

INDUSTRIAL APPLICATIONS

REFERENCES FOR JOB TITLES

SKILL MATRIX



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ÍNDEX

1.	Key of Lecture.....	1
2.	Job Titles Common Skills	1
2.1	Control Engineer.....	1
2.2	Automation Engineer	1
2.3	Software / Embedded software Engineer	1
2.4	Application Engineer	2
2.5	Process Engineer	2
2.6	Systems Engineer	3
2.7	Systems Architect.....	3
2.8	Test and Validation Engineer	4
2.9	Research Engineer.....	4
3.	Job Titles by Sectors	5
3.1	Autonomous Vehicles (On Ground)	5
3.1.1	Autonomous and ADAS Control System Engineer	5
3.1.2	Embedded Control Systems Engineer	5
3.1.3	Autonomous Driving SW Engineer	6
3.1.4	Autonomous Driving Systems Integration and Test Engineers	7
3.1.5	Autonomous Driving Research Engineer.....	7
3.2	Industrial Robotics.....	8
3.2.1	Robotics Control Systems Engineer.....	8
3.2.2	Robotics Automation Engineer	9
3.2.3	Robotics Embedded SW Engineer	10
3.2.4	Robotics Application Engineer	10
3.2.5	Robotics Test and Validation Engineer.....	11
3.3	Industry 4.0	12

3.3.1	Industrial Control Systems Engineer	12
3.3.2	Industrial Automation Engineer	13
3.3.3	Industrial Application Engineer	14
3.3.4	Equipment Systems Engineer	15
3.3.5	Industrial Systems Architect.....	16
3.3.6	Industrial Automation Systems Research Engineer	17
3.4	Aerial Vehicles (Unmanned & Manned).....	18
3.4.1	Flight Control Systems Engineer.....	18
3.4.2	Flight Embedded SW Engineer	19
3.4.3	Flight Systems Test and Validation Engineer.....	20
3.4.4	Flight Systems Engineer.....	20
3.4.5	Flight Control Research Engineer	21
3.5	Mobile Robotics.....	21
3.5.1	Mobile Robot Control Systems Engineer.....	21
3.5.2	Mobile Robot Embedded SW Engineer	22
3.5.3	Mobile Robots Test and Validation Engineer	22
3.5.4	Mobile Robot Systems Architect	23
3.5.5	Mobile Robot Control Systems Research Engineer	24
3.6	Vehicle Powertrain and Dynamics.....	24
3.6.1	Vehicle Powertrain Control Systems Engineer	24
3.6.2	Vehicle Powertrain Embedded Systems Engineer	25
3.6.3	Vehicle Powertrain Test and Validation Engineer.....	26
3.6.4	Vehicle Powertrain Systems Architect	26
3.6.5	Vehicle Powertrain Research Engineer	27

1. KEY OF LECTURE

The Co4AIR project is mainly focusing on the specific topic of computer based embedded control in education and research, and aims to make a bridge with the industrial world.

In order to deal with this last point, the purpose of this document is to provide a list of industrial jobs related to the topic and the associated skills. In the first part, some common roles and skills are described for generic type of engineers. Then, in the second part, specific competences are given for current and future major fields of application.

2. JOB TITLES COMMON SKILLS

2.1 CONTROL ENGINEER

Control engineering is an engineering discipline that applies automatic control theory to design systems with desired behaviours in control environments. The discipline of controls overlaps and is usually taught along with electrical engineering at many institutions around the world.

2.2 AUTOMATION ENGINEER

Automation engineers are experts who have the knowledge and ability to design, create, develop and manage systems, for example, factory automation, process automation and warehouse automation.

2.3 SOFTWARE / EMBEDDED SOFTWARE ENGINEER

In the world of software design and development, a software engineer plays a key role. The engineer is typically the person who helps to develop the ways that software functions created by a software design team will work. The software engineer will work with designers to help consolidate disparate program functions into a unified whole. The engineer also works with programmers and coders to help map out various programming tasks and smaller functions, which are then combined into larger, functioning programs or new features for existing software.

The engineer will typically work in both design and development stages of the software creation. During the design phase, dedicated designers or design teams will work with the engineer to help work out the basic things the program or update will be expected to perform.

The engineer will typically help to plot out the various aspects of the automated tasks that will be necessary, usually using design documentation and flowcharts to help illustrate the process.

Embedded Software Engineering is the process of controlling various devices and machines that are different from traditional computers, using software engineering. Integrating software engineering with non-computer devices leads to the formation of embedded systems. Embedded systems are typically popular in medical science, consumer electronics, manufacturing science, aviation, automotive technology. A typical embedded system requires a wide range of programming tools, microprocessors and operating systems. Embedded software engineering, performed by embedded software engineers, needs to be tailored to the needs of the hardware that it has to control and run on.

Now that we have the answer to “what is embedded engineering”, let us understand what are the requirements of embedded systems, which includes the software for embedded systems. The software and operating system requirements of an embedded system is also different from a traditional computer based system. Typically, embedded systems use basic embedded system software such as C, C++, ADA, etc. Some specialized embedded systems may use OS such as Windows CE, LINUX, TreadX, Nucleus RTOS, OSE, etc.

Embedded software engineering differs from traditional application development in terms of the additional consideration to external factors such as temperature and other environmental factors that may affect performance.

To work as a software or embedded software engineer, a person must normally have a bachelor’s degree in computer engineering, computer science, or a related field. Many companies will prefer candidates for this job who can show practical experience in programming and coding.

2.4 APPLICATION ENGINEER

Application engineers are responsible for designing, developing and implementing programs and applications. They must be able to do customer analysis to create applications that respond to customer needs and provide innovative solutions to common problems.

2.5 PROCESS ENGINEER

Process engineering is the understanding and application of the fundamental principles and laws of nature that allow us to transform raw material and energy into products that are useful to society, at an industrial level. By taking advantage of the driving forces of nature such as pressure, temperature and concentration gradients, as well as the law of conservation of mass, process engineers can develop methods to synthesize and purify large quantities of desired chemical products. Process engineering focuses on the design, operation, control, optimization and intensification of chemical, physical, and biological processes. Process engineering

encompasses a vast range of industries, such as agriculture, automotive, biotechnical, chemical, food, material development, mining, nuclear, petrochemical, pharmaceutical, and software development. The application of systematic computer-based methods to process engineering is "process systems engineering".

2.6 SYSTEMS ENGINEER

Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design, integrate, and manage complex systems over their life cycles. At its core, systems engineering utilizes systems thinking principles to organize this body of knowledge. The individual outcome of such efforts, an engineered system, can be defined as a combination of components that work in synergy to collectively perform a useful function.

System engineers are generally responsible for managing and monitoring all installed systems and infrastructure, installing, configuring, testing and maintaining operating systems, application software and system management tools. They work extensively with hardware engineers, software engineers, system administrators, hardware technicians, programmers, and product development staff. Moreover, systems engineer must be flexible and adaptable to rapidly changing work environments.

2.7 SYSTEMS ARCHITECT

The systems architect is typically responsible for the overall design of their organization's technology system, platform, or program. Their main objective is to provide architectural leadership to the company's technology group and ensure best practices are created and followed. Systems architects manage teams of designers and engineers and establish standard operating procedures to help control the risks associated with the projects. They are responsible for all aspects of designing, scheduling, planning, and pricing projects, as well as delegating tasks to subordinates. Additionally, these architects also monitor key project metrics and perform quality control initiatives and reviews.

The systems architect is also responsible for making sure that projects are completed on time and stay within budget. They work with engineers, project managers, upper-level managers, and cost accountants. These architects usually report to a chief technology officer (CTO) or vice president. Systems architect jobs are generally classified as technology or engineering positions; most of the time systems architects work in the computer engineering and computer technology fields. These are typically full time positions that take place in an office setting.

Systems architect jobs generally require a bachelor's degree in a related field and experience in the field; experience may be substituted for formal education. Excellent organizational and multitasking skills are also required. System architects must possess the ability to lead and direct the work of other team members, and they need to be familiar with software and systems relevant to the position.

2.8 TEST AND VALIDATION ENGINEER

A validation engineers evaluate and calibrate the equipment and procedures used in development and production of a variety of products. The job is hugely varied and validation engineers can be found in labs and research facilities as well as in a wide range of manufacturing industries, including aerospace, automotive, computer software and pharmaceuticals. A validation engineer's role will depend on the industry they work in and their specialism, but typical tasks include: monitoring and testing equipment, analysing and documenting test results, preparing compliance reports, directing validation activities, resolving testing problems, making adjustments or improvements to equipment and processes, creating databases to track validation activities, interpreting customer requirements, developing validation schedules, conducting training and overseeing the work of validation technicians, maintaining instrumentation and equipment, keeping up to date on industry standards and regulations.

2.9 RESEARCH ENGINEER

The research engineer is responsible of the design of new products and technology. A research engineer generally works in R&D (Research and Development) department which may be found in a variety of industries. His role includes: analysing, implementing, and testing the materials developed in a research lab; creating designs for instruments or devices based on innovative concepts so that they are functional; writing research and grant proposals and maintaining contact with academic and/or research sponsors; Coordinating a team of researchers and staff working on a project.

Research engineer jobs generally require at least a Master's degree or preferred a PhD in a related field and a first experience in the field.

3. JOB TITLES BY SECTORS

3.1 AUTONOMOUS VEHICLES (ON GROUND)

3.1.1 Autonomous and ADAS Control System Engineer

See also description of [Control Engineer](#).

The responsibilities of the autonomous and ADAS control system engineer will be to perform the development of control architecture, estimation, control analysis, and control algorithms for autonomous vehicles. His role is to:

- ✓ Develop model based design for guidance, navigation, and control.
- ✓ Perform control architecture evaluation and selection, dynamic modelling, estimation and control system analysis and design
- ✓ Implement control algorithms in real-time hardware for verification
- ✓ Assist in developing and implementing detailed test and verification plans from the subsystem to vehicle level

His educational background is in electrical engineering with emphasis on control systems. Some of the essential skills or qualifications required are:

- ✓ Expertise in MATLAB/Simulink
- ✓ Expertise in functions and algorithm development (e.g. in C++)
- ✓ Expertise in control system rapid prototyping development (e.g. MATLAB/Simulink and dSPACE MicroAutobox)
- ✓ Knowledge of the various electric-and electronic vehicle architectures
- ✓ Knowledge in communication protocols (e.g. CAN, LIN, FlexRay)
- ✓ Knowledge of radar and camera technologies

3.1.2 Embedded Control Systems Engineer

See also description of [Control Engineer](#).

The responsibilities of the embedded control engineer will be to design and implement the next generation of control algorithm in automotive ECU. His role is to:

- ✓ Architect, develop and maintain board support software and the operating system
- ✓ Be the technical leader on vehicle controls and embedded systems software stack
- ✓ Develop key requirements and flow into technical specifications including hardware and software architectures
- ✓ Be a key contributor to the ECU hardware specification and selection
- ✓ Perform system integration of the embedded controller into the vehicle platform

- ✓ Characterize software performance on target hardware, identify bottlenecks, and recommend hardware and/or software solutions
- ✓ Improve performance, security, and safety of the software using state-of-the-art software approaches and dedicated hardware components

His educational background is in computer engineering, electrical Engineering, or similar field with emphasis on embedded software application or board support development. Some of the essential skills or qualifications required are:

- ✓ Experience in automotive embedded development
- ✓ Experience with agile software development process
- ✓ Expertise developing software in C and/or assembly
- ✓ Experience with microcontroller architecture (multi-core, watchdog processors)
- ✓ Experience with software design methodologies and software quality and coding standards (like MISRA and SPICE)
- ✓ Expertise with CAN, Serial, and Ethernet communication protocols
- ✓ Electrical and electronic hardware design experience

3.1.3 Autonomous Driving SW Engineer

See also description of [Software Engineer](#).

The responsibilities of the autonomous driving SW are to develop software, to create and execute designs for new functionality, or enhances existing functionality for autonomous vehicle (vision algorithm, sensor fusion algorithms, ACC, etc.). His role is to:

- ✓ Develop software in low level code (e.g. C/C++)
- ✓ Test software using debuggers, emulators and simulators
- ✓ Perform software quality assurance activities
- ✓ Write unit and integration tests and work collaboratively and professionally with other teams within the project.

His educational background is in computer engineering with emphasis on embedded DSP software design and development. Some of the essential skills or qualifications required are:

- ✓ Mastery of software engineering tools (configuration management systems, build processes, debuggers, emulators, simulators and logic analysers).
- ✓ Work in an agile software development environment (e.g. AUTOSAR)
- ✓ Expertise on driver device development, on Ethernet and CAN communication.
- ✓ Knowledge and expertise on multi-core/processor system implementation (e.g. NXP, TI, Infineon, etc.)
- ✓ Experience on memory management, memory optimizations, performance measurement and tuning.
- ✓ Expertise on Digital Signal Processing and on hardware accelerator experience
- ✓ Knowledge about safety-systems (norms ISO26262, ASIL A-D)

3.1.4 Autonomous Driving Systems Integration and Test Engineers

See also description of [Test and Validation Engineer](#).

The responsibilities of the Autonomous Driving Systems Integration and Test Engineers is to develop and execute test plans and procedures for testing autonomous driving vehicles, to collaborate with the engineering development and operations teams to verify and validate autonomous driving car systems.

His role is to:

- ✓ Develop systems integration of connected, fully automated autonomous vehicles
- ✓ Supervise and implement software and hardware integration and testing in close collaboration with functional development teams
- ✓ orchestration of high quality system software releases being test-worthy in real world environments ...

His educational background is a Master or PhD degree in Robotics, Mechatronics, Computer Science or related field. Some of the essential skills or qualifications required are:

- ✓ Experience with C++ or Python for analysis
- ✓ Experience with software development tools and methods
- ✓ Experience in embedded systems development
- ✓ Knowledge of testing methodologies, writing test plans, creating test cases, and debugging
- ✓ Experience in the design and/or validation of vehicle, robotics, or software development for safety critical systems

3.1.5 Autonomous Driving Research Engineer

See also description of [Research Engineer](#).

The main responsibility of the autonomous driving research engineer is to provide solutions for technical challenging problems in the autonomous driving context. His role is to:

- ✓ Generate innovative ideas to address technical challenges (planning under uncertainty, decision-making, obstacle avoidance...) for autonomous driving
- ✓ Design and implement algorithms for full self-driving vehicles
- ✓ Analyse data from simulation and real-world testing
- ✓ Work closely with experts of robotics, AI, and machine learning...

His educational background is a Master or PhD degree in Computer Science, Electrical Engineering, Mechanical Engineering, Robotics or related field. Some of the essential skills or qualifications required are:

- ✓ Experience with autonomous vehicle in one or more of the following areas: planning under uncertainty, decision-making, tracking and prediction, vehicle control systems, perception, localization, estimation, and machine learning

- ✓ Experience with dedicated simulation tools (ROS, Matlab/Simulink...)
- ✓ Experience working with, modifying, and creating advanced algorithms (C++, Python...)

3.2 INDUSTRIAL ROBOTICS

Industrial companies are continuously innovating with their product offerings to meet the evolving customer requirements. With this objective, industrial companies incorporate industrial robotics and robotics engineering for optimizing the industrial processes. As the evolution of Industry 4.0 increases and the rise of the Industrial Internet of Things (IIoT), the demand for robotic engineering is likely to increase considerably in the coming years. Industrial robotics lies somewhere in between the more traditional embedded control applications and the most programmable industrial automation systems.

3.2.1 Robotics Control Systems Engineer

See also description of [Control Engineer](#).

The Robotics Control Systems Engineer envisions and creates complex demonstration prototypes and innovative solutions involved in the complete project life-cycle of robotics control systems, from concept and requirements definition, systems analysis, architecture development, design and implementation to field testing and evaluation.

The responsibilities of the Robotics Control Systems Engineer will be to perform the development of control architecture, estimation, control analysis, and control algorithms for robotic systems. His role is to:

- ✓ Conduct development and researches on estimation, decision, and control of robotics systems.
- ✓ Design and develop control systems for robotic systems using modern controls methods.
- ✓ Develop embedded software in real-time hardware.
- ✓ Assist in developing and implementing detailed test and verification plans.
- ✓ Design robot operations.

His educational background is Bachelor's, Master's, or PhD degree in robotics, industrial engineering, mechatronics engineering, control system engineering, or related major. Some of the essential skills or qualifications required are:

- ✓ Expertise in C/C++ and Matlab design and programming skills.
- ✓ Proficiency with C/C++ coding.
- ✓ Proficiency with scripting languages such as Python.
- ✓ Proficiency with Linux.
- ✓ Experience with simulation development using Matlab.
- ✓ Expertise in hardware, software, and mechanism integration skills.
- ✓ Experience in embedded software design and development.
- ✓ Experience with time-deterministic real-time software.

- ✓ Experience with RTOS.
- ✓ Experience with controls development using modern controls methods (state space control, observer design, kalman filters, etc.)
- ✓ Experience with adaptive controls methods.
- ✓ Knowledge of electrical and mechanical design principles and CAD tools.
- ✓ Knowledge in industrial communication protocols (e.g. CAN, TCP/IP)
- ✓ Knowledge of classical and modern servo control systems.
- ✓ Knowledge of serial-arm robot kinematics.
- ✓ Knowledge of computer vision

3.2.2 Robotics Automation Engineer

See also description of [Automation Engineer](#).

The Robotics Automation Engineer will have extensive theoretical and hands-on experience in all facets of robotic applications used in manufacturing, as well as experience managing new product introductions, equipment projects, new installations and process optimization, upgrades and modifications.

The responsibilities of the Robotics Automation Engineer will be to perform the development of control architecture, estimation, control analysis, and control algorithms for robotic systems. His role is to:

- ✓ Design, select and test processes and prototypes for robotic systems.
- ✓ Develop and implement software for robot programming.
- ✓ Create prototypes and work on necessary components.
- ✓ Develop custom robot application code to interface with new technologies
- ✓ Conduct research in robotics fields.
- ✓ Monitor and stay on top of new advancements in robotics and relevant fields of engineering.
- ✓ Project management related to robotics systems.
- ✓ Develop procedures and maintain proper documentation related to robotics systems.
- ✓ Verify complex systems involving hardware, software, and mechanical components.

His educational background is Bachelor's, Master's, or PhD degree in robotics, industrial engineering, mechanical engineering, electrical engineering, electronics engineering, automation engineering, control system engineering, computer science, or related major. Some of the essential skills or qualifications required are:

- ✓ Experience on high level and background robotic programming skills.
- ✓ Experience on commissioning and programming industrial robots.
- ✓ Experience on Robotic mechanical and electrical trouble shooting skills.
- ✓ Experience on robot simulation packages as well as off-line programming.
- ✓ Experience on virtual commissioning of robotics system.
- ✓ Experience on robotics applications.
- ✓ Proficiency with classical and modern servo control systems.

- ✓ Proficiency with serial-arm robot kinematics.
- ✓ Proficiency with Robot Operating System.
- ✓ Proficiency with C/C++ programming.
- ✓ Knowledge in PLC programming.
- ✓ Knowledge in industrial communication protocols (e.g. CAN, TCP/IP)
- ✓ Knowledge of electrical and mechanical principles and CAD tools.

3.2.3 Robotics Embedded SW Engineer

See also description of [Software Engineer](#).

The Robotics Embedded SW Engineer assist in preparing proposals adapted to technical requirements, participate on and lead technical project tasks, documents and reports technical work, develops and designs test advanced software solutions for robotic systems.

The responsibilities of the Robotics Embedded SW Engineer will be to develop, and deploy robotic software solutions for advanced applications. His role is to:

- ✓ Understand computer systems including concurrent programming, operating systems, compilers, and computer architecture.
- ✓ Debug system level issues.
- ✓ Manage development from requirements.
- ✓ Integrate components from controls and perception.
- ✓ Build tools to improve development.

His educational background is Bachelor's, Master's, or PhD degree in robotics, electronics engineering, automation engineering, computer science, or related major. Some of the essential skills or qualifications required are:

- ✓ Proficiency with computer systems, operating systems, compilers, and computer architecture.
- ✓ Proficiency with programming robots.
- ✓ Proficiency with C/C++ programming.
- ✓ Proficiency with embedded software design and development.
- ✓ Proficiency with RTOS and Robot Operating System.
- ✓ Proficiency with concurrent programming and time-deterministic real-time software.
- ✓ Knowledge in PLC programming.
- ✓ Knowledge in industrial communication protocols.
- ✓ Experience on robotics applications.
- ✓ Experience on robot simulation packages as well as off-line programming.
- ✓ Experience on virtual commissioning of robotics system.

3.2.4 Robotics Application Engineer

See also description of [Application Engineer](#).

The Robotics Application Engineer take the leading role and ownership of projects, particularly in the areas of application design, layout, engineering, and proposal development of robotic systems. Work in partnership with business development, product management and external parties and ensure value creation. Provide the technical solution and coordination hardware and software aspects of a robotic system solution.

The responsibilities of the Robotics Application Engineer will be to develop concepts and technical solutions for robotic systems. His role is to:

- ✓ Design and troubleshoot automation products.
- ✓ Analyse supplied specification to draft operation manuals detailing functionality and equipment set-up specifications.
- ✓ Perform developments to ensure minimum downtime and optimal operation of machines and equipment.
- ✓ Use of knowledge in robot operations, applications, training and programming tools to improve development.

His educational background is undergraduate or graduate program related to robotics engineering, mechatronics engineering, industrial engineering, automation engineering, control systems engineering or applicable field of study. Some of the essential skills or qualifications required are:

- ✓ Experience on electrical circuits, controls hardware design, electrical panel design, pneumatic design, hydraulic design, PLCs, HMIs, servo applications, and device communication networks.
- ✓ Experience on robotics applications.
- ✓ Experience on virtual commissioning of robotics system.
- ✓ Knowledge in programming robots.
- ✓ Knowledge in C/C++ programming.
- ✓ Knowledge in PLC programming.
- ✓ Hands-on design and development experience of software and hardware products.
- ✓ Experience verifying consumer or robotics products.

3.2.5 Robotics Test and Validation Engineer

See also description of [Test and Validation Engineer](#).

The Robotics Test and Validation Engineer will apply testing and validation skills across mechanical, electrical, and software engineering disciplines to develop robotic systems. This position requires the desire to solve complex problems in a fast-paced environment as well as provide feedback to others executing tasks across all active projects.

The responsibilities of the Robotics Test and Validation Engineer will be to contributing to process improvement initiatives. His role is to:

- ✓ Understanding of computer systems including concurrent programming, operating systems, compilers, and computer architecture.

- ✓ Understanding of detailed top-down development, and simulation.
- ✓ Apply test and validation plans, and generate interface control documentation.
- ✓ Apply component integration for robotic system
- ✓ Identify risks to technical progress and their appropriate mitigations.
- ✓ Contributing to process improvement initiatives.

His educational background is undergraduate or graduate program related to software engineering, mechatronic, automation or robotics, and have strong mechanical and or electrical aptitude, embedded programming, enjoys problem solving and can potentially handle multiple parallel tasks. Some of the essential skills or qualifications required are:

- ✓ Ability to build/assemble/modify electronic assemblies or robots into various configurations for test purposes.
- ✓ Knowledge on virtual commissioning of robotics system.
- ✓ Knowledge on motion component design for robotic mechanisms.
- ✓ Knowledge on common sensor and actuator models, integration, and practical concerns.
- ✓ Knowledge in embedded systems.
- ✓ Knowledge in programming robots.
- ✓ Knowledge in C/C++ programming, and familiar with other programming languages.
- ✓ Knowledge in Matlab/Simulink.
- ✓ Knowledge in Robot Operating System.
- ✓ Knowledge in PLC programming.
- ✓ Knowledge in industrial communication protocols.
- ✓ Hands-on verifying software and hardware products.
- ✓ Knowledge on robotics applications.
- ✓ Knowledge on robot simulation packages.
- ✓ Knowledge on virtual commissioning of robotics system.

3.3 INDUSTRY 4.0

3.3.1 Industrial Control Systems Engineer

See also description of [Control Engineer](#).

Control systems engineer are responsible for designing, developing, and implementing solutions that control dynamic systems. The dynamic system that a Control Systems Engineer works on in a manufacturing environment is a production line. This could be an entire production line or part of a production line.

Most production lines have a range of different components. This includes A Control Systems Engineer integrates and coordinates components (human components as well as technological components including robots, vision systems, and more.) to ensure they work efficiently, i.e. ensuring products are of a consistent quality and that the production line meets volume targets.

Many Control Systems Engineers start by getting degree qualifications in electrical engineering. While getting an appropriate degree is essential in getting a job as a Control Systems Engineer, having a wider range of skills and knowledge is also important. This includes:

- ✓ Knowledge and experience of automation and control technologies and systems – examples include Distributed Control Systems (DCS), Programmable Logic Controllers (PLCs), SCADA systems, and, often, Vision Systems.
- ✓ Software development skills – including knowledge of C/C++/C#, VB, SQL, and Java.
- ✓ Strong mathematical abilities – as computer modelling and simulations are a core part of the role of a Control Systems Engineer.
- ✓ Strong problem-solving skills – there are no two projects, production lines, or problems that are the same, so problem-solving skills are essential.
- ✓ Good communication – this is especially important as a Control Systems Engineer needs to be across all aspects of the project.
- ✓ Knowledge of network services – this includes LAN, WAN, WLAN, VPN, and more. This is becoming increasingly important given the growing use of remote access and monitoring on production lines.

3.3.2 Industrial Automation Engineer

See also description of [Automation Engineer](#).

The Automation Engineer is responsible for the integration of new process equipment in addition to maintaining, troubleshooting. The Industrial Automation Engineer will have extensive theoretical and hands-on experience in all facets of industrial applications, as well as experience managing new product introductions, equipment projects, new installations and process optimization, upgrades and modifications.

The responsibilities of the Industrial Automation Engineer will be to provide technical expertise for the design, configuration, installation, and maintenance of automation software and associated hardware. His role is to:

- ✓ Design, configuration, installation, and maintenance of automation software and associated hardware.
- ✓ Oversight or participation on all automation aspects of automation projects
- ✓ Determine equipment or system specifications and most cost-effective technology to implement.
- ✓ Create and update procedures to drive operational efficiency and compliance.
- ✓ Deploy, maintain, and upgrade manufacturing applications.
- ✓ Execute change controls to update and upgrade automation systems and equipment.
- ✓ Analyse, interpret data, and make sound technical recommendations on continuous improvements and non-conformance remediation.
- ✓ Integration of equipment, data concentration, batch reporting, and data retention.
- ✓ Development and implementation of software for automation systems.
- ✓ Apply smart automation based on CPPS, IIoT communications, and fog and cloud computing.

- ✓ Create prototypes and work on necessary components.
- ✓ Project management related to automation systems.
- ✓ Conducting research in automation systems.
- ✓ Monitor and stay on top of new advancements in automation systems and relevant fields of engineering.
- ✓ Develop procedures and maintain proper documentation related to automation systems.

His educational background is Bachelor's or Master's degree in industrial engineering, mechanical engineering, electrical engineering, electronics engineering, automation engineering, control system engineering, or related major. Some of the essential skills or qualifications required are:

- ✓ Proficiency with PLC program design and development.
- ✓ Proficiency with SCADA/HMI systems.
- ✓ Proficiency with industrial communication protocols.
- ✓ Expertise on MES and ERP systems.
- ✓ Expertise on CPPS distributed automation.
- ✓ Expertise on IIoT protocols.
- ✓ Expertise on authoring and design test protocols for automation system level commissioning and qualification.
- ✓ Expertise on troubleshooting and start-up of control systems, and familiarity with instrumentation.
- ✓ Proficiency on field device signal wiring practices and panel design.
- ✓ Proficiency on industrial communication protocols.
- ✓ Expertise on writing and executing change controls in change management systems.
- ✓ Expertise on project management skill set.
- ✓ Expertise on virtual commissioning.
- ✓ Experience providing technical support on manufacturing issues and able to drive toward issue resolution.

3.3.3 Industrial Application Engineer

See also description of [Application Engineer](#).

The Industrial Application Engineer supports customer relationships by maintaining deep product technical knowledge and providing technical advice, technical support, and technical expertise to enable and foster expansion in the market and solve for customer inquiry, problems, and needs.

The responsibilities of the Industrial Application Engineer will be to develop concepts and technical solutions for industrial automation systems. His role is to:

- ✓ Be an expert in products and applications across end-markets while being vigilant of cost savings and expansion into untapped market applications.
- ✓ Provide expert advice on the industrial products in specific applications.

- ✓ Perform analysis of complex application needs and develop recommendations in support of customer balancing business need.
- ✓ Maintain expert knowledge on industry trends, training opportunities, and forecasts.
- ✓ Support sales growth in using the products/technology to design and execute cost savings initiatives with customers.
- ✓ Active collaboration with internal customers to ensure information share and goal alignments.

His educational background is undergraduate or graduate program related to automatics, mechatronics engineering, industrial engineering or applicable field of study. Some of the essential skills or qualifications required are:

- ✓ Knowledge in PLC programming.
- ✓ Knowledge in SCADA/HMI programming.
- ✓ Knowledge in industrial communication protocols.
- ✓ Experience on virtual commissioning of automation system.
- ✓ Experience on electrical circuits, electrical panel design, pneumatic design, hydraulic design, servo applications.
- ✓ Hands-on design and development experience of software and hardware products.
- ✓ Experience verifying consumer or industrial automation products.

3.3.4 Equipment Systems Engineer

See also description of [Systems Engineer](#).

The Equipment Systems Engineer will utilize appropriate requirements, processes, procedures and tools throughout the system development life cycle. The Equipment Systems Engineer supports the design and development for equipment, troubleshooting issues and completing appropriate maintenance.

The responsibilities of the Industrial Application Engineer include improving the product development process, making manufacturing less costly and more efficient, improving the quality of products produced. His role is to:

- ✓ Responsible for equipment, supporting with equipment related queries.
- ✓ Researching new equipment and software needs for product testing and project planning.
- ✓ Quoting, ordering and tracking new equipment, components and software to ensure timely project completion.
- ✓ Assisting in developing software for new and existing equipment.
- ✓ Assisting with procurement, installation, verification, and validation equipment.
- ✓ Ensuring appropriate maintenance for equipment.
- ✓ Troubleshooting equipment issues and completing appropriate corrective maintenance.
- ✓ Consulting on technical problems as related to product equipment or procedures.

- ✓ Completing the equipment development documentation including risk assessment, design verification and validation, and installation documents.
- ✓ Identifying and completing equipment upgrades including hardware and software updates.
- ✓ Supporting in identifying new equipment and technology development initiatives that will drive continuous improvement.
- ✓ Supporting the design and development of tooling to support test methods development.

His educational background is undergraduate or graduate program related to automatics, mechatronics engineering, industrial engineering or applicable field of study. Some of the essential skills or qualifications required are:

- ✓ Knowledge in C/C++ programming, and familiar with other programming languages.
- ✓ Knowledge in PLC programming.
- ✓ Knowledge in SCADA/HMI programming.
- ✓ Knowledge in industrial communication protocols.
- ✓ Knowledge in CAD tools.
- ✓ Experience on electrical circuits, electrical panel design, pneumatic design, hydraulic design, servo applications.
- ✓ Hands-on design and development experience of software and hardware products.
- ✓ Experience verifying consumer or industrial automation products.
- ✓ Experience in problem solving and maintaining electro-mechanical manufacturing or test equipment.
- ✓ Experience of equipment design, verification and validation activities.
- ✓ Experience writing and presenting technical information.

3.3.5 Industrial Systems Architect

See also description of [Systems Architect](#).

Embedded systems engineers are responsible for the design, development, production, testing, and maintenance of embedded systems. Like the systems they manage, the embedded systems engineer requires experience with both hardware and software.

The core skill set of an embedded systems engineer looks something like this:

- ✓ Programming languages such as C, C++, and Assembly Language are the most common requirements for this position. LabView is also popular for working with National Instruments data acquisition units. Depending on the job position, familiarity with other languages such as ADA, Lua, Rust, Python, VHDL, and Verilog may also be required.
- ✓ Microcontroller/microprocessor ecosystems such as Arduino, Raspberry Pi, Atmel AVR, ESP8266 NodeMcu, and PIC10Fxx.

- ✓ Memory management: a solid understanding of the different types of memory, including RAM, ROM and Flash, and how to develop software where memory is a premium.
- ✓ Circuit Design: PCBs, signal analysis, debugging, assembly and testing of integrated circuits and their components. PCB analysis and design software such as Sigrity and Allegro.
- ✓ CAD Design: Basic hardware design using CAD software such as AutoCad or SolidWorks.
- ✓ Measurement: Experience using digital multimeters, oscilloscopes, DAQs, and other equipment to measure, analyse and troubleshoot electrical systems.
- ✓ IoT devices and frameworks such as Google Cloud Platform, IBM Watson, Azure, and AWS.
- ✓ Data Processing and Analysis: Able to process and analyse data using Excel, Matlab, and Python.
- ✓ Technical Writing: A large part of the actual engineering job is technical documentation. Even better if you can write research grants.

Even if an embedded system engineer never has to directly touch the hardware of the systems they design, intimate knowledge of those hardware systems is required to properly design embedded software.

3.3.6 Industrial Automation Systems Research Engineer

See also description of [Research Engineer](#).

The Industrial Automation Systems Research Engineer are automation enthusiasts, innovators, engineers with deep technical expertise in disruptive technologies in the field of the industrial automation. Their research results enable the successful transformation of the technology trends in automation and control into novel products and services.

The responsibilities of the Industrial Automation Systems Research Engineer will be to design, develop and implement novel industrial automation solutions. His role is to:

- ✓ Conceive, develop, and deploy industrial automation solutions for advanced manufacturing applications.
- ✓ Design, build, debug and implement industrial automation solutions.
- ✓ Develop and test advanced solutions for manufacturing and industrial processes and technologies.
- ✓ Assist in preparing research proposals and cost estimates.
- ✓ Interact with academic institutions and government agencies to promote new researches and develop new projects.

His educational background is Bachelor's, Master's, or PhD degree in industrial engineering, mechanical engineering, electrical engineering, electronics engineering, computer science engineering, automation engineering, control system engineering, or related major. Some of the essential skills or qualifications required are:

- ✓ Experience designing complex systems for industrial automation systems.
- ✓ Experience with product development in automation equipment, or similar.
- ✓ Experience managing design engineering projects.
- ✓ Experience using technical software.
- ✓ Proficiency with PLC program design and development.
- ✓ Proficiency with SCADA/HMI systems.
- ✓ Proficiency with industrial communication protocols.
- ✓ Expertise on MES and ERP systems.
- ✓ Expertise on CPPS distributed automation.
- ✓ Expertise on IIoT protocols.
- ✓ Expertise on virtual commissioning.
- ✓ Ability to understand, analyse and troubleshoot complex systems.
- ✓ Ability to develop innovative solutions to complex problems.
- ✓ Ability to work effectively in cross-functional teams.
- ✓ Ability to work and generate solutions independently.

3.4 AERIAL VEHICLES (UNMANNED & MANNED)

3.4.1 Flight Control Systems Engineer

See also description of [Control Engineer](#).

The responsibilities of the Flight Control Systems Engineer lie within the development process of the typical flight control systems. His role is to:

- ✓ Establish the aerodynamic design and system performance requirements
- ✓ Modelling and analysis of the unaugmented vehicle
- ✓ Design criteria and flying qualities specifications
- ✓ Control laws design and development
- ✓ Control laws functional specification, implementation and verification
- ✓ Piloted simulation and handling qualities
- ✓ Aeroservoelasticity and structural mode filter design
- ✓ Design robustness and flight clearance

His educational background is in aerospace, electronics, mechanical engineering or similar. Some of the essential skills or qualifications required are:

- ✓ Experience in control theory, control system architecture, aerodynamics, aircraft dynamics, aero- (and aero-servo-) elasticity, aircraft loads, weight balance, simulation and modelling methods, digital signal processing, software engineering.
- ✓ Good understanding of the different types of sensors (air data, inertial, etc), their architecture, and how they are usually modelled (filters, delays, conversion calculations); familiarity with tools for visual modelling of dynamic systems (Simulink, Scade, Xcos); good understanding of the aircraft dynamic and how the main stability

derivatives affect its overall behavior; understanding of all the available actuation system (surfaces or possibly engines, for example)

- ✓ Knowledge of the market segment and customers needs; knowledge of certification regulations (EASA Certification Specifications, FAA Federal Aviation Regulations), the MIL-STD specifications (if applicable); understanding of stability margins, PIO rating, flying qualities standard criteria and pilot rating (like Cooper-Harper rating scale)
- ✓ Design control techniques and performance analysis (stability margins, for example); understanding of model trimming and linearization processes and how to use the tools to perform it as desired; linear aircraft analysis (dynamic modes and state-space representation); dynamic system modeling (Matlab/Simulink, C/C++, Fortran or whichever programming language used); understanding of flight control computer architecture and functioning; understanding of configuration control systems (SVN, GIT); understanding of requirements management systems (Rational Doors, Caliber, Jama, Pearls, etc); understanding of issue tracking and project management tools (Jira, Clarizen, Zenhub, GitScrum, etc).
- ✓ Understanding of the translation process of the control laws algorithms to the actual code to be embedded in the real hardware; awareness of the main constraints of the hardware; awareness of the integration details of the flight control system with the other systems; knowledge of the main recommendations of the international standards for critical software/system development (ARP4754, DO-178B, DO-178C)
- ✓ Understanding of the flexible and rigid modes of the aircraft structures; knowledge of control system performance and stability analysis; understanding of filter design (mainly band-stop and notch filters); understanding of possible issues related to the discretization of these filters
- ✓ Knowledge of robust control theory; understanding of the uncertainty associated with aerodynamic model and the various sensors and ability to assess the robustness of linear and non-linear designs; understanding of the certification procedures and requirements

3.4.2 Flight Embedded SW Engineer

See also description of [Software Engineer](#).

The responsibilities of the flight embedded SW engineer are in software design and implementation for flight management systems. His role is to:

- ✓ Develop real-time embedded applications
- ✓ Develop distributed embedded solutions
- ✓ Within functional areas as Flight Planning , Navigation, Input / Output, Crew Interface / HMI, EFIS Graphical Displays, Datalink, Lateral Guidance, Vertical Guidance, and Performance functions

His educational background is mainly in Computer Science. Some of the essential skills or qualifications required are:

- ✓ Experience in development of real-time embedded software

- ✓ Experience in development skills in the C programming language
- ✓ Experience with RTOS, software configuration management tools, continuous integration, test coverage, worst case execution time analysis, worst case stack usage analysis, static code analysis and Git knowledge
- ✓ Experience with digital communication bus standards

3.4.3 Flight Systems Test and Validation Engineer

See also description of [Test and Validation Engineer](#).

The responsibilities of the flight systems test and validation engineer are to be in charge of testing activities for flight software. His role is to:

- ✓ Develop the specification of the tests to be performed (unit tests, Integration tests and Validation tests)
- ✓ Write test procedures
- ✓ Play, collect and analyze test results
- ✓ Set up ad hoc test environments

His educational background is typically in Computer Science. Some of the essential skills or qualifications required are:

- ✓ Knowledge of architecture of embedded real-time applications
- ✓ Experience in validation, development and reuse of embedded software
- ✓ Experience in programming languages such as C, C ++, python, java, TCL

3.4.4 Flight Systems Engineer

See also description of [Systems Engineer](#).

The flight systems engineer should develop and engineer avionics and control systems for flight platforms. His role is to:

- ✓ Specify, design, develop, verify, validate, implement, and support avionics systems (hardware and software) for flight.

His educational background is in multiple engineering disciplines such as mechanical, electrical, control systems and systems engineering. Some of the essential skills or qualifications required are:

- ✓ Experience in defining, classifying, and programming software for critical aircraft systems: selecting, designing, fabricating, qualifying, integrating, installing, and testing flight-worthy hardware.
- ✓ Experience in defining systems requirements based on end-user needs and safety.

3.4.5 Flight Control Research Engineer

See also description of [Research Engineer](#).

The responsibilities of the flight control research engineer are the design of new products and technologies for flight control. His role is to:

- ✓ Design new electronic and avionics systems, subsystems, units.
- ✓ Design new software for flight management systems
- ✓ Design new control techniques

His educational background is a Master or PhD degree in Mechanical Engineering, Electrical Engineering, Science, Aeronautics or related fields. Some of the essential skills or qualifications required are:

- ✓ Proven past experience in flight control tasks
- ✓ Experience in research projects, as a team member or preferably as a coordinator.
- ✓ Experience in project writing

3.5 MOBILE ROBOTICS

3.5.1 Mobile Robot Control Systems Engineer

See also description of [Control Engineer](#).

The responsibilities of the mobile robot control systems engineer will be to perform the development and implementation of algorithms for path planning, navigation and motion control of mobile robots. His role is to:

- ✓ Develop and integrate mobile robot self-navigation technology, including low-level control systems, path planning algorithms and higher level behaviors
- ✓ In charge of testing new algorithms and code on the hardware
- ✓ Perform control architecture evaluation and selection, dynamic modelling, estimation and control system analysis and design
- ✓ Implement control algorithms in real-time hardware for verification
- ✓ Assist in developing and implementing detailed test and verification plans from the subsystem to vehicle level

His educational background is in electrical engineering with emphasis on control systems. Some of the essential skills or qualifications required are:

- ✓ Experience with control algorithms
- ✓ Experience with path planning and mobile robot navigation
- ✓ Hands on experience writing software to control physical systems
- ✓ Strong linear algebra skills
- ✓ Software fundamentals (iteration, data structure, object oriented programming, bits and bytes)

- ✓ Expertise in MATLAB/Simulink
- ✓ Expertise in algorithm development (e.g. C++ and Python in Linux environment)
- ✓ Experience in Robot Operating System (ROS)

3.5.2 Mobile Robot Embedded SW Engineer

See also description of [Software Engineer](#).

The responsibilities of the mobile robot embedded SW engineer are to design and to develop embedded software that allows to perform the different tasks (motion control, data acquisition and processing, SLAM...) dedicated to mobile robots. His role is to:

- ✓ Writing code for discovery, analysis and implementation of solutions
- ✓ Creating tests to validate accuracy and conformity of code
- ✓ Review and maintain code written by others
- ✓ Investigating issues as reported by grid operations and other engineering teams
- ✓ Analysing hardware behaviour and performance
- ✓ Collaborate closely with cross functional engineering teams

His educational background is in Computer Science with emphasis on embedded systems. Some of the essential skills or qualifications required are:

- ✓ Experience in developing highly reliable embedded software for mobile robots
- ✓ Experience in Control systems engineering, ideally in a real-time environment
- ✓ Experience with version control (Git) and CI/CD pipelines
- ✓ Experience in using data Frameworks (BigQuery, Google Cloud Platform, Airflow...)
- ✓ Proficiency in Python with associated data processing/machine learning toolkits (Numpy, Scipy, Jupyter notebooks...)
- ✓ Experience in developing unit tests and working with other testing frameworks
- ✓ Knowledge in mechatronics, robotics, computer science
- ✓ Knowledge in motor control and of motor types
- ✓ Understanding of Electronics would be helpful
- ✓ Knowledge in Actuators and sensors
- ✓ Experience with control solutions for mobile robots
- ✓ Experience with working with Big Data and data analytics tools

3.5.3 Mobile Robots Test and Validation Engineer

See also description of [Test and Validation Engineer](#).

The responsibilities of the mobile robot test and validation engineer will be designing and running test suites that validate all capabilities of a complex robotic system. His role is to:

- ✓ Design and implement test frameworks for a material handling mobile robot involving dynamic simulation in addition to development of test software to control real hardware.
- ✓ Support system testing of systems and subsystems
- ✓ System level debug of hardware/software components for mobile robot platform
- ✓ Provide technical support for developer as needed

His educational background is in Electrical, Mechanical or Computer Engineering. Some of the essential skills or qualifications required are:

- ✓ Experience with developing and executing test plans for software solutions
- ✓ Ability to troubleshoot hardware/software systems via scripting (ex: Pearl, Python), and data log parsing and analysis (ex: GREP, regex)
- ✓ Experience programming in C or C++ or C#.
- ✓ Ability to dive deep into data to understand issues that need to be addressed.
- ✓ Experience with motion control equipment, material handling systems, or robotics
- ✓ Experience with simulation environments

3.5.4 Mobile Robot Systems Architect

See also description of [Systems Architect](#).

The responsibilities of the mobile robot systems architect are to work on complex projects that require in-depth domain knowledge or two or more specialized architecture areas. His role is to:

- ✓ Develop, lead and grow new technology concepts with strategic impact focused on robotics, autonomy, cyber-physical systems, and the Industrial inspection
- ✓ Lead projects, relationship building, and the development of new autonomous and robotic systems technology
- ✓ Interface with business leaders and provide direction and guidance for technology roadmaps
- ✓ Identify key technical issues and focus resources to produce cutting-edge technical breakthroughs in the area of cyber-physical systems technology
- ✓ Actively participate in design, architecture, and development efforts of robotic inspection solutions for industrial assets
- ✓ Guide robotics researchers on the principals of software design and architecture

His educational background is a Master or a PhD in Computer Science, Computer Engineering, Electrical Engineering, Mechanical Engineering or a related discipline. Some of the essential skills or qualifications required are:

- ✓ Experience in enterprise system design, architecture and integration

3.5.5 Mobile Robot Control Systems Research Engineer

See also description of [Research Engineer](#).

The responsibilities of the mobile robot control systems research engineer are to develop assembly control strategies and to explore the opportunities offered by state-of-the-art in mobile robot applications. His role is to:

- ✓ Explore state-of-the-art collaborative robot applications and make proposals for their implementation in such a way that the industry benefits from them by improving current solutions in terms of flexibility, productivity and safety
- ✓ Define and develop the online or real-time control strategy for mobile robots (position control, vision control, collaborative control...) and for component handling and gripping, exploration applications
- ✓ Test and improve operational functionalities (sensors, software, control strategies...).

His educational background is a master or PhD degree in a relevant domain (Automatic control, Computer science, Electrical engineering...). Some of the essential skills or qualifications required are:

- ✓ Experience in academic or industry research
- ✓ Reliable expertise in robot control
- ✓ Experience in writing high-quality codes (ex: C++, Java...) and a good feel for Robot Programming
- ✓ Affinity with simulations and modelling of robots using different simulation environment

3.6 VEHICLE POWERTRAIN AND DYNAMICS

3.6.1 Vehicle Powertrain Control Systems Engineer

See also description of [Control Engineer](#).

The responsibilities of the control design engineer will be to perform the development of control architecture, estimation, control analysis, and control algorithms for advanced powertrain architecture (with various gear boxes and/or multi energy source such as electrified one) or/and vehicles (active suspension, breaking assistance, wheel trajectory control). His role is to:

- ✓ Develop low consumption and low emission for multi energy source vehicle
- ✓ Perform control architecture evaluation and selection, dynamic modelling, estimation and control system analysis and design
- ✓ Implement control algorithms from simulation to real-time hardware (SIL, HIL)
- ✓ Assist in developing and implementing detailed test and verification plans from the subsystem to vehicle level

His educational background is in electrical engineering, mechanical engineering, aerospace engineering or a related field with emphasis on control systems. Some of the essential skills or qualifications required are:

- ✓ Knowledge in modelling vehicle systems (tires, suspension, steering, etc.)
- ✓ Knowledge in vehicle architecture (engine, motor, energy storage, transmissions, electric and electronic devices) for classical gasoline or diesel to hybrid vehicle
- ✓ Expertise in robust control laws development using model based approach
- ✓ Expertise in MATLAB/Simulink
- ✓ Expertise in functions and algorithm development (e.g. in C++)
- ✓ Expertise in control system rapid prototyping development (e.g. MATLAB/Simulink and dSPACE MicroAutobox)

3.6.2 Vehicle Powertrain Embedded Systems Engineer

See also description of [Systems Engineer](#).

The responsibilities of the embedded systems engineer are to lead the design of ECUs (e.g. implementing efficient and safe algorithms, develop on-board diagnosis) for the current and new generation of vehicles. His role is to:

- ✓ Create and maintain application specific Design Validation Methods (DVMs) and execute them in vehicle and Hardware-in-the-Loop (HIL)
- ✓ Create and maintain Diagnostic Design Failure Mode and Effects Analysis (FMEA), p-diagram)
- ✓ Develop Matlab scripts required to analyze fleet data and aide calibration. Develop Matlab Models and Scripts for Rapid Prototype development of new monitor concept.
- ✓ Implement control algorithms from simulation to real-time hardware (SIL, HIL)
- ✓ Assist in developing and implementing detailed test and verification plans from the subsystem to vehicle level
- ✓ Support Service and Manufacturing tool requirements (End-Of-Line Diagnostics)

His educational background is in mechanical engineering, automotive engineering, electrical engineering or a related field with emphasis on embedded systems. Some of the essential skills or qualifications required are:

- ✓ Knowledge in powertrain controls design and validation
- ✓ Expertise in MATLAB/Simulink modelling
- ✓ Expertise in functions and algorithm development (e.g. in C, C++)
- ✓ Expertise in control system rapid prototyping development (e.g. MATLAB/Simulink and dSPACE MicroAutobox)
- ✓ Expertise in software-in-the-loop (SIL) and hardware-in-the-loop (HIL)
- ✓ Knowledge in V-cycle developing diagnostic or control systems
- ✓ Expertise in calibration and data acquisition tools

3.6.3 Vehicle Powertrain Test and Validation Engineer

See also description of [Test and Validation Engineer](#).

The responsibilities of the Vehicle Powertrain Test and Validation Engineer are to maintain lab operations for product development engineering teams involved with optimization of automotive powertrains, to build powertrain test schedules, to diagnose test cell systems, to guarantee data integrity and to maintain operational efficiency throughout the lab. His role is to:

- ✓ Maintain and modify test programs for automotive powertrain
- ✓ Perform component, system and powertrain validation under dynamic and environmental conditions
- ✓ Analyze test data and write test reports

His educational background is a Master in Electrical Engineering, Computer Science, or other related fields. Some of the essential skills or qualifications required are:

- ✓ Experience with Python, Matlab, or other data acquisition and analysis software.
- ✓ Knowledge in Automotive component/system testing experience, including certification testing.
- ✓ Experience in physical testing and analysis of mechanical, thermal, or electrical systems
- ✓ Knowledge of automotive communication protocols such as CAN, UDS and TCP/IP

3.6.4 Vehicle Powertrain Systems Architect

See also description of [Systems Architect](#).

The responsibilities of the Powertrain Architecture Engineer are the powertrain architecture development and synthesis for various vehicle powertrain systems (conventional, electric, hybrid,...) to meet performance, fuel economy and Greenhouse gas emissions targets. His role is to:

- ✓ Lead vehicle and powertrain architecture development and synthesis for commercial vehicles to meet fuel economy and Greenhouse gas emissions targets.
- ✓ Works with product engineering team to establish powertrain and vehicle system requirements for customer programs, and lead vehicle/powertrain modelling and analysis effort to evaluate the performance of architecture alternatives and system-level trade-offs
- ✓ Develop the processes for standard methods and analysis work package for architecture synthesis, performance evaluation and design optimization.
- ✓ Performs detailed studies and analysis of the electric and hybrid electric vehicle/powertrain system (including the mechanical, thermal, electrical, and controls architecture) with emphasis on performance evaluation, design optimization, component selection and sizing, control strategy develop

- ✓ Develop electric and hybrid electric vehicle/powertrain system requirements and decomposes into component and integration requirements
- ✓ Works with chassis, e-Drive, auxiliary, controller, software engineers to assign requirements, discuss tradeoffs, perform design reviews, & ensure successful integration
- ✓ Develop vehicle control, calibration and validation strategy based on model-based systems engineering methodology

His educational background is in Mechanical Engineering, Electrical Engineering or related field. Some of the essential skills or qualifications required are:

- ✓ Experience with automotive systems engineering
- ✓ Knowledge of various vehicle architectures (conventional, electric and hybrid), systems, subsystems at various voltage levels including component design, selection and mating
- ✓ System-level design of powertrain control systems experience including system/subsystem level trade-off analysis, troubleshooting, control and calibration strategy

3.6.5 Vehicle Powertrain Research Engineer

See also description of [Research Engineer](#).

The responsibilities of the Vehicle Powertrain Research Engineer are to stimulate open innovation towards high-performant, energy efficient, flexible and autonomous vehicles. His role is to:

- ✓ Develop eg. by rethinking the electric and autonomous prototype vehicles. In the e-powertrain lab we test drivetrains for electric and hybrid vehicles or machines. We can support in every step of the development process, from design and architecture to realistic driving tests.
- ✓ Generate new research ideas inspired by new concepts for the electric vehicle of the future (eg. a hybrid truck, an electric forklift, ...) & for high tech industrial variants (eg. mobile robot) and respond to innovation needs of manufacturing companies; Can you think of an alternative energy system replacing the central e-motor?
- ✓ Translate your innovative ideas into project proposals;
- ✓ Take the technical lead of a research team combining expertise in model based mechatronic system engineering, vehicle dynamics, energy management, battery systems, control, and testing and validation.

His educational background is a Master's degree or preferably a PhD in Engineering at large. Some of the essential skills or qualifications required are:

- ✓ Knowledge of machine and/or vehicle dynamics and motion control, modelling, control algorithms, system simulation, sensors and actuators, ...
- ✓ Experience in automotive context