Panel structure 2024 calls

Physical Sciences and Engineering

**PE1**  Mathematics
All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics

- PE1_1 Logic and foundations
- PE1_2 Algebra
- PE1_3 Number theory
- PE1_4 Algebraic and complex geometry
- PE1_5 Lie groups, Lie algebras
- PE1_6 Geometry and global analysis
- PE1_7 Topology
- PE1_8 Analysis
- PE1_9 Operator algebras and functional analysis
- PE1_10 ODE and dynamical systems
- PE1_11 Theoretical aspects of partial differential equations
- PE1_12 Mathematical physics
- PE1_13 Probability
- PE1_14 Mathematical statistics
- PE1_15 Generic statistical methodology and modelling
- PE1_16 Discrete mathematics and combinatorics
- PE1_17 Mathematical aspects of computer science
- PE1_18 Numerical analysis
- PE1_19 Scientific computing and data processing
- PE1_20 Control theory, optimisation and operational research
- PE1_21 Application of mathematics in sciences
- PE1_22 Application of mathematics in industry and society

**PE2**  Fundamental Constituents of Matter
Particle, nuclear, plasma, atomic, molecular, gas, and optical physics

- PE2_1 Theory of fundamental interactions
- PE2_2 Phenomenology of fundamental interactions
- PE2_3 Experimental particle physics with accelerators
- PE2_4 Experimental particle physics without accelerators
- PE2_5 Classical and quantum physics of gravitational interactions
- PE2_6 Nuclear, hadron and heavy ion physics
- PE2_7 Nuclear and particle astrophysics
- PE2_8 Gas and plasma physics
- PE2_9 Electromagnetism
- PE2_10 Atomic, molecular physics
- PE2_11 Ultra-cold atoms and molecules
- PE2_12 Optics, non-linear optics and nano-optics
- PE2_13 Quantum optics and quantum information
- PE2_14 Lasers, ultra-short lasers and laser physics
- PE2_15 Thermodynamics
- PE2_16 Non-linear physics
- PE2_17 Metrology and measurement
- PE2_18 Equilibrium and non-equilibrium statistical mechanics: steady states and dynamics
**PE3**  **Condensed Matter Physics**
Structure, electronic properties, fluids, nanosciences, biological physics

PE3_1  Structure of solids, material growth and characterisation
PE3_2  Mechanical and acoustical properties of condensed matter, lattice dynamics
PE3_3  Transport properties of condensed matter
PE3_4  Electronic properties of materials, surfaces, interfaces, nanostructures
PE3_5  Physical properties of semiconductors and insulators
PE3_6  Macroscopic quantum phenomena, e.g. superconductivity, superfluidity, quantum Hall effect
PE3_7  Spintronics
PE3_8  Magnetism and strongly correlated systems
PE3_9  Condensed matter – beam interactions (photons, electrons, etc.)
PE3_10 Nanophysics, e.g. nanoelectronics, nanophotonics, nanomagnetism, nanoelectromechanics
PE3_11 Mesoscopic quantum physics and solid-state quantum technologies
PE3_12 Molecular electronics
PE3_13 Structure and dynamics of disordered systems, e.g. soft matter (gels, colloids, liquid crystals), granular matter, liquids, glasses, defects
PE3_14 Fluid dynamics (physics)
PE3_15 Statistical physics: phase transitions, condensed matter systems, models of complex systems, interdisciplinary applications
PE3_16 Physics of biological systems

**PE4**  **Physical and Analytical Chemical Sciences**
Analytical chemistry, chemical theory, physical chemistry/chemical physics

PE4_1  Physical chemistry
PE4_2  Spectroscopic and spectrometric techniques
PE4_3  Molecular architecture and Structure
PE4_4  Surface science and nanostructures
PE4_5  Analytical chemistry
PE4_6  Chemical physics
PE4_7  Chemical instrumentation
PE4_8  Electrochemistry, electrodialysis, microfluidics, sensors
PE4_9  Method development in chemistry
PE4_10 Heterogeneous catalysis
PE4_11 Physical chemistry of biological systems
PE4_12 Chemical reactions: mechanisms, dynamics, kinetics and catalytic reactions
PE4_13 Theoretical and computational chemistry
PE4_14 Radiation and Nuclear chemistry
PE4_15 Photochemistry
PE4_16 Corrosion
PE4_17 Characterisation methods of materials
PE4_18 Environment chemistry

**PE5**  **Synthetic Chemistry and Materials**
New materials and new synthetic approaches, structure-properties relations, solid state chemistry, molecular architecture, organic chemistry

PE5_1  Structural properties of materials
PE5_2  Solid state materials chemistry
PE5_3  Surface modification
PE5_4  Thin films
PE5_5  Ionic liquids
PE5_6  New materials: oxides, alloys, composite, organic-inorganic hybrid, nanoparticles
PE5_7  Biomaterials synthesis
Intelligent materials synthesis – self assembled materials
Coordination chemistry
Colloid chemistry
Biological chemistry and chemical biology
Chemistry of condensed matter
Homogeneous catalysis
Macromolecular chemistry
Polymer chemistry
Supramolecular chemistry
Organic chemistry
Medicinal chemistry

Computer Science and Informatics
Informatics and information systems, computer science, scientific computing, intelligent systems

Computer architecture, embedded systems, operating systems
Distributed systems, parallel computing, sensor networks, cyber-physical systems
Software engineering, programming languages and systems
Theoretical computer science, formal methods, automata
Security, privacy, cryptology, quantum cryptography
Algorithms and complexity, distributed, parallel and network algorithms, algorithmic game theory
Artificial intelligence, intelligent systems, natural language processing
Computer graphics, computer vision, multimedia, computer games
Human computer interaction and interface, visualisation
Web and information systems, data management systems, information retrieval and digital libraries, data fusion
Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)
Scientific computing, simulation and modelling tools
Bioinformatics, bio-inspired computing, and natural computing
Quantum computing (formal methods, algorithms and other computer science aspects)

Systems and Communication Engineering
Electrical, electronic, communication, optical and systems engineering

Control engineering
Electrical engineering: power components and/or systems
Simulation engineering and modelling
(Micro- and nano-) systems engineering
(Micro- and nano-) electronic, optoelectronic and photonic components
Communication systems, wireless technology, high-frequency technology
Signal processing
Networks, e.g. communication networks and nodes, Internet of Things, sensor networks, networks of robots
Man-machine interfaces
Robotics
Components and systems for applications (in e.g. medicine, biology, environment)
Electrical energy production, distribution, applications
**PE8**  **Products and Processes Engineering**
Product and process design, chemical, civil, environmental, mechanical, vehicle engineering, energy processes and relevant computational methods

PE8_1  Aerospace engineering  
PE8_2  Chemical engineering, technical chemistry  
PE8_3  Civil engineering, architecture, offshore construction, lightweight construction, geotechnics  
PE8_4  Computational engineering  
PE8_5  Fluid mechanics  
PE8_6  Energy processes engineering  
PE8_7  Mechanical engineering  
PE8_8  Propulsion engineering, e.g. hydraulic, turbo, piston, hybrid engines  
PE8_9  Production technology, process engineering  
PE8_10  Manufacturing engineering and industrial design  
PE8_11  Environmental engineering, e.g. sustainable design, waste and water treatment, recycling, regeneration or recovery of compounds, carbon capture & storage  
PE8_12  Naval/marine engineering  
PE8_13  Industrial bioengineering  
PE8_14  Automotive and rail engineering; multi-/inter-modal transport engineering

**PE9**  **Universe Sciences**
Astro-physics/-chemistry/-biology; solar system; planetary systems; stellar, galactic and extragalactic astronomy; cosmology; space sciences; astronomical instrumentation and data

PE9_1  Solar physics – the Sun and the heliosphere  
PE9_2  Solar system science  
PE9_3  Exoplanetary science, formation and characterization of extrasolar planets  
PE9_4  Astrobiology  
PE9_5  Interstellar medium and star formation  
PE9_6  Stars – stellar physics, stellar systems  
PE9_7  The Milky Way  
PE9_8  Galaxies – formation, evolution, clusters  
PE9_9  Cosmology and large-scale structure, dark matter, dark energy  
PE9_10  Relativistic astrophysics and compact objects  
PE9_11  Gravitational wave astronomy  
PE9_12  High-energy and particle astronomy  
PE9_13  Astronomical instrumentation and data, e.g. telescopes, detectors, techniques, archives, analyses
**PE10  Earth System Science**

Physical geography, geology, geophysics, atmospheric sciences, oceanography, climatology, cryology, ecology, global environmental change, biogeochemical cycles, natural resources management

PE10_1 Atmospheric chemistry, atmospheric composition, air pollution
PE10_2 Meteorology, atmospheric physics and dynamics
PE10_3 Climatology and climate change
PE10_4 Terrestrial ecology, land cover change
PE10_5 Geology, tectonics, volcanology
PE10_6 Palaeoclimatology, palaeoecology
PE10_7 Physics of earth’s interior, seismology, geodynamics
PE10_8 Oceanography (physical, chemical, biological, geological)
PE10_9 Biogeochemistry, biogeochemical cycles, environmental chemistry
PE10_10 Mineralogy, petrology, igneous petrology, metamorphic petrology
PE10_11 Geochemistry, cosmochemistry, crystal chemistry, isotope geochemistry, thermodynamics
PE10_12 Sedimentology, soil science, palaeontology, earth evolution
PE10_13 Physical geography, geomorphology
PE10_14 Earth observations from space/remote sensing
PE10_15 Geomagnetism, palaeomagnetism
PE10_16 Ozone, upper atmosphere, ionosphere
PE10_17 Hydrology, hydrogeology, engineering and environmental geology, water and soil pollution
PE10_18 Cryosphere, dynamics of snow and ice cover, sea ice, permafrosts and ice sheets
PE10_19 Planetary geology and geophysics
PE10_20 Geohazards
PE10_21 Earth system modelling and interactions

**PE11  Materials Engineering**

Advanced materials development: performance enhancement, modelling, large-scale preparation, modification, tailoring, optimisation, novel and combined use of materials, etc.

PE11_1 Engineering of biomaterials, biomimetic, bioinspired and bio-enabled materials
PE11_2 Engineering of metals and alloys
PE11_3 Engineering of ceramics and glasses
PE11_4 Engineering of polymers and plastics
PE11_5 Engineering of composites and hybrid materials
PE11_6 Engineering of carbon materials
PE11_7 Engineering of metal oxides
PE11_8 Engineering of alternative established or emergent materials
PE11_9 Nanomaterials engineering, e.g. nanoparticles, nanoporous materials, 1D & 2D nanomaterials
PE11_10 Soft materials engineering, e.g. gels, foams, colloids
PE11_11 Porous materials engineering, e.g. covalent-organic, metal-organic, porous aromatic frameworks
PE11_12 Semi-conducting and magnetic materials engineering
PE11_13 Metamaterials engineering
PE11_14 Computational methods for materials engineering
## Life Sciences

**LS1**  **Molecules of Life: Biological Mechanisms, Structures and Functions**

*For all organisms:*
Molecular biology, biochemistry, structural biology, molecular biophysics, synthetic and chemical biology, drug design, innovative methods and modelling

| LS1_1  | Macromolecular complexes including interactions involving nucleic acids, proteins, lipids and carbohydrates |
| LS1_2  | Biochemistry |
| LS1_3  | DNA and RNA biology |
| LS1_4  | Protein biology |
| LS1_5  | Lipid biology |
| LS1_6  | Glycobiology |
| LS1_7  | Molecular biophysics, biomechanics, bioenergetics |
| LS1_8  | Structural biology |
| LS1_9  | Molecular mechanisms of signalling processes |
| LS1_10 | Synthetic biology |
| LS1_11 | Chemical biology |
| LS1_12 | Protein design |
| LS1_13 | Early translational research and drug design |
| LS1_14 | Innovative methods and modelling in molecular, structural and synthetic biology |

**LS2**  **Integrative Biology: from Genes and Genomes to Systems**

*For all organisms:*
Genetics, epigenetics, genomics and other ‘omics studies, bioinformatics, systems biology, genetic diseases, gene editing, innovative methods and modelling, ‘omics for personalised medicine

| LS2_1  | Genetics |
| LS2_2  | Gene editing |
| LS2_3  | Epigenetics |
| LS2_4  | Gene regulation |
| LS2_5  | Genomics |
| LS2_6  | Metagenomics |
| LS2_7  | Transcriptomics |
| LS2_8  | Proteomics |
| LS2_9  | Metabolomics |
| LS2_10 | Glycomics/Lipidomics |
| LS2_11 | Bioinformatics and computational biology |
| LS2_12 | Biostatistics |
| LS2_13 | Systems biology |
| LS2_14 | Genetic diseases |
| LS2_15 | Integrative biology for personalised medicine |
| LS2_16 | Innovative methods and modelling in integrative biology |
### LS3  Cell Biology, Development, Stem Cells and Regeneration

*For all organisms:*

Structure and function of the cell, cell-cell communication, embryogenesis, tissue differentiation, organogenesis, growth, development, evolution of development, organoids, stem cells, regeneration, therapeutic approaches

| LS3_1  | Cell cycle, cell division and growth |
| LS3_2  | Cell senescence, cell death, autophagy, cell ageing |
| LS3_3  | Cell behaviour, including control of cell shape, cell migration |
| LS3_4  | Cell junctions, cell adhesion, the extracellular matrix, cell communication |
| LS3_5  | Cell signalling and signal transduction, exosome biology |
| LS3_6  | Organelle biology and trafficking |
| LS3_7  | Mechanobiology of cells, tissues and organs |
| LS3_8  | Embryogenesis, pattern formation, morphogenesis |
| LS3_9  | Cell differentiation, formation of tissues and organs |
| LS3_10 | Developmental genetics |
| LS3_11 | Evolution of developmental strategies |
| LS3_12 | Organoids |
| LS3_13 | Stem cells |
| LS3_14 | Regeneration |
| LS3_15 | Development of cell-based therapeutic approaches for tissue regeneration |
| LS3_16 | Functional imaging of cells and tissues |
| LS3_17 | Theoretical modelling in cellular, developmental and regenerative biology |

### LS4  Physiology in Health, Disease and Ageing

Organ and tissue physiology, comparative physiology, physiology of ageing, pathophysiology, inter-organ and tissue communication, endocrinology, nutrition, metabolism, interaction with the microbiome, non-communicable diseases including cancer (and except disorders of the nervous system and immunity-related diseases)

| LS4_1  | Organ and tissue physiology and pathophysiology |
| LS4_2  | Comparative physiology |
| LS4_3  | Physiology of ageing |
| LS4_4  | Endocrinology |
| LS4_5  | Non-hormonal mechanisms of inter-organ and tissue communication |
| LS4_6  | Microbiome and host physiology |
| LS4_7  | Nutrition and exercise physiology |
| LS4_8  | Impact of stress (including environmental stress) on physiology |
| LS4_9  | Metabolism and metabolic disorders, including diabetes and obesity |
| LS4_10 | The cardiovascular system and cardiovascular diseases |
| LS4_11 | Haematopoiesis and blood diseases |
| LS4_12 | Cancer |
| LS4_13 | Other non-communicable diseases (except disorders of the nervous system and immunity-related diseases) |
LS5  Neuroscience and Disorders of the Nervous System
Nervous system development, homeostasis and ageing, nervous system function and dysfunction, systems neuroscience and modelling, biological basis of cognitive processes and of behaviour, neurological and mental disorders
– In humans and all other organisms

LS5_1 Neuronal cells
LS5_2 Glial cells and neuronal-glial communication
LS5_3 Neural development and related disorders
LS5_4 Neural stem cells
LS5_5 Neural networks and plasticity
LS5_6 Neurovascular biology and blood-brain barrier
LS5_7 Sensory systems, sensation and perception, including pain
LS5_8 Neural basis of behaviour (e.g. sleep, consciousness, addiction)
LS5_9 Neural basis of cognition (e.g. learning, memory, attention, emotions, speech)
LS5_10 Ageing of the nervous system
LS5_11 Neurological and neurodegenerative disorders
LS5_12 Mental disorders
LS5_13 Nervous system injuries and trauma, stroke
LS5_14 Repair and regeneration of the nervous system
LS5_15 Neuroimmunology, neuroinflammation
LS5_16 Systems and computational neuroscience (e.g. modelling, simulation, brain oscillations, connectomics)
LS5_17 Imaging in neuroscience
LS5_18 Innovative methods and tools for neuroscience

LS6  Immunity, Infection and Immunotherapy
The immune system, related disorders and their mechanisms, biology of infectious agents and infection, biological basis of prevention and treatment of infectious diseases, innovative immunological tools and approaches, including therapies

LS6_1 Innate immunity
LS6_2 Adaptive immunity
LS6_3 Regulation of the immune response
LS6_4 Immune-related diseases
LS6_5 Biology of pathogens (e.g. bacteria, viruses, parasites, fungi)
LS6_6 Infectious diseases
LS6_7 Mechanisms of infection
LS6_8 Biological basis of prevention and treatment of infection
LS6_9 Antimicrobials, antimicrobial resistance
LS6_10 Vaccine development
LS6_11 Innovative immunological tools and approaches, including therapies

LS7  Prevention, Diagnosis and Treatment of Human Diseases
Medical technologies and tools for prevention, diagnosis and treatment of human diseases, therapeutic approaches and interventions, pharmacology, preventative medicine, epidemiology and public health, digital medicine

LS7_1 Medical imaging for prevention, diagnosis and monitoring of diseases
LS7_2 Medical technologies and tools (including genetic tools and biomarkers) for prevention, diagnosis, monitoring and treatment of diseases
LS7_3 Nanomedicine
LS7_4 Regenerative medicine
LS7_5 Applied gene, cell and immune therapies
LS7_6 Other medical therapeutic interventions, including transplantation
Pharmacology and toxicology
Effectiveness of interventions, including resistance to therapies
Public health and epidemiology
Preventative and prognostic medicine
Environmental health, occupational medicine
Health care, including care for the ageing population
Palliative medicine
Digital medicine, e-medicine, medical applications of artificial intelligence

Environmental Biology, Ecology and Evolution
For all organisms:
Ecology, biodiversity, environmental change, evolutionary biology, behavioural ecology, microbial ecology, marine biology, ecophysiology, theoretical developments and modelling

Ecosystem and community ecology, macroecology
Biodiversity
Conservation biology
Population biology, population dynamics, population genetics
Biological aspects of environmental change, including climate change
Evolutionary ecology
Evolutionary genetics
Phylogenetics, systematics, comparative biology
Macroevolution and paleobiology
Ecology and evolution of species interactions
Behavioural ecology and evolution
Microbial ecology and evolution
Marine biology and ecology
Ecophysiology, from organisms to ecosystems
Theoretical developments and modelling in environmental biology, ecology, and evolution

Biotechnology and Biosystems Engineering
Biotechnology using all organisms, biotechnology for environment and food applications, applied plant and animal sciences, bioengineering and synthetic biology, biomass and biofuels, biohazards

Bioengineering for synthetic and chemical biology
Applied genetics, gene editing and transgenic organisms
Bioengineering of cells, tissues, organs and organisms
Microbial biotechnology and bioengineering
Food biotechnology and bioengineering
Marine biotechnology and bioengineering
Environmental biotechnology and bioengineering
Applied plant sciences, plant breeding, agroecology and soil biology
Plant pathology and pest resistance
Veterinary and applied animal sciences
Biomass production and utilisation, biofuels
Ecotoxicology, biohazards and biosafety
Social Sciences and Humanities

**SH1** Individuals, Markets and Organisations
Economics, finance, management

SH1_1 Macroeconomics; monetary economics; economic growth, labour economics
SH1_2 International trade; international business; spatial economics
SH1_3 Development economics; political economics
SH1_4 Finance; financial markets
SH1_5 Corporate finance; international finance
SH1_6 Banking, insurance
SH1_7 Accounting, asset prices, auditing
SH1_8 Econometrics, game theory, decision theory
SH1_9 Behavioural economics; experimental economics; neuro-economics
SH1_10 Microeconomics, industrial organisation, applied microeconomics
SH1_11 Innovation, research & development, entrepreneurship
SH1_12 Management; operations management, international management
SH1_13 Human resource management; organisational behaviour
SH1_14 Strategy, operation research
SH1_15 Marketing, consumer behaviour
SH1_16 Quantitative economic history, economic systems, institutional economics

**SH2** Institutions, Governance and Legal Systems
Political science, international relations, law

SH2_1 Political systems, governance
SH2_2 Democratisation and social movements
SH2_3 Conflict resolution, war, peace building
SH2_4 Legal studies, comparative law, law and economics
SH2_5 Constitutions, human rights, international law
SH2_6 International relations, global and transnational governance
SH2_7 Humanitarian assistance and development
SH2_8 Political and legal philosophy
SH2_9 Digital approaches to political science and law

**SH3** The Social World and Its Interactions
Sociology, social psychology, education sciences, communication studies

SH3_1 Social structure, social mobility, social innovation
SH3_2 Inequalities, discrimination, prejudice
SH3_3 Aggression and violence, antisocial behaviour, crime
SH3_4 Social integration, exclusion, prosocial behaviour
SH3_5 Social attitudes and beliefs
SH3_6 Social influence; power and group behaviour
SH3_7 Social policies, welfare, work and employment
SH3_8 Poverty and poverty alleviation
SH3_9 Social aspects of teaching and learning, curriculum studies, education and educational policies
SH3_10 Communication and information, networks, media
SH3_11 Digital social research
SH3_12 Social studies of science and technology

**SH4** The Human Mind and Its Complexity
Cognitive science, psychology, linguistics

SH4_1 Cognitive basis of human development, developmental disorders; comparative cognition
SH4_2 Personality and social cognition; emotion
SH4_3 Clinical and health psychology
SH4.4 Neurocognitive psychology
SH4.5 Attention, perception, action, consciousness
SH4.6 Learning, memory; cognition in ageing
SH4.7 Reasoning, decision-making; intelligence
SH4.8 Language learning and processing (first and second languages)
SH4.9 Theoretical linguistics; computational linguistics
SH4.10 Language typology; historical linguistics
SH4.11 Pragmatics, sociolinguistics, linguistic anthropology, discourse analysis

SH5 Texts and Concepts
Literary studies, literature, philosophy

SH5.1 Classics, ancient literature
SH5.2 Theory and history of literature, comparative literature
SH5.3 Book studies
SH5.4 Philology; text and image studies
SH5.5 Palaeography and codicology
SH5.6 Philosophy of mind, philosophy of language
SH5.7 Philosophy of science, epistemology, logic
SH5.8 Metaphysics, philosophical anthropology; aesthetics
SH5.9 Ethics and its applications; social philosophy
SH5.10 History of philosophy
SH5.11 Digital humanities; digital approaches to literary studies and philosophy

SH6 The Study of the Human Past
Archaeology and history

SH6.1 Archaeological methods and theory, history of archaeology
SH6.2 Prehistoric archaeology, archaeology of non-literate societies
SH6.3 Archaeology of literate societies and early civilizations
SH6.4 Medieval and post-medieval archaeologies
SH6.5 Archaeological science, bioarchaeology, environmental archaeology, geoarchaeology
SH6.6 Digital, computational, virtual and geospatial archaeologies
SH6.7 Historiography, theory and methods of history, including the analysis of digital data
SH6.8 Ancient history, medieval history
SH6.9 Early modern, modern, and contemporary history
SH6.10 Colonial and post-colonial history
SH6.11 Global, transnational, and comparative history
SH6.12 Social and economic history
SH6.13 Cultural history, intellectual history
SH6.14 History of science and technologies, environmental history

SH7 Human Mobility, Environment, and Space
Human geography, demography, health, sustainability science, territorial planning, spatial analysis

SH7.1 Human, economic and social geography
SH7.2 Migration
SH7.3 Population dynamics: households, family and fertility
SH7.4 Social aspects of health, ageing and society
SH7.5 Sustainability sciences, environment and resources, ecosystem services
SH7.6 Environmental and climate change, societal impact and policy
SH7.7 Cities; urban, regional and rural studies
SH7.8 Land use and planning
SH7.9 Energy, transportation and mobility
SH7.10 GIS, spatial analysis; digital geography
SH8  Studies of Cultures and Arts
Social anthropology, studies of cultures, studies of arts

SH8_1  Kinship; diversity and identities, gender, interethnic relations
SH8_2  Religious studies, ritual; symbolic representation
SH8_3  Cultural studies and theory, cultural identities and memories, cultural heritage
SH8_4  Museums, exhibitions, conservation and restoration
SH8_5  History of art and of architecture
SH8_6  Architecture, design, craft, creative industries
SH8_7  Music and musicology; history of music
SH8_8  Visual and performing arts, screen, arts-based research
SH8_9  Digital approaches to anthropology, cultural studies and art