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Posted Apr. 10, 2024, set to expire Dec. 30, 2024

Job Title 16 Doctoral Researchers in the field of Microelectronics

Department T411 Dept. Electronics and Nanoeng

Institution Aalto University

, , Finland

Date Posted Apr. 10, 2024

Application Deadline Open until filled

Position Start Date Available immediately

Job Categories Graduate Student

Academic Field(s) Electrical and/or Electronics

Job Website https://aalto.wd3.myworkdayjobs.com/aalto/job/Otaniemi-

Espoo-Finland/XMLNAME-16-Doctoral-Researchers-in-

the-field-of-Microelectronics R39347

Apply By Email

Job Description

Aalto University is where science and art meet technology and business. We shape a sustainable future by making research breakthroughs in and across our disciplines, sparking the game changers of tomorrow and creating novel solutions to major global challenges. Our community is made up of 13 000 students, 400 professors and close to 4 500 other faculty and staff working on our dynamic campus in Espoo, Greater Helsinki, Finland. Diversity is part of who we are, and we actively work to ensure our community's diversity and inclusiveness. This is why we warmly encourage qualified candidates from all backgrounds to join our community.

MIELi is a doctoral school pilot that aims to speed up and improve doctoral education in microelectronics by collaborating with industry and academia. The doctoral school pilot aims at graduation in 3 years with industrially relevant research topics and immediate employment to companies and business after graduation. MIELi involves Finland's key players in microelectronics



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research: Tampere University, Aalto University, University of Oulu and VTT. The universities offer the doctoral positions and education, and VTT supports the pilot by offering visiting researcher positions, infrastructures, and guidance.

The MIcroELectronics ([url=http://www.microelectronics.fi/mieli]MIELi) doctoral pilot programme is now looking for 16 Doctoral Researchers in the field of microelectronics

Microelectronics is a constructive and complex research field that requires teamwork, advanced infrastructures and tools, and highly skilled and experienced workforce. The scientific and societal impact of microelectronics is significant, and it is the key enabler for ICT and other sectors, such as healthcare, energy, and transportation. The demand for experts in the field of microelectronics is already very high and growing, and the opportunities in the job market are numerous and versatile. Microelectronics experts can make a real impact on the world by contributing to technologies critical for the future.

Microelectronics covers four interdependent technology layers:

- 1. Materials, process technologies, and devices built on the material science. For example, printed electronics, transistors, MEMS, and standard cell libraries. The scope is on basic building blocks like single transistors.
- 2. Components and circuits that compose the layer of electronics based on the foundational devices. For example, macros and circuits of thousands of transistors.
- 3. System-on-Chip and processors. Build on top of previous layer with large and complex constructs like processors and RF Transceivers. The SoC itself can include billion transistors.
- 4. Applications that essentially require one or more of the other layers to be realized.

Your experience and ambitions

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A keen interest to a level of microelectronics, from devices to systems. You may be interested on semiconductor physics level, on the level of circuit design, or upper hierarchy levels.

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Excellent student track records

An applicant must have completed by 31 July 2024 or preferably earlier (to start employment on 1 August 2024) or by 31 December 2024 or preferably earlier (to start employment on 1 January 2025)
*
a master's degree awarded by a university, or

a study programme that in the awarding country gives eligibility for doctoral level studies

in microelectronics or a closely related field. A good command of English is required.

Applicants must fulfill the admission criteria of the Aalto Doctoral Programme and, if chosen for a position, apply for, obtain and accept the right to pursue doctoral studies at Aalto University. For more information on the general requirements and the application process for doctoral studies, please visit [url=https://www.aalto.fi/en/doctoral-education/how-to-apply-for-doctoral-studies]https://www.aalto.fi/en/doctoral-education/how-to-apply-for-doctoral-studies

What we offer

Opportunity to work in a dynamic community of world-class researchers and professionals where students are rigorously selected and highly motivated. This leads to an exceptionally interactive and intellectually challenging atmosphere at Aalto.

We have a flexible modern work culture. We value the balance and well-being of work and leisure in all aspects of life.



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We offer you an interesting job in an inspiring work environment. You will be able to work in a community where we promote socially significant goals in science and education. We will familiarize you with your tasks and you will be part of a nice and competent team that will provide you with support for your work tasks also in the future. We encourage and offer opportunities for continuous development of your own expertise.

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The expected starting date for the position is between 1st August 2024 and 1st January 2025. Presence in Finland for the duration of the contract is compulsory.

*

Employment contracts will be made for three years with the funding from the Finnish Ministry of Education and Culture. The contract includes a prerequisite to apply, receive and accept doctoral study right within the probation period of the first 6 months.

*

The annual workload of research and teaching staff at Aalto University is 1612 hours.

*

Aalto University follows the salary system of Finnish universities. The starting salary is approximately 2700 €/month (gross), and it increases as the Doctoral Researcher progresses in the research and studies.

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The contract includes Aalto University occupational healthcare. Aalto University provides excellent



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learning and development opportunities, and a commuter ticket benefit. Unisport offers versatile sports facilities and exercise services with a staff discount.

*

We work in a hybrid way, and the primary workplace is Otaniemi, Espoo. The Otaniemi campus is a thriving and connected community of 100 nationalities. Life at the transformed campus is vibrant and filled with amazing architecture, calming nature, and a variety of cafes, restaurants, services and good connections along the metro and city train lines. See how the campus looks like on our virtual tour: https://virtualtour.aalto.fi/

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In the first weeks, you will be assigned your own onboarding buddy who will help you get started with your work and studies at Aalto.

Join us!

You can apply for min. 1 or max. 3 of the open positions in this call. You will be asked to prioritize your choices, using the position codes. You will find each position code after the name of the position in the list below - please remember your choices when you move forward with your application. To apply, please submit the following application materials through our aalto.fi recruitment site by 15th May 2024 Finnish time. Click "Apply now". We will start reviewing candidates immediately.

Please note: Aalto University's employees should apply for the position via internal HR system Workday (Internal Jobs) by using their existing Workday user account (not via the external webpage for open positions). Aalto University's students and visitors should apply as external candidates with personal (not aalto) email.

All material should be submitted in English and a pdf-file. You can send in max. five (5) documents up to 5M bit in size.

Application material should include:

* Letter of motivation (max. one page). Please describe your background and future plans, and in



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particular the reasons for selecting the project(s).

- * A curriculum vitae and possible list of publications with complete study and employment history, contact details of referees from 2 senior academic people. We will contact your referees, if recommendation letters are required. (please see CV example [url=https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Ftenk.fi%2Fsites%2Fdefault%2F06%2FTENK_CV_template_2020.docx&wdOrigin=BROWSELINK]TENK_CV_template_2020.docx (live.com))
- * A study transcript provided by the applicant's university that lists studies completed and grades achieved.
- * A copy of the M.Sc. degree certificate or equivalent. (for doctoral study application it will need to be officially translated into Finnish, English or Swedish). If the degree is still pending, then a plan for its completion must be provided.
- * Plan for obtaining certificate of English/Finnish/Swedish language knowledge for doctoral study application if position is offered (in order to have it on time for application, see more from [url=https://www.aalto.fi/en/doctoral-education/how-to-apply-for-doctoral-studies]https://www.aalto.fi/en/doctoral-education/how-to-apply-for-doctoral-studies)

We will go through applications, and we may invite suitable candidates to interview already during the application period. The positions will be filled as soon as a suitable candidates are identified. Chosen candidates should apply for doctoral study right immediately after accepting the position.

Please find detailed descriptions of the open positions by research group below: Electron Physics Group, information about the research group [url=https://www.aalto.fi/en/department-of-electronics-and-nanoengineering/electron-physics]here
POSITION 1

Advanced Si substrates for RF applications (Position code: AALTO1)

Today's RF devices, e.g. timing chips, consist of a Si substrate and different thin films stacked on top. Unfortunately these thin films typically contain electric charge, and thus, when deposited on top of the Si wafer, a harmful conductive surface layer is formed to the substrate. This conductive layer, also



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known as parasitic surface conductivity (PSC), causes distortion in the RF signals and should thus be avoided for optimal device performance. In this position the goal is to develop new solutions to mitigate the PSC-layer. Additionally new characterization methods for the PSC-layer properties are to be developed.

For more information, please contact Prof. Hele Savin, [url=mailto:hele.salvin@aalto.fi]hele.savin@aalto.fi POSITION 2

Cost-effective Ge-on-Si microchips (Position code: AALTO2)

In this position the aim is to develop fully CMOS-compatible sensors with close to ideal performance on inexpensive Ge-on-Si substrates. The idea is to utilize the superior Ge material properties such as high mobility and narrow band gap, yet simultaneously allowing CMOS circuits to be integrated into the same wafer (Si substrate). Novel gate oxide materials will be applied and special emphasis paid on the interface quality between oxide and Ge. Additionally new characterization methods for the Ge-on-Si substrates are to be developed.

For more information, please contact Prof. Hele Savin, [url=mailto:hele.salvin@aalto.fi]hele.savin@aalto.fi POSITION 3

Novel metal-to-Si contacts (Position code: AALTO3)

All devices in microelectronics utilize ohmic contacts between metals and semiconductors.

Conventionally these contacts are achieved by ion implantation causing damage, recombination losses and requiring the use of high temperature adding complexity and material restrictions. In this position the aim is to study and develop novel methods for ohmic contact formation providing benefit to the whole semiconductor industry. After successfull experimental demonstration of proper ohmic contacts, the ultimate goal is to integrate the developed concepts and methods into actual devices.

For more information, please contact Prof. Hele Savin,

[url=mailto:hele.salvin@aalto.fi]hele.savin@aalto.fi

Electronics Integration and Reliability, more information about research group [url=https://www.aalto.fi/en/department-of-electrical-engineering-and-automation/electronics-integration-and-reliability]here

POSITION 4

Heterogeneous integration for extremely miniaturized, smart sensor systems (Position code: AALTO4) Development of next generation smaller and faster sensor chips is constrained by the limited data transfer rates within sensor and logic devices in a system. Advanced and emerging packaging technologies offer solutions to integrate MEMS and logic dies to realize system-in-package (SiP) thereby offering several advantages, such as reduced latency, increased design flexibility and reliability. This research work aims to combine two microfabricated platforms - 3D PiezoMEMS and



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solid-liquid-interdiffusion (SLID) bonding developed at Aalto University. 3D PiezoMEMS is an advance piezoelectric MEMS sensor capable of full 3D motion, whereas SLID is a wafer-level bonding technology with an advantage of reduced bonding temperature. The goal of the work is to demonstrate beyond state-of-the-art MEMS package with fast speed, high density interconnect solutions enabling sensor systems with increased intelligence.

For more information, please contact Prof. Mervi Paulasto-Kröckel, [url=mailto:mervi.paulasto@aalto.fi]mervi.paulasto@aalto.fi POSITION 5

Aluminium Nitride based polarization doped field effect transistor (Position code: AALTO5) Aluminum nitride (AIN) and high-Al-content AlGaN are in the spotlight as materials for the next-generation wide band gap (WBG) devices. However, AlN-based vertical devices with ideal electrical properties have yet to be realized. A major technical challenge for these devices is achieving controlled conductivity across a broad range. Distributed polarization doping (DPD) has recently been proposed as a unique doping technology for nitride semiconductors. In this work the candidate will develop Metal-Organic Vapor Phase Epitaxy (MOVPE) deposition processes for single crystalline high Al-content AlGaN films and investigate distributed polarization doping (DPD) techniques for p- and n- doping. Goal of the work is to demonstrate DPD AlN p-n diode and POLFET.

For more information, please contact Prof. Mervi Paulasto-Kröckel, [url=mailto:mervi.paulasto@aalto.fi]mervi.paulasto@aalto.fi POSITION 6

Nanostructured carbon-based bio detector (Position code: AALTO6)

Carbon nanomaterials have gained high interest for bioelectrochemical applications like biosensors and biofuel cells related to excellent conductivities, well-established bio functionalization methods, and high surface area to immobilize a high number of biomolecules preserving accessibility for its substrate. Besides the huge varieties of different nanosized carbon structures, the principal materials used in this field are carbon nanotubes and graphene. Nanosized sp2 allotropes of carbon behave electrochemically almost the same as macroscopic carbon electrodes but the formation of porous structures provokes an extension of the electrode with drastically enhanced surface area. Interestingly, there are little quantitative studies about the effective enhancement of the electroactive surface using nanocarbon materials. In this work, the candidate will investigate nanostructured carbon deposition methods and the use of nanostructured carbon in bio-detectors.

For more information, please contact Prof. Tomi Laurila, [url=mailto:tomi.laurila@aalto.fi]tomi.laurila@aalto.fi

Electronic circuit design, more information about research group [url=https://www.aalto.fi/en/department-of-electronics-and-nanoengineering/electronic-circuit-design]here



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POSITION 7

Cryogenic CMOS (Position code: AALTO7)

In this position you will develop and model CMOS circuits operating in the cryogenic temperatures. During the last years the interest towards low temperature CMOS circuits has increased because of activities both in quantum computing as well as non-terrestial communications and sensing. In this position you will design, model and measure CMOS circuits developed for RF, analog, mixed mode or digial domains depending on your interests. Additionally, we will engage your research to industrial operation within this field.

For more information, please contact Prof. Jussi Ryynänen, [url=mailto:jussi.ryynanen@aalto.fi]jussi.ryynanen@aalto.fi POSITION 8

Prosessor accelerators (Position code: AALTO8)

In this position you will develop elements for domain specific systolic array sensor processor accelerators for directed communications. These accelerators will be implemented together with RISC-V microprocessor for optimal energy efficiency-flexibility trade-off in implementation of signal processing. RISC-V and domain specific accelerators are timely research topic in microlectronics circuit design aiming for energy efficient implementations of circuits assisting machine learning and AI applications in energy-scarce operating environment.

For more information, please contact Prof. Jussi Ryynänen, [url=mailto:jussi.ryynanen@aalto.fi]jussi.ryynanen@aalto.fi POSITION 9

Neuromorphic Audio Sensors for Al-driven IoT (Position code: AALTO9)

Join us in revolutionizing IoT sensor platforms with next generation neuromorphic audio-inference integrated circuits (ICs)! This PhD project focuses on surpassing state-of-the-arts in power efficiency, latency, and neural network accuracy by leveraging advanced time-domain processing techniques. As a researcher, you will design, implement, and verify analog/mixed-signal ICs for audio-inference tasks like keyword spotting, with opportunities for multiple tape-outs. You are expected to have backgrounds in transistor-level analog circuit design, with experience in digital hardware design and PyTorch-based neural networks as a plus. Shape the future of Al-driven IoT devices with us!

For more information, please contact Prof. Jussi Ryynänen,

[url=mailto:jussi.ryynanen@aalto.fi]jussi.ryynanen@aalto.fi

POSITION 10

5G FR3 full-duplex transceiver (Position code: AALTO10)

In this topic you will participate on developing a 5G FR3 transceiver for full-duplex and narrow bandseparation frequency-duplex systems. Transmission leakage to reception is a major obstacle in transceivers for such systems. Hybrid self-interference cancellation at both analog and digital domain is a remedy for this issue, but it comes with a penalty of low reception sensitivity. Major challenge for analog self-interference cancellation is the additional noise it introduces for reception. We are



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developing a method to introduce noise-cancelling scheme to mitigate the issue. In this work you will join an international team that is closely co-operating will some major industrial players.

For more information, please contact Prof. Jussi Ryynänen,

[url=mailto:jussi.ryynanen@aalto.fi]jussi.ryynanen@aalto.fi

POSITION 11

Intelligent power drives (Position code: AALTO11)

Energy efficiency of modern power drives on IGBT and GaN technologies can be further boosted with intelligent control circuitry. In this position you will develop both analog and digital CMOS circuits that will tune the operation of the high power devices. The tasks range from device-level studies of the imperfections of the power devices up to development of control algorithms, even powered by AI. This task is closely related to industrial collaboration.

For more information, please contact Prof. Jussi Ryynänen, [url=mailto:jussi.ryynanen@aalto.fi]jussi.ryynanen@aalto.fi

Antennas and wireless sensors, more information about the research group [url=https://www.aalto.fi/en/department-of-electronics-and-nanoengineering/antennas-and-wireless-sensors]here

POSITION 12

Microelectronics enhanced antennas and em-structures (Position code: AALTO12) Circuit and electromagnetic co-design of active antennas. Active antennas integrate circuit components, such as amplifiers, mixers and filters in the radiating structure. Our aim is to avoid predefined interface and reduce losses, increase integration level and enable new features. We plan to integrate power amplifiers and low-noise amplifiers in an antenna element. Both amplifiers are biased on and off one at a time to realize Tx/Rx switch. Further, we plan to realize additional load-modulation amplifier in the same element for increased back-off efficiency. We will consider active circulators realized on the antenna element and study active impedance tuning methods to compensate for active impedance effects due to beam steering.

For more information, please contact Prof. Ville Viikari, [url=mailto:ville.viikari@aalto.fi]ville.viikari@aalto.fi POSITION 13

Microelectronics-packaging, integration and rf- interconnects (Position code: AALTO13) Integration of integrated circuits and electromagnetic structures. We consider different packaging and

Integration of integrated circuits and electromagnetic structures. We consider different packaging and coupling mechanisms for integrated circuits and electromagnetic strucutres. We study if non-galvanic coupling can be used to realize RF connections. We also consider chip-integrated antennas and antennas-in-package. We study how to best combine electromagnetic and circuit simulations of the chip that is integrated with an electromagnetic structure.

For more information, please contact Prof. Ville Viikari,



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[url=mailto:ville.viikari@aalto.fi]ville.viikari@aalto.fi

Networked Systems, more information about the research[url=https://www.aalto.fi/en/department-of-information-and-communications-engineering] here POSITION 14

Telecommunication algorithms accelerators related computer architectures (Position code: AALTO14) Telecommunication algorithms accelerators related computer architectures (particularly considering this in the context of RISC-V cores); particularly MAC-layer level accelerators, including new dedicated commands and compilers for flexible use and implementation of such blocks in the product development.

For more information, please contact Prof. Petri Mähönen, [url=mailto:petri.mahonen@aalto.fi]petri.mahonen@aalto.fi POSITION 15

Flexible on-silicon supported novel MAC-solutions (Position code: AALTO15)

Flexible on-silicon supported novel MAC-solutions that support multi-frequency and programmable MAC-structures. Work would include also consideration of interfaces, Programmability, and Compiler thechinques -- vision would be to extend successful P4 concepts down to real-time MAC/PHY-interfaces considering on-silicon and Network-on-Chip concepts.

For more information, please contact Prof. Petri Mähönen,

[url=mailto:petri.mahonen@aalto.fi]petri.mahonen@aalto.fi

POSITION 16

Open topic (Position code: AALTO16)

Applicant may propose a topic that 1) fits to the Aalto's scope of microelectronics research, 2) is well-justified with sufficient background, and 3) can be completed within three-year doctoral studies.

Any questions?

For additional information, kindly contact the Professors mentioned in the position descriptions. Aalto University reserves the right to leave the positions open, extend the application period, reopen the application process, and consider candidates who have not submitted applications during the application period.

In any recruitment process related questions, please contact HR Partner Karoliina Walldén (karoliina.wallden@aalto.fi) or HR Partner Hanna Koli (hanna.koli@aalto.fi).

Want to know more about us and your future colleagues?
You can watch these videos: [url=https://www.youtube.com/watch?v=5k_og_6zUJQ]Aalto



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University - Towards a better world, [url=https://www.youtube.com/watch?v=dUfEGVM-ZP8&feature=youtu.be]Aalto People , and

 $[url=https://www.youtube.com/watch?v\&\#61;ZK6pDWm1_CE]Shaping a Sustainable Future. For more information about living in Finland: [url=https://www.aalto.fi/en/careers-at-aalto/for-international-staff]https://www.aalto.fi/en/careers-at-aalto/for-international-staff .$

Read more about working at Aalto: [url=https://www.aalto.fi/en/careers-at-aalto]https://www.aalto.fi/en/careers-at-aalto

About Finland

Finland is a great place for living with or without family - it is a safe, politically stable and well-organized Nordic society. Finland is consistently ranked high in quality of life and was just listed again as the happiest country in the world: [url=https://worldhappiness.report/news/its-a-three-peat-finland-keeps-top-spot-as-happiest-country-in-world/]https://worldhappiness.report/news/its-a-three-peat-finland-keeps-top-spot-as-happiest-country-in-world/. For more information about living in Finland: [url=https://www.aalto.fi/en/careers-at-aalto/living-in-finland]https://www.aalto.fi/en/careers-at-aalto/living-in-finland.

More about Aalto University:

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Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

Contact

Finland