

FICHE DE FONCTION

Emploi : Maître de conférences

Section du CNU : 28

Département : Génie Physique et Matériaux (GPM) / Sciences et Techniques pour l'Ingénieur (STPI)

Laboratoire : Institut FOTON - UMR 6082

Profil : Caractérisations électro-optiques des dispositifs photoniques et énergétiques hybrides

Job environment :

With more than 11,000 engineers working in all sectors of the economy, INSA Rennes is a public, multidisciplinary and international engineering school, renowned for the excellence of its research and its five-year post-baccalaureate curriculum.

INSA Rennes is both a founding member of the INSA Group, France's leading group of public engineering schools, and a component of the University of Rennes, an experimental public institution grouping together training components, research clusters and five grandes écoles in Rennes.

Welcoming 2050 students and apprentices, our institute graduates over 340 engineers, 60 masters students and 40 PhDs each year. Our teaching methods encourage creativity and develop a spirit of innovation. Scientific and technical courses form the core of our training. They are complemented by human, economic and social sciences. 8 engineering specialties are taught, including 2 apprenticeships.

The institute also offers hybrid courses (engineer-entrepreneur, engineer-architect, engineer-political sciences, engineer-manager) and optional courses (sporting and artistic excellence), as well as double degrees with numerous European and international partners.

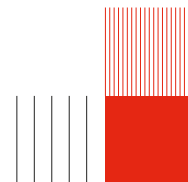
The establishment also oversees 6 research laboratories. Its research and actions in favor of the ecological transition, innovation, diversity and entrepreneurship enable it to offer all its stakeholders an environment conducive to an entrepreneurial spirit that combines impact and meaning. The links forged with socio-economic players, both in terms of engineering training and research and technology transfer, are one of its key assets.

Located on a green, sustainable campus of over 17 hectares, the institute employs around 540 public-sector staff (teaching researchers, lecturers, administrative and support staff) and almost 400 temporary staff, including over 70 temporary staff from companies.

Corporate strategy

The school has set itself 10 objectives as part of its INSA Rennes 2024-2030 strategic roadmap:

- Design a new model for training engineers to meet ecological and societal challenges
- Provide answers to ecological and societal challenges through interdisciplinary fundamental research
- Become a hub for responsible and sustainable innovation
- Build a continuing education offering
- Ensure European and international visibility
- A learning environment focused on success and well-being
- Offer a pleasant, caring and secure professional environment
- Reduce our environmental impact



- Establish a governance structure that combines the highest academic standards with dialogue with business and society at large
- Establish ourselves as the leading school for sustainable and responsible engineering

Specific context:

Electro-optical characterization of photonic and hybrid energy devices

INSA Rennes is looking to recruit a high-level teacher-researcher to bolster the academic and contractual activities of the FOTON Institute, focusing on the development of photonic and solar energy devices, with spin-offs for teaching, particularly in the Engineering Physics and Materials (GPM) department. Specific human and financial resources obtained under the "Decarbonized Hydrogen", "Advanced Energy Systems Technologies" and "Electronics" (France 2030) Priority Research Programs and Equipment (PEPR), as well as current European and national projects, will be made available to support the start-up of the teacher-researcher's activity in these areas.

Research laboratory: Institut FOTON, INSA Rennes

Director of Institut FOTON: Mehdi Alouini (directeur@institut-foton.eu)

Head of the INSA component (OHM team) of the Institut FOTON: Charles Cornet (charles.cornet@insa-rennes.fr)

A center of academic excellence in photonics for information technologies, the Institut "Fonctions Optiques pour les Technologies de l'information" (FOTON) is a joint research unit involving the CNRS (mainly attached to INSIS, and secondarily to INP and INC), UR1 (Enssat, IUT de Lannion and UFR SPM), and INSA Rennes, with a staff of around 120, including 75 permanent employees. The unit generates a scientific output of over 100 articles per year, and is one of France's leading public research forces in its field.

Institut FOTON is organized into three teams: DOP (head: Marc Vallet), OHM (head: Charles Cornet) and SP (head: Monique Thual); and three platforms: CCLO (technical head: Parastesh Pirasteh), NanoRennes (technical head: Rozenn-Gautheron-Bernard), and Persyst (technical head: Mathilde Gay).

What makes FOTON unique is that it brings together three teams and three platforms around common programs, covering targeted areas of photonics and energy: the physical layer of telecommunications, technologies linked to industrial and defense applications (optical sensors, lasers, instrumentation for photonics, quantum technologies) and photovoltaic or photoelectrochemical energy conversion.

Department to which the position is attached: Physical and Materials Engineering

Department head: Soline BOYER (soline.boyer@insa-rennes.fr)

The GPM department trains engineers capable of developing innovative, sustainable materials and components, accurately measuring their physical properties and performance, modeling complex physical systems, and deploying the associated industrial processes.

Special skills required:

Research: Electro-optical characterization of photonic and hybrid energy devices.

The OHM team at Institut FOTON (UMR 6082-site INSA) is involved in teaching and research



related to semiconductor materials (SC), photonics and renewable energies. In a dynamic and constantly evolving international context, the team has been able to capitalize on its internationally recognized expertise in III-V photonic devices and quantum nanostructures (laser, V(E)CSEL, solar cells), and propose new alternatives for photovoltaic applications, solar hydrogen production, and new advanced photonic concepts. These issues are at the heart of the OHM team's activities at the FOTON institute (UMR 6082-site INSA), through its involvement in two targeted PEPR electronics projects, one PEPR decarbonated hydrogen project, the EQUIPEX NanoFutur, a junior professorship in quantum technologies, various ANR projects, and the recent creation of a joint laboratory with 3SP. These projects, all focused on photonics or energy, use hybrid interfaces and heterojunctions, such as perovskites/SC, SC III-V/Si, electrolyte/SC.

The OHM team at Institut FOTON is keen to pursue the development of these themes, and thus contribute to the increased performance of these devices, to which it is already committed through numerous national (ANR, PEPRs electronics/hydrogen/photovoltaics) and European (FET-open, COST) projects.

The candidate recruited to the OHM team at Institut FOTON will be tasked with studying these devices (photovoltaic, photo-electro-chemical, lasers, diodes), including hybrid interfaces/heterojunctions, with the aim of improving our understanding of their impact on the laboratory's current and future devices. He/she will take charge of/develop electro-optical experiments (DLTS, CV, transport, EQE, local KP-AFM measurements, etc.), enabling him/her to provide interpretations of the limiting phenomena linked to these interfaces, based for example on electro-optical modeling (COMSOL, SCAPS, Silvaco, etc.). The recruited candidate will draw on the team's extensive know-how in the design and manufacture of III-V and Si devices, via its NanoRennes technology platform (member of the Renatech+ national network) and its extensive equipment (III-V MBE and Si CVD epitaxy reactors, clean room, optical characterization benches, electro-optical characterization benches).

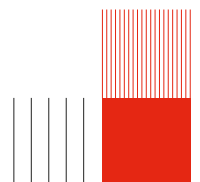
Candidates should have previous experience (thesis, post-doctorate) in advanced electrical and optoelectronic characterization of semiconductor materials and/or components, and a good general knowledge of the physical properties of semiconductors and components for photonics or solar energy production/storage.

Teaching: GPM department

The successful candidate will be assigned to the Engineering Physics and Materials (GPM) department. The training courses concerned are the GPM engineering speciality and the STPI-1er Cycle department.

The person recruited will reinforce the teaching team in the fields of instrumentation, microelectronics and components for micro and optoelectronics, in particular for performance and life cycle analysis. She will be involved in teaching the physics of electronic and optoelectronic devices, particularly the practical aspects of such teaching, with an emphasis on moving to English-language and project-based teaching.

The candidate will be expected to play an active role in the development of courses related to renewable energies, particularly photovoltaics. The successful candidate will help to build relationships with industrialists in the field, and will be particularly involved in setting up and supervising industrial projects in 5th year.



For teaching in the STPI-1er Cycle department, the successful candidate will be part of the physics teaching team, and will be in charge of tutorials and practical work in physics (electricity, optics, thermo-energetics, waves, electromagnetism).

Detailed descriptions of these courses can be found in the ECTS sheets on the INSA website, or by contacting the relevant department heads.

For further information, please contact

Soline BOYER (soline.boyer@insa-rennes.fr) - director of the GPM department

Charles CORNET (charles.cornet@insa-rennes.fr) - OHM team leader (INSA component) at Institut FOTON.

