QUPRAYOG

Senior / Lead Precision Electronics Engineer – Precision Lasers & Optical Frequency Combs

Location: Pune, India (On-site)

Company: QuPrayog Private Limited

Technology Stack: Precision Analog Electronics • RF & Microwave Electronics (DC–20+ GHz) • FPGA • Embedded Systems • Servo Control • Precision Laser Electronics • Optical Frequency Combs • Scientific Instrumentation

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About QuPrayog

QuPrayog is an Indian deep-tech startup developing next-generation precision photonics and quantum technologies. Incubated at I-HUB Quantum Technology Foundation, IISER Pune, and supported under the **National Quantum Mission (Government of India)**, we are building indigenous ultrastable laser systems, optical frequency combs, and enabling technologies for precision metrology, quantum sensing, optical communications, and scientific instrumentation.

Our mission is to design and manufacture world-class photonic systems in India that power the next generation of quantum technologies, precision timing, and advanced scientific instrumentation.

As an early team member, you will have the opportunity to influence product architecture, establish engineering practices, and help build a world-class photonics company from the ground up.

The Role

As a **Senior / Lead Precision Electronics Engineer**, you will own the design and development of electronics for some of the world's most demanding laser and photonic systems. You will work closely with physicists and optical engineers to transform laboratory concepts into reliable hardware suitable for research instruments and commercial products.

This is **not a conventional embedded electronics role**. It involves designing ultra-low-noise analog electronics, high-bandwidth feedback systems, RF and microwave circuits, FPGA-based control systems, and embedded hardware for precision laser stabilization and optical frequency combs.

Depending on your experience, you will either lead or play a major technical role in defining the electronics architecture for QuPrayog's next-generation photonic products.

Technical Responsibilities

1. Precision CW Laser Electronics

Design, develop and optimize electronics for precision continuous-wave laser systems including:

- External Cavity Diode Lasers (ECDL)

- Distributed Feedback (DFB) lasers
- Vertical External Cavity Surface Emitting Lasers (VECSEL)
- Other narrow-linewidth laser sources

You will develop electronics for:

- Ultra-low-noise laser current controllers
- Precision temperature controllers (TEC drivers)
- Laser frequency tuning electronics
- Low-noise analog front-end circuits
- Servo controllers and feedback systems
- Laser protection and monitoring electronics
- Precision data acquisition and diagnostics

These systems are expected to achieve frequency stability suitable for demanding spectroscopy and precision photonics applications, requiring laser frequency control in the kHz to MHz regime.

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2. Optical Frequency Comb Electronics

Develop the electronics required for stabilization and control of optical frequency combs based on mode-locked fiber and free-space lasers.

Responsibilities include the design and integration of electronics for:

- Repetition-rate stabilization
- Carrier-envelope offset (CEO) frequency stabilization
- Optical and RF phase-locked loops
- Servo controllers
- Phase detectors
- Frequency mixers
- RF filters
- RF amplifiers
- Oscillators and frequency synthesizers
- Frequency dividers
- High-speed photodetection and signal conditioning

- Low-noise timing and synchronization electronics

You will work extensively with RF and microwave signals ranging from DC to **20+ GHz** while developing high-bandwidth feedback systems for ultrafast laser stabilization.

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3. Embedded Systems & Product Development

Develop embedded hardware and firmware that integrate precision electronics into reliable laboratory and commercial instruments.

Responsibilities include:

- FPGA development
- Microcontroller-based system design
- High-speed ADC/DAC interfaces
- Digital communication protocols
- PCB design and hardware bring-up
- Firmware development in C/C++
- Instrument automation and diagnostics
- System integration, testing and validation

You will work closely with optical physicists and engineers to convert laboratory prototypes into robust, manufacturable products while taking ownership of the complete electronics development cycle—from concept and architecture through testing and deployment.

Essential Qualifications

- Bachelor's or Master's degree in Electronics Engineering, Electrical Engineering, Instrumentation Engineering, Embedded Systems, or a related discipline.
- Strong understanding of analog and digital electronics.
- Experience designing, debugging and testing precision electronic circuits.
- Familiarity with PCB design, laboratory instrumentation and hardware bring-up.
- Strong analytical and problem-solving skills.
- Ability to independently troubleshoot complex electronic systems.
- Excellent communication skills and the ability to work in multidisciplinary teams.

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Ideal Candidate

The ideal candidate has **at least two years of hands-on experience** developing electronics in a research laboratory working on:

- Precision lasers
- Ultrafast lasers
- Photonics
- Spectroscopy
- Optical instrumentation
- Precision scientific instrumentation
- Or closely related experimental systems

Experience with any of the following is highly desirable, but not mandatory:

- Ultra-low-noise analog electronics
- Precision current and temperature controllers
- Narrow-linewidth laser electronics
- RF or microwave electronics
- High-speed analog electronics
- Optical frequency combs
- Phase-locked loops (PLL/OPLL)
- Servo control systems
- FPGA development
- Embedded firmware
- High-speed ADC/DAC systems
- Precision timing electronics
- Low-noise measurement electronics

Industrial experience in photonics, lasers, semiconductor equipment, aerospace, defence, medical devices, or scientific instrumentation is highly desirable. However, exceptional candidates from academic research laboratories are equally encouraged to apply.

What We Look For

QUPRAYOG

Beyond technical expertise, we value engineers who:

- Take ownership rather than wait for instructions.
- Enjoy solving difficult engineering problems from first principles.
- Are excited by experimental hardware development.
- Learn new concepts rapidly across electronics, optics and physics.
- Can communicate effectively with scientists, engineers and external collaborators.
- Thrive in a fast-moving startup environment where initiative and execution matter.
- Are motivated by building products that do not yet exist rather than maintaining existing ones.
