

UPES School of Engineering
Advert for Junior Research Fellows Positions

The School of Engineering at UPES, Dehradun is inviting applications for Junior Research Fellows (JRFs), (i.e. funded positions for full-time PhD students) in a variety of sectors to transform its scope of activities to advanced engineering levels. The intention is to explore real-world engineering scenarios to realise and demonstrate solutions on campus as well as utilise them for further exploitation for encouraging start-ups at UPES. For achieving this, we have decided to build and develop in-house engineering capabilities in the latest hi-tech areas of mechanical, electrical/electronic, software, chemical, petroleum, aerospace, civil and safety engineering to allow advanced engineering solutions to be developed through the combined efforts of our faculty and students.

Applications are invited from ambitious team-oriented individuals with good overall technical knowledge in their chosen area of research and those who are keen to develop their applied engineering knowledge and contribute towards achieving the University's goals to carve niches expertise for themselves in engineering domains. It is expected that the JRFs recruited will contribute to our overall efforts by researching and implementing latest engineering technologies to realise innovate demonstrators.

Applications are invited for Junior Research Fellows in the following areas: Mechanical & Aerospace Engineering, Electrical Engineering, Chemical Engineering, Oil & Gas Engineering, Sustainability, Safety & Environment, and Applied Sciences to support the following strategic flagship projects within the School of Engineering:

- Disaster management
- Smart cities (urban and rural)
- Rural technologies
- Flying cars

Applicants will be asked to complete a specially developed entrance test designed to assess the overall competencies and determine their suitability to our goals to develop advanced engineering innovations. In this respect, one aim in this vision is to realise autonomous networked mobile, climbing and flying innovations (such as machines and robots) for multiple applications on the campus at UPES as well as in a variety of other scenarios as our demonstration sites. The applications are expected to focus on energy, water, rural, sustainable development and healthcare sectors. Interest in these applied areas will be expected in the successful appointees. (See the research cluster-wise detail presented below).

All applicants must be excellent communicators and should be willing to support all technical developments as needed for the advanced engineering activities planned and produce related documents, presentations, project plans, etc., as required.

We offer the opportunity to complete the PhD within 3.5 years. You will work in an interdisciplinary working group on research topics related to our Flagship Projects (for more information see the website or contact Dean SoE). You will have access to the excellent research infrastructure and experimental facilities at UPES.

Selection procedure: Selection will be based on the written test in specialised areas followed by an interview conducted by the research committee. The detailed recommendations of the committee will be final.

Applications from potential researchers having relevant background skills and interests stated as follows for various sectors relevant to UPES are warmly invited:

Mechanical Engineering applicants must demonstrate as many of the following skills or be interested to be involved in:

- Excellent overall knowledge of mechanical engineering and research experience/ expertise in areas covering experimental fluids, thermodynamics, CFD, vibration and acoustics, biomechanics, material science, structural and aeroelastic analysis, mechanism design, design for manufacturing and assembly, additive manufacturing, computational mechanics, turbomachinery, microfluidics, combustion, multiphase flows, dynamics and control, etc.
- Strong analytical problem-solving skills and able to apply advanced mathematical concepts to real problems and realise multiple bespoke designs
- Deep knowledge in 3D CAD design using software such as SolidWorks, Catia, etc.
- Deep knowledge in design for manufacturing and assembly (DFMA)
- Good knowledge in rapid prototyping (e.g. FDM, SLA, SLS, etc.)
- Sound knowledge of materials properties and material usage
- Ability to work independently or as part of the mechanical team in modular ways
- Ability to work as part of a multidisciplinary team
- Knowledge of electronic integration into mechanical designs
- Ability to write clear and comprehensive technical documentation.

Electrical Engineering applicants must demonstrate as many of the following skills or be interested to be involved in:

- Excellent overall knowledge of electrical and electronic engineering covering circuit analysis, design and interfacing, sensors, measurement and data acquisition, instrumentation and computer interfacing, communications and networking, power and energy systems, microelectronics and embedded systems design, microwave and radar, signal and image processing, control theory and real-time control.
- Strong analytical problem-solving skills and able to apply advanced mathematical concepts to real problems
- Knowledge of ARM-SoC, ARM Cortex-32 bit for real-time embedded and RTOS applications
- Ability to work with micro-controllers/development boards and specialist systems to develop customised hardware and software for embedded applications
- Ability to design PCBs, dedicated interfacing boards, test and de-bug
- Ability to design and develop dedicated electrical/embedded solutions and interfaces in tasks such as: kernel programming, embedded testing, Linux shell scripting and build and testing of efficient high-quality embedded code
- Detailed knowledge of working with and developing real-time operating systems
- Knowledge of software quality assurance and optimized I/O performances for writing and implementing bespoke high-speed sensor-actuator control loops
- Ability to troubleshoot issues to design necessary remedial steps in the various sub-systems of hardware, software and composite sub-assemblies via adopting appropriate debugging techniques; usage of software/hardware debuggers, emulators and protocols (e.g., JTAG, SWD)
- Ability to collaborate with other engineering specialists to maintain coherent approach to multi-disciplinary flagship project demonstrators on campus
- Knowledge of ROS2 and its application to realising advanced engineering robots
- Knowledge of fundamentals of RF, antenna -HFSS, MATLAB, frequency planning, and microwave links
- Ability to work on 5G and 6G: M to M communication, error correction, network operations, and management
- Knowledge of electronic integration into mechanical designs
- Ability to write clear and comprehensive technical documentation.

Software Engineering applicants must demonstrate as many of the following skills or be interested to be involved in:

- Excellent overall knowledge of computer science and software engineering covering computer programming and data structures, operating systems, computer networks, data bases and data base management, object-oriented analysis and design, real-time software development, testing and debugging, problem solving and logical thinking, AI and machine learning.
- Experience of working with range of computing platforms (from micro-controllers/development boards/embedded PCs in distributed heterogenous architectures) to develop customised software solutions
- Mastery of one or more of the following programming languages including but not limited to Python, Java, C/C++
- Experience with algorithms, data structures, complexity analysis, and software design
- Knowledge of databases like SQL, MongoDB and Bigdata databases
- Knowledge on Data analytics and Deep learning techniques
- Experience in developing software solutions in a Linux/Unix environment
- Experience in working with real-time operating systems, embedded Linux, etc
- Developing simulation environments as needed to support use case scenarios
- Developing standard and advanced bespoke software innovations for optimized product operation using ROS2 and other approaches
- Supporting technical developments as needed and produce documents, presentations, project plans, etc., as required
- Testing, troubleshooting and validating software designs/ solutions developed
- Collaborating with other engineering teams to maintain coherent approach to advanced engineering system developments within the university and in external partnerships.

Earth Sciences based engineering, the applications must demonstrate as many of the following skills or be interested to be involved in:

- Excellent overall knowledge of Earth sciences and research experience/ expertise in areas covering geological and geophysical field investigations, exploration geology, exploration geophysics, mineralogy, petrology, geochemistry, petroleum geology, geomorphology, engineering geology, hydrology, sedimentology, computational geosciences, sequence stratigraphy, methods of surface and subsurface geological mapping, gravity, magnetic, resistivity and electrical surveys, economic geology, mining geology, geomechanics, understanding of earth system science, structural and tectonics, origin of earth, mineral mapping, optical, thermal and microwave remote sensing technology, geospatial technology, geodesy, surveying, global navigation system, seismic data processing, computational methods in geoscience, etc.
- Strong analytical and real time problem-solving skills and able to apply advanced geoscientific concepts to explore the hidden natural resources and dynamic mechanism of earth.
- Deep knowledge in theory and concepts of field geology, geomodelling software like, Arch GIS, Earthworks, Petrel etc.
- Deep knowledge in handling the field equipment's like, Gravity meter, magnetometer, and resistivity meter, Branton compass, etc.
- Good knowledge in geoscientific data generation and their correlation
- Sound interpretation skills for well log data and seismic sections.
- Ability to work independently or as part of the earth science team in modular ways
- Competency in developing tools for the transformation, analysis, acquisition, processing, modelling, storage.

Oil & Gas (Petroleum/Chemical), applicants must demonstrate as many of the following skills or be interested to be involved in:

- Excellent knowledge and research aptitude in areas of Petroleum/Chemical Engineering. The candidate should have experimental/computational skills aimed at addressing issues related to Petroleum/Chemical Engineering and their different aspects. The research in oil & gas, chemical will be covering field, laboratory and computational aspects of drilling, production, reservoir engineering, oil field development, reservoir modelling & simulation, well stimulation, well testing, petro-physics, enhanced oil recovery, nano drilling fluids, gas hydrates, source rock evaluation, mud formulation, drilling fluids for shale formations, flow assurance, petroleum geo-mechanics, unconventional hydrocarbon resources, horizontal and vertical well technology, simulation lab techniques, chemical reactor engineering, catalysis, unit process and operations, polymers, advanced separation techniques, transportation of oil and gas, corrosion, multiphase hydrodynamics, pharmaceuticals, materials for energy storage, green fuels.
- Fundamental knowledge of petroleum, data analysis, simulation, reservoir characterization.
- Fundamental knowledge of process calculation, transport phenomena, reaction engineering, unit process & operation, process control & equipment design, materials science, downstream processes.
- Familiarity with programming languages or industrial softwares like Eclipse, CMG, Petrel, MATLAB, Python, ASPEN Plus, HYSYS, CFD, HTRI, etc., will be beneficial.
- Strong analytical and problem solving skills and ability to apply advanced oil & gas technology to explore the petroleum/chemical, refining and unconventional natural resources.
- Deep knowledge in handling drilling equipment's at well site.
- Good knowledge in petroleum/chemical data acquisition, processing and interpretation.
- Awareness about Ecological aspects like Biodiversity, Climate Change, Sewage Treatment, Soil Erosion because drilling, boring during the on-site projects causes a huge amount of damage to the ecosystem.
- Sound interpretation skills for well log data and production data.
- Ability to work independently or as part of the multidisciplinary team in modular ways.
- Competency in developing tools for the transformation, analysis, acquisition, processing, modelling, storage for oil & gas.
- Ability to develop the equipment to extract oil and gas, making plans to drill in oil and gas fields; developing ways to inject water, chemicals, gases, or steam into an oil reserve; keep an eye at oilfield equipment installation, operation, and maintenance.
- Knowledge of geoscientific integration into petroleum exploration and production.
- Ability to write clear and comprehensive technical documentation.