QUEEN'S UNIVERSITY BELFAST

FACULTY OF ENGINEERING AND PHYSICAL SCIENCES

QUEEN'S 25 – ENGINEERING AND PHYSICAL SCIENCES

INTERNATIONAL SUMMER SCHOOL

21 July to 15 August 2025

RUSSELL GROUP

WE'RE A RUSSELL GROUP UNIVERSITY
This means you'll be taught by world-leading academics and that your course content will be informed by the latest research, making it as relevant as it can be.

WE'RE IN THE UK'S BEST CITY
Queen's is based in Belfast, a buzzing capital city with the lowest student cost of living in the UK. *(Times and Sunday Times Good University Guide 2020).* What could be better?

YOU'LL FIND A PLACE TO BELONG
With over 200 student-led clubs and societies on campus, you are sure to find your tribe.

CONTENTS

EXPERIENCE FOUR WEEKS OF ACADEMIC AND CULTURAL ENRICHMENT WITH QUEEN'S UNIVERSITY BELFAST!

Join us for an unforgettable four weeks in Northern Ireland, where you can immerse yourself in a unique academic and cultural experience through our tailored summer school programmes. Each programme includes:

- **Specialised Academic Focus**: Dive deep into your chosen field with courses designed by world-leading academics, centered around impactful global research themes.
- **Professional Skills Development:** Enhance your career prospects with an additional programme focused on Careers, Employability, and Entrepreneurship.
- **Guaranteed Campus Accommodation:** Enjoy secure, comfortable living in our purpose-built student village, just a 15-minute walk from Queen's campus.
- **Cultural Exploration:** Discover Northern Ireland through engaging cultural field trips and a lively social programme, featuring a welcome reception and a traditional 'Ceilidh' Night with Irish music and dancing

Join us for a summer that promises to be both enriching and enjoyable!

Students can pursue their interests in one of seven tailored EPS summer school programmes:

- **CHEMISTRY AND CHEMICAL ENGINEERING**
- **PSYCHOLOGY**
- **MECHANICAL AND AEROSPACE ENGINEERING**
- **CIVIL ENGINEERING**
- **ELECTRONICS, ELECTRICAL ENGINEERING AND COMPUTER SCIENCE**
- **QUEEN'S BUSINESS SCHOOL**
- **MATHEMATICS AND PHYSICS**

OVERVIEW

	Week 1 (21 - 25 July)	Week 2 (28 - 1 August)	Week 3 (4 - 8 August)	Week 4 (11 - 15 August)
Monday	Welcome and Introduction PM: Welcome Dinner	School Programme	Free Day	Professional Skills
Tuesday	School Welcome and Introduction PM: PEC Induction	School Programme	School Programme	Professional Skills
Wednesday	School Programme	School Programme	School Programme	Professional Skills
Thursday	School Programme	School Programme	School Programme	Professional Skills PM: Farewell Dinner
Friday	Social trip	Social trip	Social trip	Next Steps and Round Up of Summer School
Saturday	Free Weekend	Free Weekend	Free Weekend	Departures
Sunday	Free Weekend	Free Weekend	Free Weekend	Departures

Chemistry and Chemical Engineering
Emerging Technologies in Sustainability and Healthcare

Programme Summary

Our summer school programme addresses global challenges like infectious diseases, drug resistance, energy depletion, and environmental issues through advanced chemistry and chemical engineering. Participants will engage in:

Seminars by experts on innovative solutions to global challenges.

Practical Labs with hands-on experiments to apply theoretical knowledge.

Computational Workshops on cutting-edge methods for analysing complex systems.

VR Labs offering immersive simulations of real-world problems and solutions.

Join us to learn how chemistry and chemical engineering can help tackle today's most critical issues!

Lecturer

Collective lecturers

Learning outcomes

Gain knowledge of sensors in disease diagnosis, next generation of antibiotics, and computer-aided molecular engineering and AI accelerated rational design. Gain insights of design, preparation of functional materials and their applications in sustainable development such as renewable energy, energy storage, CO2 capture/conversion. Gain critical thinking, problem-solving, teamwork skills from group-based workshops/mini-projects. Enhance scientific reporting skills.

Course Schedule

Day 1: School Welcome and Introduction
Day 2: Advanced materials
Day 3: Rational Molecular Engineering
Day 4: Pharma synthesis
Day 5: Batteries and fuels cells
Day 6: Sensors
Day 7: Hydrogen energy and conversion
Day 8: Future chemicals manufacturing
Day 9: Energy storage
Day 10: Renewables generation

Assessment

Assessment will involve the following elements.

Attendance 10%
Mini project 30%
Poster presentation 30%
Oral presentation 30%

Please note: this is a draft copy and is subject to change.

Psychology
Psychological Health and Wellbeing: Theory and Practice

Programme Summary

Explore the diverse ways psychology can be applied across a range of contexts, including trauma and resilience, sport and exercise, and animal psychology and welfare. Learn about how psychology can provide insight into human behaviour and into the human capacity for growth and building resilience. Our programme will include lectures, workshops, practical lab classes and a trip to the local zoo!

Learning outcomes

1. Gain an understanding of how psychologists measure aspects of the human mind.
2. Understand how trauma is defined and measured as well as how it relates to a variety of psychological outcomes.
3. Gain an understanding of the importance of patient and public involvement (PPI) in psychological research to ensure meaningful, acceptable, and relevant intervention development.
4. Understand how we can use psychology to enhance wellbeing and physical performance.
5. Gain an appreciation of some of the welfare problems facing animals in captivity, and observe how psychologists have made a difference.

Lecturer(s)

Professor Pauline Adair, Prof Armour, Dr Breslin, Dr Cena, Dr Corry, Dr Crossey, Dr Fino, Dr Walker, Dr Wells

Course Schedule

Day 1: School Welcome and Introduction
Day 2: Theory and Practice of Psychological Measurement
Day 3: Understanding Sport and Exercise Psychology
Day 4: Patient and Public Involvement in Research
Day 5: Trauma, Mental Health, and Posttraumatic Resilience
Day 6: Understanding health behaviour change to improve health and wellbeing
Day 7: Behaviour and welfare in zoo animals
Day 8: Exploring Dynamics of Acculturation
Day 9: Individual Differences: How Personality and Intelligence Affect Health and Wellbeing
Day 10: Assessment

Assessment

Assessment will involve the following elements.
Podcast 90%
Attendance..... 10%

Please note: this is a draft copy and is subject to change.

Mechanical and Aerospace Engineering
Low Carbon Transport

Programme Summary

The transportation of people and goods accounts for over 20% of global greenhouse gas emissions. To achieve a reduction in global warming, it is therefore vital that steps are taken to significantly reduce the emissions from this sector. In this Summer School we examine the sources of these greenhouse gases for the main transport categories (cars and vans, trucks and buses, shipping and aviation), and present the current research being applied at QUB to minimise the emissions from these sectors. Practical demonstrations in the School's state-of-the-art research facilities will be used to compliment the theoretical background to these technologies.

Learning outcomes

1. Understand the fundamental design aspects of key technologies used in transportation (batteries, fuel cells, internal combustion engines).
2. Understand the technologies used to provide sustainable energy for transport applications.
3. Identify and appraise suitable low-carbon fuels for specific transport applications.
4. Gain critical thinking, problem-solving, teamwork skills from group-based workshops.

Lecturer(s)

Collective Lecturers

Course Schedule

Day 1: School Welcome and Introduction
Day 2: Battery technology for transport applications
Day 3: Battery electric and fuel cell vehicle design
Day 4: Low-carbon buses
Day 5: Electricity generation for low-carbon transport
Day 6: Renewable electricity generation – site visit
Day 7: IC engine design for low fuel consumption
Day 8: Low-carbon fuels for heavy goods transport
Day 9: Low-carbon shipping
Day 10: Low-carbon aviation

Assessment

Assessment will involve the following elements.
Multiple Choice Questions per day (Day 2 to 10) 90%
Attendance. 10%

Please note: this is a draft copy and is subject to change.

Civil Engineering
Introduction to Net-Zero Civil Engineering

Programme Summary
Civil engineers develop and refine the technical skills and infrastructure essential for sustaining life while protecting both built and natural environments. The Civil Engineering programme offers a valuable opportunity to deepen your knowledge and experience in this crucial field. The course will blend theoretical learning with hands-on activities, including design and build projects and laboratory exercises. It will provide a comprehensive overview of net-zero civil engineering. Additionally, participants will gain insights into ongoing research within the school and explore future study opportunities.

Learning Outcomes
1. Understand the challenges associated with developing sustainable built environment.
2. Gain knowledge of tools and their application for evaluating existing and future construction projects.
3. Understanding of drivers influencing the pathway to net-zero in the built environment.
4. Gain experience in oral presentations.

Lecturer(s)
Collective lecturers

School Programme
Day 1: School Welcome and Introduction
Day 2: Net-Zero Engineering in the Built Environment
Day 3: Net-Zero Engineering in the Built Environment
Day 4: Net-Zero Engineering in the Built Environment
Day 5: Net-Zero Engineering in the Built Environment
Day 6: Net-Zero Engineering in the Built Environment
Day 7: Net-Zero Engineering in the Built Environment
Day 8: Net-Zero Engineering in the Built Environment
Day 9: Net-Zero Engineering in the Built Environment
Day 10: Net-Zero Engineering in the Built Environment

Assessment
Assessment will involve the following elements.
Presentation..... 40%
Group Assignmants 50%
Attendance..... 10%

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Electronics, Electrical Engineering and Computer Science

Cyber-Physical Intelligence: Microcontroller Programming, AI, and Cybersecurity

Programme Summary

Cyber-Physical systems have been emerged in the fourth industrial revolution. In Industry 4.0, artificial intelligence and cognitive computing capabilities are embedded into the design and simulation of real physical systems. The module is designed to introduce some important concepts of Cyber-Physical Intelligence. It will cover a variety of topics, ranging from microcontroller programming, designing control systems, cyber security and artificial intelligence.

Learning Outcomes

1. Introduction to microcontroller programming using 'C'.
2. Basic principles of interfacing digital and analogue circuits to microcontrollers.
3. Understand the design of simple feedback control systems.
4. Understanding of cyber security and landscape; Awareness of fundamental cyber security concept.
5. Understand about countermeasure and Impact and context of cyber security in society.

Lecturer(s)

Dr. Wasif Naeem, Dr. Son Thai Mai, Dr. Sanmi Olade, Dr. Tuan Anh Hoang

School Programme

Day 1: School Welcome and Introduction
Day 2: Introduction to microcontrollers and the Tinkercad simulation environment)
Day 3: Programming LED Series via Arduino
Day 4: Digital signal inputs and simple serial communications
Day 5: Introduction to 7-Segment Display Module
Day 6: Introduction to Audio and Temperature Sensor
Day 7: Microcontroller Lab Assessments
Day 8: Cyber Security landscape
Day 9: Cyber Risk and Secure Design Principle
Day 10: Cutting Edge Challenge in Cyber Security and Assessments

Assessment

Assessment will involve the following elements.
Practical and Multiple Choice Questions 90%
Attendance. 10%

Please note: this is a draft copy and is subject to change.

Queen's Business School
Responsible AI & Analytics for Business

Programme Summary
The "Responsible AI & Analytics for Business" Summer School module offers a comprehensive dive into modern business analytics, blending cutting-edge techniques with the essential ethical considerations of AI and data analysis. The module covers a broad range of topics, providing valuable insights into the rapidly evolving AI and analytics landscape.

A central focus is placed on responsible AI practices, such as fairness, transparency, accountability, and bias mitigation, ensuring the ethical application of AI in real-world business scenarios. Participants will gain hands-on experience with no-code tools, making analytics accessible even to those without prior coding knowledge.

Through interactive and practical labs and workshops, they will apply AI and analytics to solve real-world business challenges while critically examining the ethical considerations involved in responsible AI usage. By the end of the module, participants will have developed foundational knowledge, practical skills, and a strong awareness of the ethical landscape surrounding AI and business analytics.

Learning Outcomes
1. Develop a comprehensive understanding of core concepts in business analytics and AI, empowering informed decision-making.
2. Leverage no-code tools to creatively solve business challenges.
3. Identify and navigate ethical challenges surrounding AI and analytics, ensuring responsible and fair applications in business environments.
4. Effectively communicate data-driven insights, translating complex analyses into clear, actionable strategies for diverse stakeholders.
5. Assess the impact of AI and analytics on business performance.

Lecturer(s)
Collective lecturers

School Programme
Day 1: School Welcome and Introduction
Day 2: Fundamentals of Analytics + Workshop
Day 3: Large Language Models (NLP/NLU) + Lab
Day 4: Responsible AI for Business + Workshop
Day 5: HR Analytics I + Lab
Day 6: HR Analytics II + Lab
Day 7: Marketing Analytics I+ Lab
Day 8: F Marketing Analytics II+ Lab
Day 9: Data-Driven Decision-Making I + Lab
Day 10: Data-Driven Decision-Making II + Lab

Assessment
Assessment will involve the following elements.
10 MCQs per day (from Day 2 - Day 10) 90%
Attendance. 10%

Please note: this is a draft copy and is subject to change.

Mathematics and Physics
Numerical Modelling and Artificial Intelligence

Programme Summary
Explore how artificial intelligence and numerical modelling can help us understand the physical world around us, providing insights on the behaviour of complex systems and giving us predictive capability.

Learning Outcomes
1. Acquire working knowledge of the basics of artificial intelligence and machine learning algorithms
2. Gain experience in mathematical and numerical modelling of complex phenomena.
3. Develop critical thinking in assessing the predictions of numerical models.

Lecturer(s)
Dr. G Tribello, Dr. M. Streeter, Prof. G. Sarri

School Programme
Day 1: School Welcome and Introduction
Day 2: Basics of artificial intelligence and machine learning
Day 3: Basics of artificial intelligence and machine learning
Day 4: Examples of machine learning and AI applications
Day 5: Examples of machine learning and AI applications
Day 6: Machine learning and AI applications in everyday life
Day 7: Assessment #1: presentation
Day 8: An Introduction to atmospheric modelling
Day 9: An Introduction to atmospheric modelling
Day 10: Assessment #2: presentation

Assessment
Assessment will involve the following elements.
Attendance..... 10%
Presentation #1 ..... 45%
Presentation #2..... 45%

Please note: this is a draft copy and is subject to change.

PROFESSIONAL SKILLS

This module, offered in the final week, is designed to equip students with essential professional skills to enhance their career prospects. Delivered at the cutting-edge One Elmwood Student Centre and Students' Union, the Professional Skills module allows students to take advantage of a variety of facilities—whether studying in a tech-friendly environment or enjoying lunch at the SU Bar.

Innovation and entrepreneurship

A focus on innovation, entrepreneurship and creativity which will provide students with the skills they need to get involved in making real change in their industries.

Careers Development

Careers Employability and Skills will be delivering a dynamic series of workshops and activities, focussing on developing transferrable skills, foundational employability skills, and cultural awareness. Students will get the chance to work both in teams and individually, to explore essential topics such as presentation techniques, interpersonal skills, creativity, and communication and language skills. These interactive sessions will also involve facilitators from other teams within QUB, to better offer all participants practical insights and strategies to navigate the intricacies of their future careers.

WHY JOIN OUR SUMMER SCHOOL?

An experience like no other
Want a Russell Group education in an affordable, fun and friendly UK capital – all just one hour from London? We're a university that prioritises academic excellence and is dedicated to helping you discover your potential.

Achieve great things
Committed to excellence, we provide a world-class education for students from all backgrounds and nationalities. Recognised as one of the leading universities in the world *(qub.ac.uk/Study/Why-Study-at-Queens/greatest-achievements/)*, our aim is to inspire our students to be tomorrow's global citizens through leadership and citizenship. Our students go on to make significant contributions to society, a fact of which we are very proud.

RANKED IN THE TOP 200 UNIVERSITIES IN THE WORLD FOR IMPACT AND SUSTAINABILITY

(THE IMPACT RANKINGS 2024/QS WORLD UNIVERSITY RANKINGS 2024: SUSTAINABILITY)

NORTHERN IRELAND HAS THE LOWEST STUDENT LIVING COSTS IN THE UK

(SAVE THE STUDENT NATIONAL STUDENT MONEY SURVEY 2023)|

13TH IN THE UK FOR RESEARCH INTENSITY

(COMPLETE UNIVERSITY GUIDE 2025)

A MEMBER OF THE PRESTIGIOUS RUSSELL GROUP OF 24 UK RESEARCH INTENSIVE UNIVERSITIES

What our students say...

"Northern Ireland's vast natural landscapes and pleasant climate directly touched my soul and provided a soothing backdrop, creating a low-stress environment that resulted in a fulfilling life."

– Weitao Qi, Zhejiang University

"During this week, we encountered the beautiful campus, experienced the cuisines from different countries, immersed ourselves in the rich courses, and gained a lot. Everything here filled us with novelty and excitement."

– Staff Member on Group Visit, Hangzhou Dianzi University

ACCOMMODATION

Your accommodation will be provided throughout the programme at Queen's Accommodation, Elms BT9, a purpose-built student village just a 15-minute walk from Queen's campus.

Situated in a residential area, each student will have their own ensuite bedroom while sharing a common room and kitchen with fellow summer school participants.

The village features the Treehouse, the central social hub for residents, complete with a coffee bar, snooker and pool tables, table tennis, a TV lounge, a games and karaoke room, as well as computers and high-speed internet. Recently refurbished, the Treehouse is an ideal spot to relax and socialize with friends during the summer school.

You'll enjoy living in a vibrant student community, with the lively nightlife of Queen's Quarter right at your doorstep. Additionally, there's a self-service laundry facility on-site, equipped with washing machines, dryers, irons, and ironing boards for your convenience.

Queen's Accommodation includes:

- 29 nights at Queen's Student Accommodation, Elms BT9 available from Friday 18 July to Saturday 16 August 2025
- Private ensuite bedroom
- Off-peak gym membership
- Utility bills
- High Speed Wi-Fi
- Bed linen and towels
- Communal kitchen and common room with a TV and kitchen equipment
- Weekly cleaning of communal areas
- 24-hour safety staff
- Reception (8am - 8pm, 7 days a week)

SCAN HERE FOR MORE ABOUT QUEEN'S ACCOMMODATION

or visit qub.ac.uk/accommodation/student-accommodation/elms-bt9

ENTRY REQUIREMENTS AND FEES

Entry Requirements

- The summer school is tailored for students currently in the first or second year of their undergraduate studies in a subject area relevant to their chosen programme.
- Students for whom English is not their first language must possess strong written and spoken English skills to fully engage with their selected summer school programme.

FEES

The tuition fee includes full tuition, field trips and social events including meals as well as complimentary airport pick up and drop off.

We are offering an early confirmation award of £150 discount off the tuition fee for payment received in full by the appropriate deadline.

Early Confirmation Fee Payment before Friday 4 April 2025	£1400
Regular Fee Payment from Saturday 5 April 2025	£1550

The deadline for payment is Friday 2 May 2025

ACCOMMODATION FEES

The accommodation fee includes 29 nights in Queen's accommodation and will be available from Friday 18 July to Saturday 16 August 2025. If you plan to stay with us in Belfast a few extra days, additional nights can be purchased.

Accommodation Fee	£1400
Additional Nights	£48 per night

APPLICATION INFORMATION

Whether you are a student applying individually or you are a member of staff from a university who would like to send a group of students, we would love to welcome you!

The deadline for applications is Friday 25 April 2025.

The deadline for full payment is Friday 2 May 2025

In order to apply for the EPS Summer School, students must complete the simple online form on the 'Apply Now' tab of the website.

Group Bookings

If you work with an institution and wish to register a group of students for the summer school, we would be delighted to assist you.

For further information, please contact us at epssummerschool@qub.ac.uk

Individual Applications

After you complete the online application form, we may reach out to request additional information. Once you receive notification of your successful application, you will be asked to make the full payment. After we receive your payment, you will be required to provide your passport details to obtain your visa support letter.

Please note that our programmes can fill up quickly, so we operate on a *first come, first served* basis. Your place on the programme cannot be held or guaranteed until the fee is paid.

*Before you apply please make sure you have read and agreed to our terms and conditions.

SCAN HERE TO VIEW OUR TERMS OF SERVICE

or visit

qub.ac.uk/Study/TermsandConditions/

Visa Information

We aim to provide visa support letters at the beginning of May to allow students around two months to apply for their visas. This should allow you sufficient time to have everything in order for their arrival at Queen's.

LOYALTY SCHOLARSHIP

Students who have attended the EPS Summer School who return to an undergraduate programme via one of our collaboration models or a full-time postgraduate taught programme, receive a 20% tuition fee reduction on first year of study.

Exclusions apply

20% tuition fee reduction on year 1

Application necessary

Queen's Loyalty Scholarship can only be used once and cannot be used in conjunction with other scholarships.

CONTACT

We would love to hear from you. If you have any questions or require further information, please do not hesitate to get in touch with a member of our team: epssummerschool@qub.ac.uk

APPLY NOW

SCAN HERE TO APPLY

or visit qub.ac.uk/about/Leadership-and-structure/Faculties-and-Schools/Engineering-and-Physical-Sciences/EPS/

QUEEN'S UNIVERSITY BELFAST

qub.ac.uk

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SHAPING A BETTER WORLD SINCE 1845