# PFE BOOK 2026

OTOM8 SYSTEMS

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ROBOTS Designed to Fit Into Life

At Otom8 Systems, we aim to seamlessly integrate advanced robotics into everyday life, enhancing productivity and improving the quality of life for all. Our dedicated team is committed to developing modular , cost effective, reliable, and user-friendly robotic systems that transform industries and homes alike.

Nomad Robot

Our main product is Nomad, it is a rugged, ROS 2–ready mobile robot built for surveillance, inspection, and exploration in extreme environments. Powered by the ElectroCore controller, it offers powerful motor control, real-time teleoperation, and customizable protection for hazardous zones—perfect for nuclear plants, oil refineries, firefighting, and more.

SOFTWARE
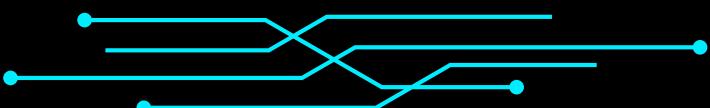
This department focuses on embedded firmware, ROS 2 / micro-ROS integration, and AI-based perception for the Nomad NS1 robot. Topics cover software running on microcontrollers and embedded Linux systems, with emphasis on robustness, modularity, and real-world deployment.

SW-01: ETHERLIGHT MODULAR LIGHTING FIRMWARE

Objectives

Develop firmware for the EtherLight module, a multi-channel lighting system on Nomad, to allow configurable light patterns (static, flashing, smooth transitions) and remote control via ROS 2 services over Ethernet. You will implement embedded firmware with PWM outputs, micro-ROS integration, and OTA updates to make the module fully modular and remotely maintainable.

Required Skills

- C/C++ embedded programming
- ESP32 / microcontroller experience
- PWM and real-time control
- ROS 2 services and topics
- Networking basics (Ethernet)
- OTA update implementation

SW-02: COMPUTER VISION FOR AGRICULTURAL ANOMALY DETECTION

Objectives

Develop a perception pipeline for Nomad to detect anomalies in crops and agricultural fields, using computer vision and ROS 2. The module will process camera data in real time, detect irregularities, and publish alerts for monitoring, enabling proactive agricultural management.

Required Skills

- Object detection and tracking
- Activity recognition and anomaly detection
- ROS 2 message handling
- Python/C++ programming

SW-03: COMPUTER VISION FOR SECURITY & INDUSTRIAL ENVIRONMENTS

Objectives

Create a vision-based security module for Nomad to detect intrusions, abnormal activities, or environmental anomalies in industrial, office, or residential areas. The system will analyze camera data, identify threats, and communicate alerts via ROS 2, enabling autonomous monitoring.

Required Skills

- Object detection and tracking
- Activity recognition and anomaly detection
- ROS 2 message handling
- Python/C++ programming

SW-04: FORESTFORGE EMBEDDED FIRMWARE

Objectives

Develop embedded firmware for the ForestForge module, responsible for spraying water, pesticides, or fertilizers and reading environmental sensors (temperature, humidity, air quality). The firmware will handle actuator control, sensor acquisition, safety checks, and ROS 2 communication for modular and autonomous operation.

Required Skills

- C/C++ embedded programming
- ESP32 / microcontroller experience
- Relay and actuator control
- Sensor reading and calibration
- ROS 2 topic/service integration
- OTA update management

SW-05: NOMAD UNIFIED UI DASHBOARD (NUIID)

Objectives

Develop a unified UI dashboard for Nomad operators to monitor the robot and its modules in real time. The dashboard will display sensor data, robot status, and controls for actuators and modules, allowing intuitive supervision, diagnostics, and ROS 2 integration.

Required Skills

- Web development (React / Vue / HTML/CSS/JS)
- ROS 2 integration (rosbridge, Foxglove, rclpy,transitive)
- Real-time data visualization
- UX/UI basics

SW-06: OUTDOOR VISUAL-GPS NAVIGATION & LOCALIZATION

Objectives

Develop a navigation and localization module for Nomad using a ZED stereo camera and GPS. The system will fuse visual odometry, GPS, and wheel odometry in ROS 2 to provide accurate outdoor positioning and enable reliable autonomous navigation even in challenging environments.
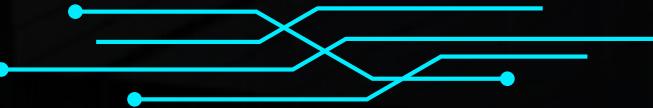
Required Skills

- ROS 2 navigation and TF
- stereo camera SDK
- Sensor fusion (EKF/UKF)
- Python/C++ programming
- GNSS / GPS processing

SW-OP: NOMAD AUTONOMY & BEHAVIOR LAYER (ROS 2)

Objectives

Develop the core decision-making layer for Nomad to manage autonomous operations, robot modes, and mission execution. Using behavior trees or state machines in ROS 2, the system will coordinate perception, navigation, and actuator commands while ensuring safe and reliable operation.

Required Skills

- ROS 2 lifecycle nodes
- Behavior trees / state machines
- C++/Python programming
- Integration of multiple ROS 2 nodes
- Mission planning and safety logic

SW-08: NOMAD DIAGNOSTICS, LOGGING & HEALTH MONITORING

Objectives

Develop a diagnostics and health-monitoring system for Nomad that collects data from all software and hardware modules, aggregates errors and status, and provides visual feedback to the operator. The module ensures early fault detection, safe operation, and system reliability during field deployment.

Required Skills

- ROS 2 diagnostics, logging
- Python/C++ programming
- Sensor and node monitoring
- Data visualization (UI integration)

MECHANICS

This department focuses on the mechanical robustness, waterproofing, weight optimization, and modularity of the Nomad robot and its modules. Topics include mechanical design optimization and simulation using URDF and Gazebo (ROS 2).

ME-01: NOMAD MECHANICAL OPTIMIZATION & SIMULATION

Objectives

Improve Nomad's mechanical design to enhance robustness, waterproofing, and weight optimization for outdoor operations. You will analyze the current structure, propose improvements, and create a full URDF model for simulation in Gazebo, allowing you to test mechanical changes, dynamics, and interactions with modules in realistic scenarios.

Required Skills

- CAD modeling (SolidWorks / Fusion 360)
- Mechanical analysis (FEA)
- URDF and ROS 2 Gazebo simulation
- 3D printing / prototyping knowledge

ME-02: FORESTFORGE MECHANICAL MODULE DESIGN

Objectives

Design and optimize the ForestForge module mechanically to integrate seamlessly with Nomad while being durable and modular. You will develop CAD models for mounting, fluid routing, nozzle placement, and environmental protection, ensuring the module performs reliably in field conditions while maintaining manufacturability.

Required Skills

- CAD modeling and assembly
- Fluid dynamics basics (spraying systems)
- Environmental resistance materials
- Manufacturability knowledge
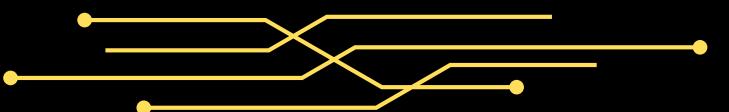
ELECTRONICS

This department focuses on the design of electronic systems for Nomad, including power electronics, battery monitoring, sensor/actuator control, and PCB design, with strong emphasis on safety and system integration.

EL-01: SMART CHARGING STATION & BATTERY MONITORING SYSTEM

Objectives

Develop a complete charging station for Nomad, including power electronics, battery monitoring, and firmware. The system will manage safe charging of the robot, read battery voltage, current, and temperature, estimate state-of-charge, and integrate with ROS 2 for monitoring, ensuring reliable long-term autonomous operation.

Required Skills

- Power electronics design
- Battery monitoring and SoC estimation
- Firmware development for embedded controllers
- ROS 2 integration

EL-02: FORESTFORGE ELECTRONIC CONTROL BOARD

Objectives

Design and implement the ForestForge control board to manage actuators and sensors reliably in outdoor conditions. You will develop the PCB, integrate relay and sensor interfaces, implement embedded firmware for actuation and monitoring, and ensure EMC and safety compliance for industrial-grade field deployment.

Required Skills

- PCB design (Eagle / KiCAD / Altium)
- Actuator and sensor interface electronics
- Embedded firmware programming
- EMC / safety considerations

business &
marketing
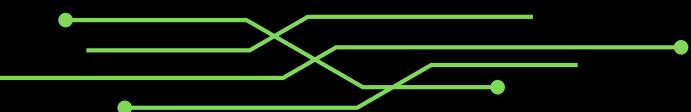
This department focuses on the commercialization, market positioning, and scaling of the Nomad and ForestForge ecosystems. Topics bridge advanced robotics technology with real-world business strategy, international markets, and startup growth.

MK-01: MARKET STRATEGY & INTERNATIONAL EXPANSION

Objectives

Define a go-to-market and international expansion strategy for the Nomad NS1 and ForestForge products, focusing on market analysis, identification of high-value industrial and agricultural niches, and structured entry into Tunisian, European, and African markets.

Required Skills

- Market research and strategic analysis (SWOT, PESTEL)
- B2B industrial marketing
- International business fundamentals
- Professional writing in English and French

MK-02: BUSINESS MODEL & GROWTH STRATEGY

Objectives

Design scalable business models for Otom8 Systems by exploring revenue strategies such as direct sales and Robot-as-a-Service, supported by financial projections, digital growth initiatives, and investor-ready materials.

Required Skills

- Business Model Canvas and Lean Startup methods
- Financial modeling and basic accounting
- Digital marketing and B2B communication
- Presentation and storytelling skills

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We take mentorship seriously — you will learn a lot working on Nomad .
To apply:

- Email us with Subject: [Topic Code] internship submission to **internship@otom8.systems**
- Include a short message expressing your interest.

That's all — simple and fast!

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All robot images and illustrations used in this document are generated from simulation software representing the real Nomad robot.

Any additional images or visual elements are sourced from free-to-use platforms (Freepik) and are used for illustrative purposes only.