process Compliance, Permanent, 1.0 FTE, Contract Type A

Ref #: 011090

TABLE OF CONTENTS

Lecturer in Regulatory and Process Compliance, Permanent, 1.0 FTE, Contract Type A

College	Science and Engineering
School	School of Biological and Chemical Sciences
Post Title & Subject Area	Lecturer in Regulatory and Process Compliance
Post Duration	Permanent
Level	Lecturer
Reports to	Head of School/Vice Head of School

JOB ADVERTISEMENT

Applications are invited for the post of Lecturer in Regulatory and Process Compliance, School of Biological and Chemical Sciences, at the University of Galway.

Ollscoil na Gaillimhe – University of Galway has been inspiring minds since 1845 as a research-led university. It is one of the oldest and largest universities in Ireland. The campus community includes over 21,000 students and staff and 110,000 alumni located in over 100 countries across the world. University of Galway has earned international recognition as a research-led university with a commitment to top quality teaching. University of Galway is counted among the Top 300 universities in the world, positioned in the top 2% in QS global rankings. The university has committed to aligning all major activities, including teaching, research, operations, and engagement to the Sustainable Development Goals (SDGs), targets and indicators. University of Galway is ranked 34th in the world and first in Ireland in the Times Higher Education's Impact Rankings.

The Lecturer will be located within the School of Biological and Chemical Sciences, which hosts programmes and pathways in Biochemistry, Biomedical Sciences, Biopharmaceutical Chemistry, Biotechnology, Chemistry, Genetics/Genomics, Medicinal Chemistry, MedTech, Microbiology, and Plant and Agribioscience. We also offer postgraduate taught programmes in Medical Technology Regulatory Affairs and Quality, Biotechnology, Biomedical Sciences, AgriFood Sustainability & Technology, and Climate Change, Agriculture and Food Security.

The Lecturer will be expected to work closely with associated MSc and BSc programmes. As a type A lecturer, the focus of the position is on teaching and administration, however development of research activities is desirable, particularly to enable research-led teaching. The MSc in Medical Technology Regulatory Affairs and Quality and the BSc in Science and Technology Studies at the University of Galway involves working with students and groups from diverse backgrounds.

The School of Biological and Chemical Sciences especially encourages applications from candidates who can enhance the diversity and inclusiveness of the academic community.

For informal enquiries, please contact Dr Olivia McDermott, Email olivia.mcdermott@universityofgalway.ie. (+353) 87 2205256 (by prior appointment). Initial Email communication is recommended. Follow up telephone calls or virtual meetings (MS Teams or Zoom) can be arranged by appointment subsequently.

Information on the University's Strategic Plan is available at:
https://www.universityofgalway.ie/strategy2025/

Salary:
€63,624 to €101,498 p.a. (applicable to new entrants effective from January, 2011)
(This appointment will be made on the Lecturer scale in line with current Government pay policy)

Closing date for receipt of applications is 17:00 (Irish Time) on 3rd July 2025. It will not be possible to consider applications received after the closing date.

Garda vetting may apply.
Appointments will be conditional on work authorisation validation.
Further details are available at www.dbei.ie

For more information and Application Form please see website:
Jobs - University of Galway **Applications should be submitted online.**
Please see further information on how to apply here: E-Recruit - University of Galway and Guidelines for On-line Applications (universityofgalway.ie)

Please note that appointment to posts advertised will be dependent upon University approval, together with the terms of the Employment Control Framework for the higher education sector.

At the University of Galway, we celebrate diversity and believe that every candidate can bring unique perspectives, talents and approaches to our University community. We actively encourage applications from all backgrounds regardless of race, religion, ethnicity, gender, family status, civil status, membership of the Traveller community, sexual orientation, disability or age.

We value flexibility and recognise that a work-life balance is essential. We offer flexible working arrangements, including hybrid options, to accommodate the diverse needs of our staff. Our commitment to inclusivity extends beyond recruitment as we foster a friendly and supportive work environment, where all work styles are valued and respected. Join us in shaping a workplace that thrives on diversity, creativity and collaboration.

University of Galway is an equal opportunities employer.

JOB DESCRIPTION

Principal Duties and Responsibilities

The post-holder duties will include, but not be limited to, the following:

Teaching

- Teaching, design and development of courses, modules for on-campus and online delivery and associated activities in the subject area of regulatory and process compliance and quality, and aspects of human biology.
- Use of a range of teaching methods and strategies appropriate to (a) undergraduate, (b) postgraduate and (C) adult learners who are industry-based;
- Review, update, and expand BSc and MSc offerings.
- Carry out MSc coordination activities.
- Liaise and establish good working relationships with SBCS academic staff for provision of module teaching and research project opportunities.
- Development and delivery for on-campus and online, of micro-credentials in the above areas.
- Delivery of lectures, tutorials, project supervision, examination, and other assessment. responsibilities in the field of regulatory and process compliance, quality and related fields.
- Competency in a range of teaching methods and strategies with a willingness to continually evaluate and improve teaching methods and skills.
- Coordination of modules and associated examinations and assessments in a timely manner.
- Research-led teaching, incorporating recent developments into modules to enhance student interest and the student experience.
- Carry out promotion and recruitment activities.
- Liaise with programme external examiner and University Quality Office
- Performing any additional duties as requested by the HoS.

Research
This post is focused on teaching and coordination activities of the MSc in Medical Technology Regulatory Affairs and Quality, and BSc Science and Technology Studies. The new lecturer will also be encouraged to develop research activities including:
- Engage in research and other creative and innovative activity in Medical Technology sector.
- Provide quality supervision and guidance in relation to the research of students.
- Disseminate research outputs in academic publications, conferences, and workshops.
- Participate in postgraduate supervision and training.
- Establish collaborative links locally and externally.

Personal Effectiveness

- The post holder must have excellent interpersonal and communication skills.
- S/he should demonstrate excellent planning, organisation, and prioritisation skills, to effectively meet deadlines and to deliver to high standards across the areas of teaching, research, and contribution.
- Have good time management skills to manage academic workload.
- Be flexible and adaptable in managing competing demands while protecting core values.

ELIGIBILITY REQUIREMENTS

Essential Requirements:
- The post-holder will have a Ph.D. in a relevant discipline of Science or Engineering and Technology.
  OR
- A professional qualification in the area of proposed appointment, **OR** evidence of significant contribution to the particular area : plus
- Third-level teaching experience or a teaching qualification; plus
- A minimum of 5 years' relevant professional experience (the third-level teaching experience will be counted towards the total 5 years "relevant professional experience").
- Experience of lecturing at undergraduate, postgraduate levels and/or of adult learners;
- Experience in designing and developing undergraduate and/or postgraduate programme materials including on-campus and online modules e.g. module lecture content and assessments, ideally in Biomedical Science and Engineering;
- Experience of teaching-associated administration.
- Demonstrated evidence of good communication and interpersonal skills.
- Demonstrated enthusiasm and motivation for applying for post.

Desirable Requirements:
- Knowledge and experience of designing and delivering course materials using modern teaching technologies for blended and / or online learning, including lecturers and / or workshops.
- Experience in the delivery of lectures to adult learners, who are industry-based and practically experienced in the subject area.
- Industry experience in Regulatory Affairs and/or Quality Assurance in the Medical Technology or Pharmaceutical / BioPharmaceutical industry sectors.
- Experience of engagement in research in his/her field, or in the Scholarship of teaching, as evidenced by publications, conference presentations, and/or other relevant outputs.

Appendix 1: Competency Framework for Lecturer (Contract Type A) Roles at University of Galway. This is a type A post which is predominantly a teaching contract (60%) with research and administration sharing the remainder.

	Academic Excellence		Leadership Excellence		Organisational Excellence
CORE	• **Excellence in Teaching** *The Lecturer (Contract Type A) develops and delivers quality modules and courses which engage and inspire students at all levels towards deriving optimal benefit from their programmes of study. He/she is confident in using a range of teaching techniques, maintains currency with pedagogical developments and innovations in teaching in their discipline and is focused on continually developing her/his own teaching skills.*	**CORE**	• **Personal Effectiveness** *The Lecturer (Contract Type A) is committed to her/his discipline and to making a high quality contribution through employing excellent planning, organising, communication and decision making skills to achieve their goals and in exercising flexibility in order to meet the multiple and changing requirements of the Lecturer (Contract Type A) role.*	**CAPACITY TO DEVELOP**	• **Strategy & Vision** *The Lecturer (Contract Type A) should contribute to the strategic development of the discipline through an awareness of the wider educational environment, maintaining currency with developments in the discipline and how the School/Discipline can develop in the long term to optimise its contribution to the University's programmes. He/She must have the ability to develop proposals for the development of new modules and courses and engage in interdisciplinary initiatives towards the development of the School/Discipline.*
CORE	• **Excellence in Associated Research** *The Lecturer (Contract Type A) keeps up to date with research developments in her/his field and incorporates same into teaching as appropriate. He/she engages in the scholarship of teaching.*	**CAPACITY TO DEVELOP**	• **Leading Others** *The Lecturer (Contract Type A) must work well with others, providing leadership and direction to students and colleagues in relation to projects or areas of work that they are leading on. In such instances they effectively encourage, support and manage the contributions of others to deliver a project/programme of work to a high level.*	**DEVELOPING**	• **Collegiate & Community Contribution** *The Lecturer (Contract Type A) values and engages in a collegiate approach to working with others, within their own discipline, School, College and University and also within the wider external community. He/She actively seeks to build effective networks and is willing to contribute their time and expertise to University projects.*

Competencies for Lecturer (Contract Type A) Role in University of Galway

<u>ACADEMIC EXCELLENCE</u>

Competency 1: Excellence in Teaching

The Lecturer (Contract Type A) develops and delivers quality modules and courses which engage and inspire students at all levels towards deriving optimal benefit from their programmes of study. He/she is confident in using a range of teaching techniques, maintains currency with pedagogical developments and innovations in teaching in their discipline and is focused on continually developing her/his own teaching skills.

- Provides a high standard of teaching to students across a range of programmes in their discipline
- Provides mentoring and supervision to undergraduate and post graduate students / projects / programmes as required
- Leads on/contributes to the development and review of the curriculum and programmes delivered and encourages other staff to contribute
- Works to keep programmes 'fresh' and maintains currency of programmes informed by research
- Confident teaching student groups of various sizes and at different levels
- Competent and consistent in setting and organising/co-coordinating the marking of examinations
- Demonstrates, through their teaching, strong enthusiasm for their subject area and a high level of up to date knowledge and expertise in their area
- Competent in a range of teaching methods and strategies and is willing to continually evaluate and develop their teaching methods and skills, looking for better ways of teaching
- Open to using technological innovation as part of their teaching and keeps up-to-date with developments in this area
- Organises and structures their teaching logically to help maximise learning and ensure a good student experience
- Demonstrates a commitment to students and gives the time and effort to engage with, and be accessible to students
- Has the ability to give constructive and timely feedback and advice to students
- Balances a concern for students with a focus on being consistent and equitable in their treatment
- Benchmarks against those relevant programmes in other universities and aims to ensure that programmes are of a high standard
- Works with students to promote ideas of academic integrity, including the avoidance of plagiarism
- Embraces new modes of teaching and learning

Competency 2: Excellence in Associated Research

The Lecturer (Contract Type A) keeps up to date with research developments in her/his field and incorporates same into teaching as appropriate.

- Keeps up to date and maintains currency with associated research that furthers the School / Discipline
- Contributes to and supports the research priorities and activities at School / Discipline level
- Builds up collaborative links and networks with external organisations and keeps up to date with research and what is happening in the relevant international research area
- Attends relevant conferences, and works with industry and other relevant external bodies to keep knowledge relevant
- Provides supervision and guidance in relation to the research of students, motivating and encouraging them to help them overcome problems
- Engages/seeks opportunities in the scholarship of teaching and learning

LEADERSHIP EXCELLENCE

Competency 3: Personal Effectiveness

The Lecturer (Contract Type A) is committed to her/his discipline and to making a high quality contribution through employing excellent planning, organising, communication and decision making skills to achieve their goals. He/She will exercise flexibility in order to meet the multiple and changing requirements of the Lecturer (Contract Type A) role.

- Demonstrates excellent planning, organisation and prioritisation skills, to effectively meet deadlines and to deliver to high standards across the areas of teaching, associated research and administration
- Has good time management skills to manage workload
- Has a reflective approach to their own work and can consistently review it in order to ensure it is of a high standard
- Flexible and adaptable in managing competing demands while protecting core values
- Shows a strong commitment to keeping up to date and maintaining professional competence
- Is resilient and maintains a positive outlook in challenging and pressurized circumstances
- Takes a balanced approach to the demands of the role and is flexible with what the role encompasses
- Understands the importance of programme innovation, related budget management and raising programme funds

Competency 4: Leading Others

The Lecturer (Contract Type A) must work well with others, providing leadership and direction to students and colleagues in relation to projects or areas of work that they are leading on. In such instances they effectively encourage, support and manage the contributions of others to deliver project/programme of work to a high level.

- Works constructively within a collective collegiate structure
- Consistently works with others to ensure high standards in all aspects of the role
- Is able to get the most of out of people and to secure their support and cooperation in relation to work they are leading/managing
- Gives clear instructions in relation to the contribution expected from others
- Has the ability to manage and encourage others to deliver what is required
- Actively supports the career development of students and newer colleagues
- Organises and delegates work in a way which is consistent and fair and makes best use of resources
- Understands the importance of, and can use a range of strategies to, motivate students and colleagues
- Takes the initiative to put good ideas into practice

ORGANISATIONAL EXCELLENCE

Competency 5: Collegiate and Community Involvement

The Lecturer (Contract Type A) values and engages in a collegiate approach to working with others, within their own discipline, School, College and University and also within the wider external community. He/She actively seeks to build effective networks and is willing to contribute their time and expertise to University projects.

- Actively builds strong internal and external networks and collaborative links
- Takes time to build up positive working relationships with others and treats everyone fairly and with respect
- Assumes administrative/organisational roles and tasks to help ensure the smooth running of the School/Discipline
- Acts as chair on committees or acting as representative at school/college/university level and works to develop the skills needed to perform these roles effectively
- Makes an effort to understand and take account of different people's views and perspectives
- Encourages students to get involved in relevant external groups also, where appropriate
- Supports colleagues internally and cooperates with other universities in initiating collaborative programmes
- Possess the skills required to achieve a balance between internal requirements and external requirements
- Participate in relevant professional organisations/networks as appropriate

Competency 6: Strategy and Vision

The Lecturer (Contract Type A) should contribute to the strategic development of the discipline through an awareness of the wider educational environment, maintaining currency with developments in the discipline and how the School/Discipline can develop in the long term to optimise its contribution to the University's programmes. He/She must have the ability to develop proposals for the development of new modules and courses and engage in interdisciplinary initiatives towards the development of the School/Discipline.

- Has a clear overall vision for what the School/Discipline is trying to achieve and how their work fits in with the overall direction
- Understands how the discipline is developing and brings this to bear on their work
- Undertakes relevant benchmarking against other organisations and avails of opportunities to increase understanding of best practice
- Identifies opportunities for new modules and programmes by assessing what will be viable and of interest in the long term
- Creates, and takes advantage of, opportunities to market programmes to attract high quality students
- Able to negotiate whilst recognising the realities and the resource restrictions and is willing to change and adapt to meet future needs

Ollscoil na Gaillimhe

University of Galway

PROFILE OF THE UNIVERSITY

The University at a Glance:
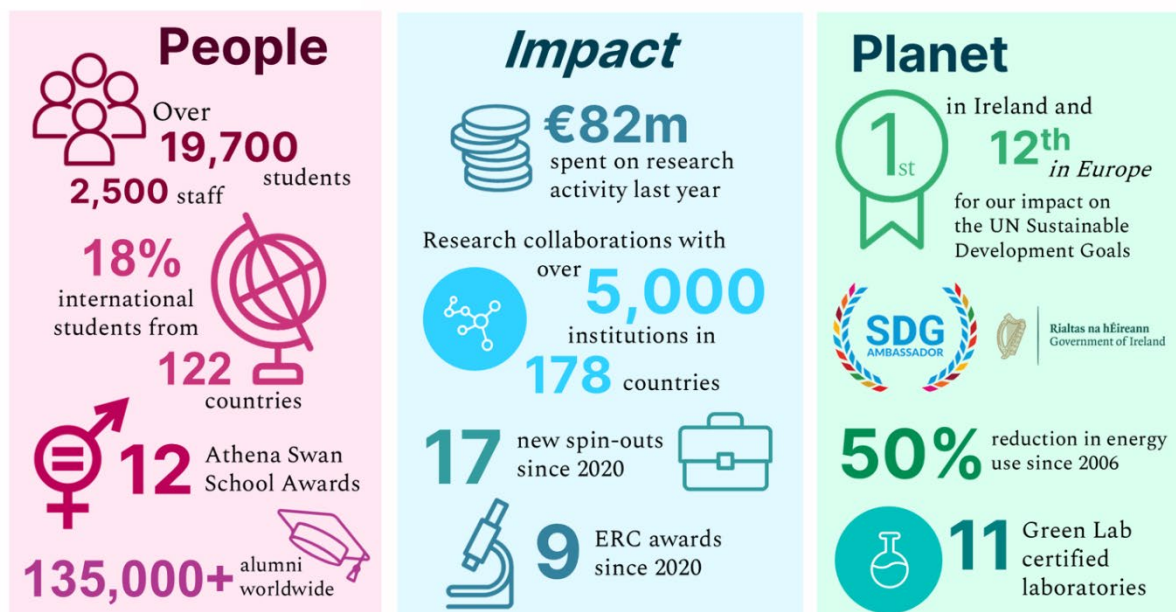
The University Management Team

The University Management Team (UMT) is responsible for the executive day-to-day management of the University. UMT is led by the President who is the Head and Chief Officer of the University. Our current Interim University President, Professor Peter McHugh, was appointed in 2024. You can read more about him at: www.universityofgalway.ie/president

Acting under the President, the members of the University Management Team (UMT) each have specific leadership responsibilities for delivery of the University's objectives in education, research and management of the organisation. You can see the full UMT membership in the organisational chart above.

Find out more about the University's Governance and Management structures at: www.universityofgalway.ie/governance/the-kube-the-governance-hubhttp://www.universityofgalway.ie/governance/the-kube-the-governance-hub

Colleges and Schools

The University has four Colleges:

- College of Arts, Social Sciences & Celtic Studies
- College of Business, Public Policy & Law
- College of Medicine, Nursing & Health Sciences
- College of Science & Engineering

Each of the Colleges is led by an Executive Dean. Within each College, decisions are taken by College Boards, chaired by the Executive Dean, and including the Heads of each School in the College.

For more information on Colleges, Schools and Disciplines, visit:

www.universityofgalway.ie/colleges-and-schools

College	Schools
College of Arts, Social Sciences & Celtic Studies	School of Political Science & Sociology
	School of Psychology
	School of Education
	School of Geography, Archaeology & Irish Studies
	School of English & Creative Arts
	School of History & Philosophy
	School of Languages, Literatures, & Cultures
College of Business, Public Policy & Law	J.E. Cairnes School of Business & Economics
	School of Law
	Shannon College of Hotel Management
College of Medicine, Nursing & Health Sciences	School of Health Sciences
	School of Medicine
	School of Nursing & Midwifery
College of Science & Engineering	School of Biological & Chemical Sciences
	School of Computer Science
	School of Engineering
	School of Mathematical & Statistical Sciences
	School of Natural Sciences

Shared *vision*, shaped by *values*

Strategic Plan 2020–2025

Strategic Plan 2020-2025

In January 2020, following widespread consultation, the University published *Shared Vision, Shaped by Values,* the University's strategic plan for the period 2020-2025. It is structured around four core values debated and defined by the University community: Respect, Openness, Sustainability and Excellence. Over 50 Flagship Actions for implementing the strategy are articulated under each value. A further section entitled 'Building for the Future' articulated the University's plans for campus development in the years ahead.

- **Strategic Plan:** You can read the strategic plan at:
  www.universityofgalway.ie/strategy2025
- **Halfway Progress Report:** In December 2022, the University published a halfway report on our progress towards strategy implementation. You can read the report (internal access only) at:
  https://nuigalwayie.sharepoint.com/sites/UniversityStrategy-HalfwayReport. Or request a copy from the Director of Human Resources.

We are currently at the final stages of developing our next Strategic Plan 2025-2030, building on our core values, and with a renewed focus on our **core mission of teaching, learning, research and innovation that are both excellent and impactful**. The incoming Dean will play an important role in achieving our strategic priorities for research and innovation, delivering landmark initiatives, and developing our research functions, systems and infrastructure to enable success in the years ahead.

Academic Programmes

The University provides teaching through four Colleges and 18 Schools up to PhD level, for primary and postgraduate Degrees and for a wide variety of Diplomas, Certificates and, more recently, Micro-credentials. 68 separate programmes of study are offered for undergraduate students, with over 190 taught programmes at postgraduate level and over 90 structured

postgraduate research programmes. The University also provides a programme of Adult Learning and Professional Development and conducts a number of Summer Schools.

The University has displayed considerable dynamism in the development of programmes to meet the evolving needs of society. Supported by funding from the Human Capital Initiative, our *Designing Futures* programme is transforming how our students learn and develop skills, through success coaching, transdisciplinary modules and our IdeasLab and Empathy Lab programmes. The University is also playing a key role in the delivery of the HCI Multicampus *Micro-credentials* project, which aims to develop a series of micro-credentials across the IUA Universities, and which will provide upskilling and reskilling opportunities to those in employment and those seeking to enhance their employability. Meanwhile, through our membership of the *ENLIGHT network* of European universities, we are developing greater opportunities for student mobility and cross-border collaboration on academic programmes and research.

Student Body

The total student body, including part-time learners, comprises over 20,000 students, over 25% of whom are studying at postgraduate level.

Over 18% of our students were from outside the island of Ireland, coming to study in Galway from over 122 different countries worldwide. Through the Global Galway project, we are seeking to grow our international diversity further through a greater focus on international recruitment, mobility and partnerships.

Research

University of Galway is a globally focused research-intensive university. We recognise that research areas are neither standalone nor static. The problems of the world are not solved from just one perspective. With our knowledge of global challenges, national policy and regional needs our research areas enable an interdisciplinarity approach and impact.

Our research community achieved over €110m in EU research funding during the 2014-2020 programme period. We are now firmly focused on the 2021-2027 programme cycle, with ambitions to achieve in excess of €150m of EU research funding, including Horizon Europe. In 2023, the University had a record €82m annual spend in research, across a breadth of research areas. Engaging with our partners locally, nationally and worldwide, our current university strategy (Strategic Plan 2020-2025) invites ambition in research that underpins the following areas:

- Enhancing policy and society
- Enriching creativity and culture
- Improving health and wellbeing
- Realising potential through data and enabling technologies
- Sustaining our planet and people

These areas are aligned to the work of our Research Institutes, including:
- Data Science Institute
- Ryan Institute for advancing sustainability and innovation
- Institute for Lifecourse and Society
- Institute for Creativity
- Institute for Clinical Trials

- Institute for Health Discovery and Innovation (launched in October 2024).

For more information on our research institutes, centres and units, visit:

www.universityofgalway.ie/our-research/listings/research-centres-institutes-and-units.html

Staff

The University employs approximately 2,500 staff, including full-time and part-time, which includes approximately 1,000 academic staff.

Human Resource issues are managed within the Human Resources Office, under the direction of the Director of Human Resources. In 2023, a new Hybrid Working Policy was launched to facilitate more flexible working arrangements in a post-Covid environment.

Finances

The University is its own financial authority and has an annual income of over €350m, including contract research income of over €70m. The sources of income are Student Fees (approx. 40%), State Grants and Pension funding (approx. 30%), Research Income (20%) and Miscellaneous (10%).

The University and the Irish language

The University's commitment to the Irish language was first set out in the University College Galway Act 1929 and this was reiterated in the University College Galway (Amendment) Act 2006, which states that one of the principle aims of the university is "the provision of education ... through the medium of the Irish language".

The University's Strategy 2020-2025 goes even further and commits to developing and implementing an ambitious and future-focused strategy for the Irish language, in partnership with national stakeholders and Gaeltacht communities, based on our values of respect and sustainability. In 2021, the University published its first Irish Language Strategy and appointed its first Irish Language Officer.

Irish language programmes are delivered primarily through the Discipline of Irish and through Acadamh na hOllscolaíochta Gaeilge, our Irish language academy, which has three centres located in the Gaeltacht.

Regional Campuses
Research Sites
Medical Academies
Gaeltacht Centres

Our Region

Our regional footprint includes five Medical Academies, three Gaeltacht centres, off-campus research sites in Connemara and the Burren, and a satellite campus in Shannon College, Co. Clare.

Our Campus

The main University Campus, with an area of some 105 hectares in the heart of the city of

Galway, is attractively situated on the west bank of the River Corrib, and stretches from Nuns' Island in the south to the Sports Grounds in Dangan to the north. Other teaching and research facilities are located outside the city in An Cheathrú Rua, Carna and Mace Head in Connemara, in Shannon, Carron and Finnevara in Co. Clare, and in Gaoth Dobhair in Co. Donegal. The University's medical students and researchers benefit from on-the-ground Medical Academies located in hospitals throughout the region from Portiuncula University Hospital in Co. Galway to Letterkenny University Hospital in Co. Donegal.

Building for the Future: The University is in the process of finalising its masterplan for the years ahead, which will include the Nuns' Island creative and innovation district in Galway city centre. Recent years have seen some significant additions to campus, including:

- Clinical Simulation Facility: completed in 2022
- Dunlin Village on-campus student accommodation (674 beds): completed in 2022

The following construction projects have been commenced or approved in recent years:

- Learning Commons (new Library): construction commenced in 2024
- Water Sports Centre: planning permission approved in 2023

- New Law School: design for planning in progress
- New Pharmacy School: funded to planning stage
- New Medical School: funded to planning stage

Sustainability

Sustainability is one of the University's core values and we are recognised as a leader in the transition to a sustainable future. We are committed to the SDGs at an institutional level on multiple levels:

- As a signatory to the SDG Accord, we have committed 'to align all major efforts with the SDG targets and indicators, including through our education, research, leadership, operational and engagement activities' and to 'share our learning'.
- Our Climate Action and Sustainability Policy formalises our commitment 'to lead the transition to a sustainable future by embedding the SDGs into all our major efforts'.
- Our Sustainability Strategy 2021-2025, which is mapped to the SDGs, sets out our vision across the campus and beyond.

In the past three years we have been ranked First in Ireland and Top 50 worldwide in the Times Higher Education Impact Rankings for our progress on the SDGs. In 2023, we established a new Sustainability Office to lead the implementation of our Sustainability Strategy and to embed sustainability across our curriculum and operations.

Through the work of the University's Sustainability Office, the Community and University Sustainability Partnership, colleagues in Buildings and Estates and other university operations, and our Student Societies, we have advanced understanding and action on the urgent need for sustainability, using a Learn – Live – Lead model. Since 2006, we have achieved over 50% reduction in energy usage, exceeding our targets. In 2021, we established our carbon footprint, and we are actively working towards achieving carbon neutrality by 2050.