EPSRC Research Areas

An A-Z list of all EPSRC research areas. On each research area page you will find a description of the area, along with details of, and reasons for, the strategic actions EPSRC intends to take.

Algebra
Algebra stems from the study of equations, their solutions and associated operations and symmetries, including group theory, representation theory and ring theory.

Analytical science
Development of novel techniques, or novel application of existing techniques, to analyse chemical or biological matter and systems, for example.

Antihydrogen
The study of antimatter physics by the production of atomic systems containing antiparticles.

Architectures and operating systems
Explores the operational structure of a system and the software which abstracts a system's hardware and presents a precise interface to higher levels of software/applications.

Artificial intelligence technologies
The reproduction or surpassing of abilities (in computational systems) that would require 'intelligence' if humans were to perform them.

Assistive technology, rehabilitation and musculoskeletal biomechanics
Assistive Technology research aims to restore human function and/or enable independence for older people, the disabled and those with long-term conditions. Musculoskeletal Biomechanics is the study of forces and their effects on the musculoskeletal system.

Bioenergy
The thermochemical conversion of biomass to energy vectors (e.g. heat, electricity and liquid fuels).

Biological informatics
Understanding information processing in biological systems.

Biomaterials and tissue engineering
The application of engineering methods to create environments and/or materials that promote cell or tissue growth and function, in vitro and in vivo.

Biophysics and soft matter physics
Biophysics combines approaches from physics with biological questions and hypotheses; Soft Matter Physics investigates soft condensed matter systems.

Built environment
Quantitative engineering research into the design and operation of buildings and the construction processes involved.

Carbon capture and storage
The capture of carbon dioxide (CO2) produced, for example, by power stations and energy-intensive industry and its secure long-term storage.

Catalysis
Development of new Catalysis concepts and catalytic processes, preparation of new/improved catalysts and studies to understand catalytic mechanisms.

Chemical biology and biological chemistry
Development of novel chemical tools and technologies for the understanding of biology and the synthesis of biological and biologically active molecules.

Chemical reaction dynamics and mechanisms
The study of rates and mechanisms of chemical reactions in gas and solution phase, and at surfaces.

Clinical technologies (excluding imaging)
Encompasses a range of areas (e.g. sensors, instrumentation, modelling, materials, and drug delivery) relevant to the development of new healthcare device solutions for the diagnosis, prevention, treatment, and monitoring of disease, injury, or disability.

Coastal and waterway engineering
Research into coastal/waterway structures, management and flood defences, estuarine engineering, reservoir/dam engineering and hydrodynamics.

Cold atoms and molecules
Theoretical and experimental studies of atomic and molecular species cooled to sub-millikelvin temperatures and their science applications.

Combustion engineering
The addressing of engineering challenges related to combustion dynamics through multi-scale modelling and experimental approaches.

Complex fluids and rheology
Characterisation, modelling, formulation and processing of complex fluids (e.g. blood, creams, pastes and emulsions).

Computational and theoretical chemistry
The study of chemistry by computational or theoretical means and/or development of new computational and theoretical methods.

Condensed matter: electronic structure
Research into the links between electronic structure and material properties.

Condensed matter: magnetism and magnetic materials
Research into the fundamental physics of magnetism and into magnetic materials.

Continuum mechanics
Research into mathematical approaches to the modelling and study of continuous media.

Control engineering
Encompasses theories, methodologies and tools for modelling, analysis, design and optimisation of self-regulating systems, with an emphasis on uncertainty and robustness of feedback systems. This research area underpins a number of others across the engineering and physical sciences research base.

Databases
Theoretical foundations of databases and research into data management systems, distributed information management and query languages.

Digital signal processing
The theory, algorithms and architectures for processing data and signals and the information they carry.

Electrical motors and drives / electromagnetics
Design and manufacture of electromechanical systems and their accompanying power electronic drives and controls.

Electrochemical sciences
The study of chemical phenomena associated with charge transfer, charge separation and electrochemical reactions at interfaces.

End use energy demand (energy efficiency)
Research into energy demand and its reduction through technical and socio-economic measures. It includes research in the context of the built environment, transport, heat, industrial processes and products.

Energy networks
Assesses the effects of decarbonisation on the existing energy supply and transmission networks and how future network technologies will deal with these challenges.

Energy storage
The study of materials and systems which store electrochemical, thermal or kinetic energy for later use.

Engineering design
Theories, methods and tools for generating, modelling, optimising, simulating and reasoning about complex engineered systems.

Fluid dynamics and aerodynamics
All aspects of fundamental fluid dynamics research applied to aerodynamics, hydrodynamics, turbulence and areas relevant to process engineering.

Fossil fuel power generation
The study of fundamental, generic and applied concepts concerning the conversion of coal, oil and gas into electricity for grid use, and the integration of these technologies into the renewable sector.

Fuel cell technology
The study of devices which generate electricity directly through the oxidation of fuel.

Functional ceramics and inorganics
Synthesis, characterisation and theoretical understanding of functional ceramic and inorganic materials.

Geometry and topology
The study of shape and form, including algebraic geometry, algebraic topology, geometric topology and geometric group theory, differential geometry and geometric analysis.

Graphene and carbon nanotechnology
Synthesis, characterisation and theoretical understanding of graphene, carbon nanotubes and other carbon-based nanomaterials.

Graphics and visualisation
Synthesis and manipulation of visual content, including augmented/virtual reality, animation, immersive technologies and novel ways of visualising data.

Ground engineering
Understanding and tackling challenges relating to ground and underground structures, geotechnics and environmental/hazardous aspects of structures.

Human communication in ICT
The study of how humans interact with each other and how an understanding of these interactions can improve the design and development of ICT.

Human-computer interaction
The study of how humans interact with computers and how to design computer systems that are effective for people to use.

Hydrogen and alternative energy vectors
Generation, storage and utilisation of synthetic chemical energy carriers and synthetic fuels (e.g. hydrogen).

ICT networks and distributed systems
Aspects of enabling research that relate to the interconnectivity (wired or wireless) of computers, devices and sensors.

Image and vision computing
The theory and fundamental underpinning of Image and Vision Computing in both 2D and 3D, across the electromagnetic spectrum.

Information systems
Management, retrieval and representation of information and knowledge.

Infrastructure and urban systems
Quantitative engineering research relating to the development of resilient infrastructure and urban systems.

Light matter interaction and optical phenomena
Theoretical and experimental research in atom-light interactions, laser trapping, optical tweezers, spanners, traps and atomic optics.

Logic and combinatorics

Logic includes model theory, recursion theory, proof theory and set theory. Combinatorics is concerned with the study of discrete structures such as graphs and hypergraphs.

Manufacturing technologies

Technologies that will allow manufacturing processes, products and systems to function with high efficiency/reliability and appropriate precision/flexibility.

Marine wave and tidal

The study and research of devices and systems to capture and utilise the kinetic or oscillatory energy of bodies of water.

Materials engineering - ceramics

Understanding, modelling and processing ceramics with respect to the properties, performance, behaviour and development of novel materials.

Materials engineering - composites

Understanding, modelling and processing composites with respect to the properties, performance, behaviour and development of novel materials.

Materials engineering - metals and alloys

Understanding, modelling and processing of metals and alloys with respect to the properties and material behaviour and development of novel materials.

Materials for energy applications

Synthesis, characterisation and theoretical understanding of functional materials to be used in energy applications.

Mathematical analysis

Quantifying change, with a key role played by fundamental notions of continuity and approximation.

Mathematical biology

Mathematical Biology covers research into the development and application of state-of-the-art mathematical or statistical tools and techniques to investigate biological processes and systems, including those of relevance to the medical sciences.

Mathematical physics

Developing new mathematics inspired by, or relevant to, physics.

Medical imaging (including medical image and vision computing)

Research into medical imaging instruments and signals for therapeutic, monitoring and diagnostic purposes, and includes image analysis.

Microelectronic device technology

Research into electronic devices for processing information, including new applications, new materials and the integration of novel technologies into electronic components.

Microelectronics design

Research into all aspects of microelectronics design, from the development of novel designs to research into design tools, processes and design automation.

Microsystems
A broad spectrum of underpinning micro-engineering research aimed at developing novel miniaturised micro-structured devices.

Music and acoustic technology
Sound (including music and other natural and artificial sounds, except speech) and its intersection with computer science.

Natural language processing
The exploration of computational techniques to learn, understand and produce human language content.

Non-linear systems
Research into the mathematical treatment of systems which do not satisfy the principle of superposition (i.e. systems where the outputs are not directly proportional to the inputs).

Nuclear fission
Research into issues concerning the generation of electricity by harnessing energy released when an atom’s nucleus splits.

Number theory
The study of the properties of integers, using the tools of modern mathematics to address many basic unanswered questions.

Numerical analysis
Research into the development, analysis and implementation of algorithms that harness numerical approaches to mathematical problems.

Operational research
Development and application of advanced analytical methods to support improved decision-making, especially in relation to the operation of complex and uncertain systems.

Optical communications
Novel techniques and systems for transporting information by fibre-guided or free-space photons, including analogue and digital signals.

Optical devices and subsystems
Design, modelling, fabrication, processing and evaluation of new or improved devices and systems whose quantum unit is the photon.

Optoelectronic devices and circuits
Design, modelling, fabrication and processing of new or improved active semiconductor-based devices and systems that use electrons and photons.

Particle technology
Growth, formation, processing, measurement, characterisation and multi-scale modelling of dry or wet particulate systems and fluid-particle systems.

Performance and inspection of mechanical structures and systems
Development, analysis, monitoring and optimisation of mechanical structures and systems.

Pervasive and ubiquitous computing

This research area refers to the integration of computing into everyday objects to create systems which support concepts such as the Internet of Things, edge computing and the tactile internet.

Photonic materials

Synthesis, characterisation and theoretical understanding of materials and nanostructures that emit or interact with electromagnetic radiation or quasiparticles with similar characteristics.

Plasma and lasers

Research into both high-temperature, high-density plasmas magnetically confined or laser-produced, and low-temperature, low-density plasmas.

Polymer materials

Synthesis, characterisation and theoretical understanding of novel Polymer Materials.

Process systems: components and integration

Design, operation, modelling, control and optimisation of chemical, physical and biological bulk-product processes that are conducted continuously or repeatedly.

Programming languages and compilers

Design of programming languages, development of the relevant mathematical theories, the processing of these and the generation of code.

Quantum devices, components and systems

Quantum devices, components and systems involve the creation, control and manipulation of quantum states to design systems with functionality that could not be achieved in a non-quantum world.

Quantum fluids and solids

Theoretical and experimental study of superfluids (typically helium), encompassing investigation of a range of their properties.

Quantum optics and information

Understanding and control of the behaviour and interactions of light and matter in terms of quantum mechanics in optical and atomic systems, and the fundamental science of generation, use and manipulation of quantum information.

RF and microwave communications

Techniques and applications that utilise and propagate signals, and related research supporting future connected infrastructure.

RF and microwave devices

Design and development of novel device architectures throughout the radio frequency, microwave, millimetre wave and terahertz domain.

Robotics

The novel physical design and development of robotic systems, for both fundamental and applied purposes.

Sensors and instrumentation

Development, optimisation and integration of devices that detect and measure changes in temperature, pressure, vibration and light, for example.

Software engineering
Research into the design, implementation and maintenance of software.

Solar technology
Research and development of devices to harness incident solar radiation for conversion to other energy vectors or for direct use.

Speech technology
Recognition, understanding and synthesis of human speech, using a range of techniques and focusing on how systems recognise and generate the sounds of language.

Spintronics
The study of the property of electrons known as 'spin' and its potential exploitation in specially designed devices.

Statistics and applied probability
Statistical methodology and development of new probabilistic techniques inspired by applications.

Structural engineering
Addressing the civil engineering challenges associated with construction materials, structural analysis, and extreme events and structural resilience.

Superconductivity
Synthesis, characterisation and fundamental physics of superconducting materials and devices.

Surface science
Understanding the structure, processes, dynamics and functionality of surfaces and interfaces, and how they determine chemical / physical properties.

Synthetic biology
The application of engineering tools and principles to design and engineer novel biologically-based parts, devices and systems that do not exist in the natural world, as well as the redesign of existing natural biological systems for useful purposes.

Synthetic coordination chemistry
Design and synthesis of novel coordination complexes and ligands, and development of novel synthetic methodologies.

Synthetic organic chemistry
Devising new ways to design and synthesise organic molecules.

Synthetic supramolecular chemistry
With a focus on structures comprising several or many molecules, design and synthesis of chemical systems using molecular self-assembly and recognition.

Theoretical computer science
Explores the fundamental and foundational aspects of computers and computation.

UK Magnetic Fusion Research Programme

This research area comprises the funding for UK Atomic Energy Agency (UKAEA) for the UK Magnetic Fusion Research Programme.

Verification and correctness

Aims to demonstrate the correctness of systems and covers both formal and software verification.

Vision, hearing and other senses

Studies of the biology and psychology of human vision, hearing and other senses, to underpin design/implementation of human-computer interfaces.

Water engineering

Design/optimisation of technologies relating to water resource management, treatment and distribution systems (including waste water and sewerage).

Whole energy systems

Aims to develop cohesion and understanding of Whole Energy Systems and specifically the whole UK energy system.

Wind power

The design, development, deployment, operation and maintenance of machines that generate clean electricity by harnessing the kinetic energy of moving air.