The Automotive Industry Development Centre Eastern Cape (AIDC-EC) and Nelson Mandela University Postdoctoral Research Fellowship Programme 2025

APPLICATION FORM

Application form and attachments to be submitted electronically to:

Ms Roshin Petersen (Roshin.Petersen@mandela.ac.za)

Checklist of documents to be submitted

- Completed Application form
- CV of prospective fellow
- Two reference letters for the prospective fellow
- Certified copy of fellow's Identity document
- Certified copy of the fellow's doctoral qualification. For those awaiting graduation, an institutional letter stating that the requirements for the doctoral qualification have been fulfilled. Doctoral candidates awaiting the outcome of their thesis examination must attach a letter from their current institution confirming that their doctoral thesis is under examination

1. Personal Details	
Title:	
First name(s):	
Surname:	
Initials:	
Citizenship:	
ID Number:	
Gender:	
Race:	
Date of Birth:	
Mobile number:	
Telephone number:	
E-mail address:	
Alternative e-mail address	

Physical address:	
The institution where and date when doctorate was obtained: (Attach copy of doctoral qualification or provide proof that requirements for doctoral qualification were fulfilled if awaiting graduation)	
Name of Doctoral promoter(s):	
Telephone number of Doctoral promoter:	
E-mail address of Doctoral promoter:	
Summary of research outputs in the past 3 years (e.g. number of publications/conference presentations). Please attach detailed CV.	
Names and contact details of two expert external (i.e. not employed by NMU) referees. Please attach reference letters.	

2. Brief Personal Profile

<Please insert here, or attach additional page>

3. Research Proposal Details

Please note that the research should be related to the Automotive Engineering

Please refer to the attached guidelines in this form

The proposal provided will be considered but the actual research work might change based on industry engagements.

1. Title of proposed research

2. Broad research problem/need

3. Overview of the post-doctoral project proposal

4. The primary objectives of the project

5. Uniqueness/significance of the project

6. Project activities/plan, including the research approach/methods/techniques and timelines
7. Data storage and protection
5. Envisioned research outputs emanating from this Fellowship: e.g. Articles Refereed/Peer-Reviewed Journals, Book(s), Book Chapters, Creative Outputs, Refereed/Peer-reviewed Conference Outputs, Publications in Press, Conferences, Keynote/Plenary Address, Artefacts, Exhibitions, Technical/Policy Reports, Performances, Capacity Development.

Background for Guidance:

The Platform Approach to structuring research activities:

The work of the Chair for Automotive Engineering is structured through a Platform approach described below:

Thinking in research Platforms:

The Chair aims to establish Engineering Research and Innovation Platforms to manage and align the requirements of Industry to the programme offerings of Nelson Mandela University as follows:

1. Product Design and Development Platforms

End to End process design for parts and systems, Original Equipment Manufacturer processes, Product Life Cycle Management and Systems Thinking

2. Software Systems Platforms

Fully connected car, Communications and power systems, cloud connectivity

Software-defined vehicles, data management systems, logistics systems, and entertainment systems

3. Advanced Manufacturing and Digital Industries Platforms

Digital design and servitisation of products and manufacturing environments. Manufacturing with engineered materials e.g. new metal alloys or composites. Manufacturing of parts and assemblies e.g. Support of OEM Product Development (localization). Smart Factory Platforms; Fourth Industrial Revolution (4IR) technologies, Advanced Robotics, Human enhancement systems, Internet of Things, Artificial Intelligence and Additive Manufacturing; Cyber-Physical Systems; Design of Future Production Systems with Digitalisation, Machine learning, Human-machine collaboration,

How the platforms lead to exciting research projects:

The platform approach will lead to exciting projects for Engineering students in the areas of:

- Modelling of Manufacturing and Production Environments
- Design of Factory Environment
- Use of digital tools/ creation of ecosystem
- Digital Transformation Management
- Introduction of Automation/Robotics/ Smart Machines in manufacturing
- Process design and assessment
- Advanced Manufacturing Techniques
- Use of new materials, casting and assembly
- Electrotechnical and specialized manufacturing e.g. for hydrogen plants and Fuel Cells
- Design and Manufacture of production lines
- Involvement in Industrial Initiatives
- Collaboration with various external stakeholders

Background motivation of the Platform Approach:

The importance and corresponding support of the Automotive and Manufacturing sectors is a core concern that lies at the heart of our Industrial Policy Action Plan of South Africa, recognising the sector's vital role in job creation and global competitiveness. The Fourth Industrial Revolution (4IR), also known as Industry 4.0, requires support in the manufacturing sector through skills development and research and innovation initiatives ranging from digital transformation to the use of advanced manufacturing materials and techniques.

To navigate the new 4IR world successfully, students will be guided toward exciting occupations and roles in the automotive manufacturing sector. This entails being at the forefront of research, innovation, and development using the new technologies of the 4IR. Particularly, for new areas such as electric vehicles, and modern manufacturing systems among others.

Significant shifts in engineering and production systems are brought about by Industry 4.0 and the 4IR. These changes require a shift towards digitalisation, product life-cycle management, and services. It is therefore essential for higher education institutions to adapt and align with the evolving production systems, manufacturing technology, advanced materials, and software.

The 4IR brings with it the fusion of technologies, a fusion of physical, digital and biological worlds, transforming the manufacturing landscape at an unprecedented pace. We are witnessing the convergence of cyber-physical systems, the Internet of Things, and advanced communications, among other technologies. This convergence enables "smart factories," where virtual and physical systems cooperate locally and globally in a flexible manner. The complexity of production and supplier networks will grow significantly, interconnecting multiple factories across the globe.

Globally shifts are towards electric vehicles, with the market projected to grow exponentially in the coming years. As manufacturers adapt to this new automotive technology, we must train engineers who specialise in automotive electric engineering and automotive engineering with electric propulsion, who embrace electric cars, understanding their positive impact on the planet. We must encourage this enthusiasm and equip our engineers accordingly.

These disruptive technologies are fundamentally changing manufacturing at both industry and societal levels. We are witnessing an unprecedented adoption of high-tech manufacturing processes, adaptive and smart manufacturing equipment, with a drive to resource-efficient factory design, in a collaborative and networked enterprise space spanning the world. This new manufacturing paradigm will unlock new sources of value, such as extensively packaged services with new products, remanufacturing of end-of-life products, and the creation of new value through strategic alliances.

Although the World Economic Forum defines 9 high-priority 4IR technologies, more key technologies are impacting the industry. The main 4IR technology areas impacting on the engineering and production industries are:

- *3D printing:*
- *Advanced materials and processing technologies:*
- *Advanced robotics:*
- *Artificial Intelligence (AI):*
- *Biotechnology:*
- *Human enhancement technologies*:
- *Internet of Things (IoT):*

Universities must produce graduates equipped with the skill sets required to adapt to the changing environment and industry needs. Strengthening relationships with manufacturing companies, and enhancing curriculum, learning and teaching practices, and research and innovation, to align the technological competence demanded by new technologies and advanced manufacturing processes are crucial steps. By doing so, we can ensure a seamless transition for our graduates into the manufacturing sector in the Eastern Cape and South Africa as a whole.

The overall strategic intent of the Chair is also to improve skills development for the manufacturing sector's competitiveness. Collaboration with industry is essential to embed local industry in global supply chains, driving the use of new technologies in manufacturing, allowing localisation of technology, and possibly even new product development tailored for Africa.