imec

embracing a better life

EMBRACING A BETTER LIFE

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Scan it to watch the movie.

Content

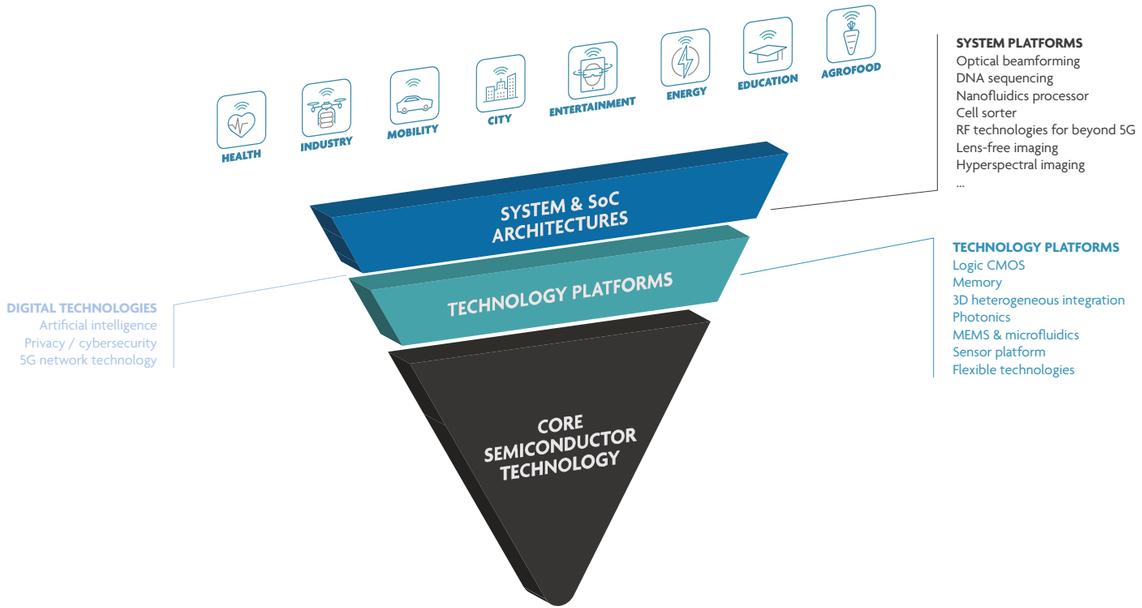
SHAPING THE FUTURE

We all share the same vision: a connected, sustainable future for everyone. And imec believes technology will help us to reach that goal.

That's why we strive to be a world-leading innovation hub in nanoelectronics and digital technologies. By providing the brilliant minds from all over the world with a stimulating environment. By leveraging a world-class infrastructure. And by bringing together a local and global ecosystem of partners from a multitude of industries.

Are you also passionate about accelerating progress? Whether you're a well-established company, start-up or academic institution, you'll find a trusted partner in imec. We're looking forward to shaping the future with you.

INNOVATION PLATFORM



Leveraging the power of data to enhance our lives

The combination of the most advanced microchip technologies and state-of-the-art software expertise is what makes us unique. The evolution in microchip technology towards more powerful and smaller chips allows us to make every object intelligent and to bring tons of data at our fingertips.

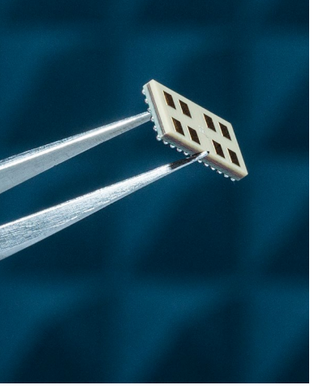
By combining and translating the collected data from billions of connected sensors into meaningful information, we help our partners to create truly smart applications that enhance our life – all while putting digital privacy and security center stage.

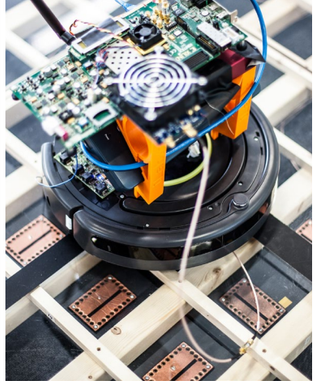
Driving microchip miniaturization

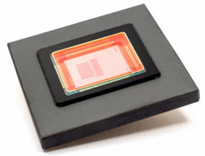
Since 1984, we have been driving the advances in microchip technology.

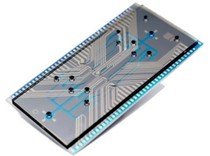
Our ultimate objective? Microchips that are smaller and faster, cheaper and more versatile. We reach that goal by performing groundbreaking research on materials, devices and chip processing. All thanks to our unique assets: world-class infrastructure, exceptional talents and close partnerships with global partners.

Imec offers a neutral, open innovation R&D platform that involves suppliers deeply and at an early stage of process step and module development. Thanks to our close partnerships with leading tool and materials suppliers, we can do advanced process development and offer our partners the industry's most advanced research infrastructure housed within a state-of-the-art 300mm cleanroom.









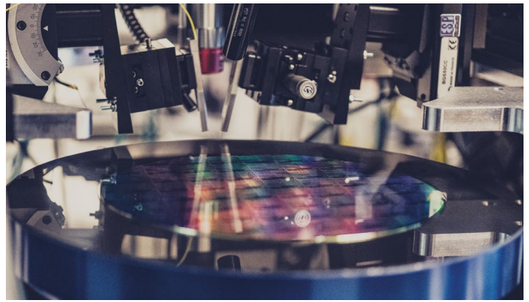
Exploring the real benefits of artificial intelligence

Thanks to ever more compact and low-cost microchip technology, every object can be connected to the rapidly expanding Internet of Things. Artificial intelligence is the act of turning that mass of harvested data into actionable knowledge. It will deeply change every aspect of our lives – from personalized medicine through DNA analyses to self-driving cars and intuitive human-machine interaction.

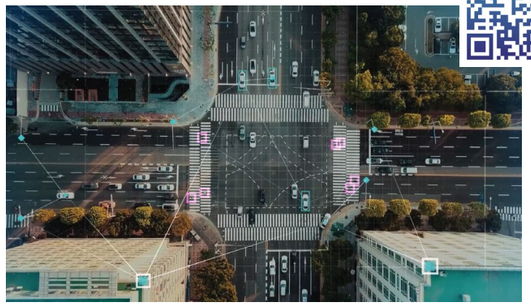
Imec is leading the way in the development of AI applications based on small but complex datasets – and the local analysis of that data.

But we're also mindful of the risks that come with a society where 'data is the new oil'. To ensure privacy and security, we're working on solutions such as advanced cryptography for Internet of Things devices and unique hardcoded 'fingerprints' in computer chips.

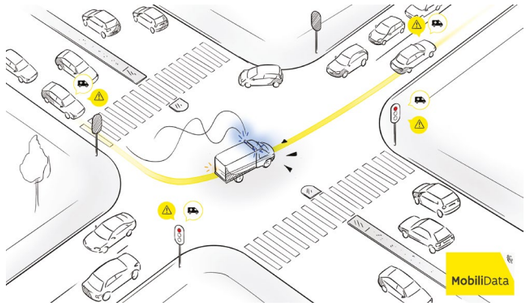
APPLICATION DOMAINS



Photonic integrated circuit for solid-state lidar system.



6G will allow vehicles to communicate with each other and the road infrastructure.



The Mobilidata project looks into how data can improve traffic flow and safety. For instance through intelligent traffic lights.

A phased-array radar highly integrated in a CMOS chip, incl. 2 active transmit & 2 active receive chains.

Mobility

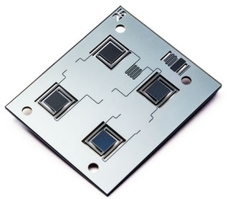
Over the last centuries, increased mobility has reduced distances and broadened horizons. But there have also been unwanted side-affects: pollution and CO_2 emissions, congestions and traffic casualties.

Imec envisions a future where transportation is comfortable, safe and clean. To make that happen, we develop several key technologies. GaN power devices for more efficient electric and hybrid vehicles. Radar, lidar and wireless networking technologies to pave the way for connected and ultimately driverless cars. And digital technologies to help us use the traffic infrastructure more efficiently and evolve towards mobility as a service.

Prototype of imec's breathalyzer. It offers fast, easy and accurate identification of viral diseases that are transmitted by exhaled particles.

Protoype of imec's ingestible.

Neural probe enabling electrical and chemical recording and stimulation of single neurons.



Integrated microsystem for detection of multiple single nucleotide polymorphisms directly in human blood.

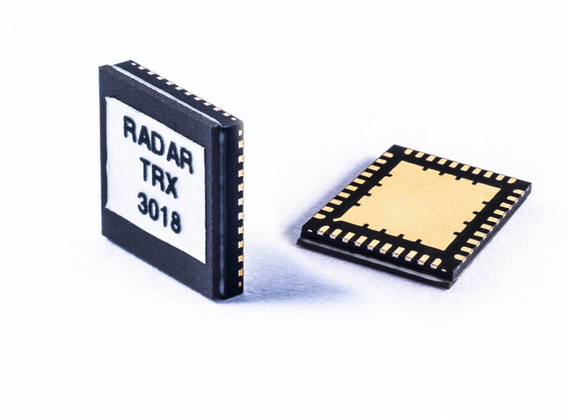
Health

Healthcare is entering the digital era. By leveraging the power silicon technology and AI, it becomes possible to improve the detection and our understanding of diseases, accelerate vaccine development, bring about affordable personalized therapies, and much more.

The COVID-19 pandemic showed us the necessity of multiple lines of defense against outbreaks of infectious diseases. We need rapid and affordable on-site testing, such as through imec's breathalyzer concept. To identify new risks, we need fast sequencing and analyses of DNA, to be accomplished through high-performance computing hardware and advanced AI. And we need to further streamline vaccine development with a combination of microfluidics, robotics, sensors and AI. These process analytical technologies allow for online and inline monitoring to replace time-consuming tests. The result is a more streamlined manufacturing process.

At all levels of the healthcare system, data will become a crucial driver for better outcomes. Apart from genomic data, there's the patient information collected by physicians, and by wearable, implantable and ingestible sensors. Combining all that information will lead to new insights and – often personalized – therapies.

Imec's high-speed ultrasonic SNAPSCAN camera enables hyperspectral image acquisition in less than one second.



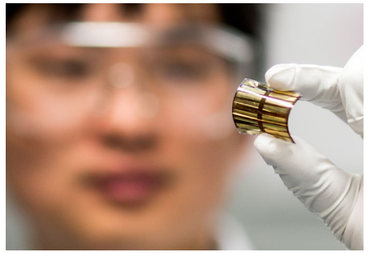
Ultra-wideband (UWB) transceiver chip. Because of its high accuracy, UWB is an ideal match for applications such as positioning and tracking in indoor industrial environments.

Industries

The internet of Things has kicked off the fourth industrial revolution. Big and small machines continuously create and collect data that allow companies to optimize their products, processes and business models.

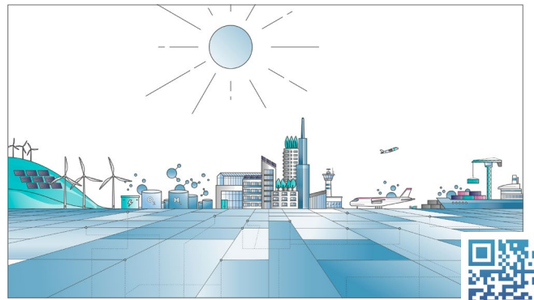
Imec builds the technologies and shares the insights that help companies through that transition. We conduct research into sensor and imaging systems for industrial applications such as quality control and stock management, augmented reality systems for complex maintenance tasks, algorithms for human-machine interaction on the factory floor, and much more.

Perovskite/CIGS tandem cell with record efficiency of 24.6%.

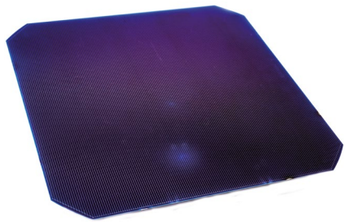


One of imec's solar cell researchers holding a flexible perovskite solar cell on foil with an efficiency above 10%.

Imec was the world's first to develop 200V and 650V dispersion-free normally-off/e-mode power devices on 200mm Si Wafers.



Power-to-molecules, innovative technology for converting energy – preferably from renewable sources – into valuable molecules.

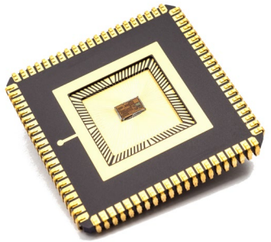


Highly efficient bifacial solar cells with near 100% bifaciality.

Energy

If we want to keep climate change within limits, we need to rapidly evolve towards a carbonless future. Renewable energy will play a crucial role in this. But because sun and wind are not continuous energy sources, we also need smarter ways to store electricity and balance our power consumption.

Imec contributes to a sustainable future by developing technologies such as specialty photovoltaic cells and modules, more efficient processes for converting energy into valuable molecules such as green hydrogen, power-efficient micro-sized power electronics, and self-learning algorithms for balancing our power use and creating a smart power grid.



Sensor read-out chip made in 40nm CMOS.

Internet of Water Flanders uses a fine-grained sensor network to continuously measure indicators of water quality.

Multi-sensor node for environmental sensing.

An urban digital twin supports policy decisions by offering real-time, cross-domain insights.

Cities

In 2050, 75% of the world's population will live in cities. A good thing, because it leaves more space for nature. But it also leads to challenges in domains such as mobility and public safety.

Technology will play a crucial role in tackling these challenges. The Internet of Things makes it possible to optimize the way we live and work. A network of sensors collects data on traffic flows, air quality and other key parameters – which enables city authorities to take appropriate measures. To realize this vision, imec is working on technologies such as low-power sensors, algorithms and wireless communication systems.

i-Learn, supported by the Flemish government, enables teachers to build personalized learning paths based on digital tools.

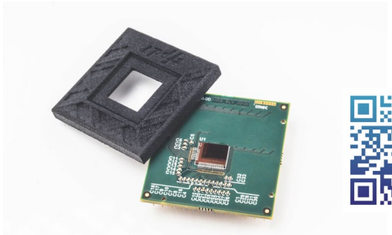
The imec.icon LECTURE+ project developed an interactive, scalable & cost-effective platform to enhance the (remote) learning experience.

Imec.academy, imec's learning institute, offers specialized courses on nanoelectronics and digital technology.

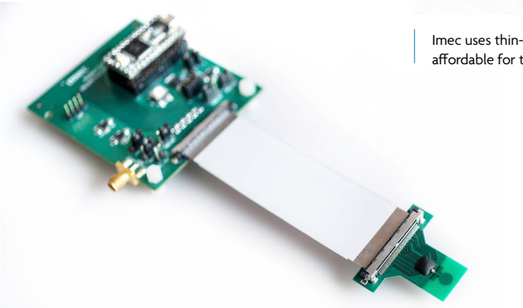
Education

We already live in a knowledge society. And as new developments such as robotization and AI put pressure on routine jobs, lifelong learning will become even more important. Especially for soft skills such as teamwork, communication and creativity.

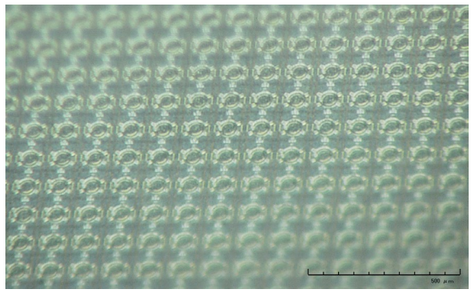
Imec wants to increase learning effectiveness by making the educational experience more personal. For this, we employ technologies such as sensors that capture neurological data, algorithms for adaptive learning and AR/VR. The research outcomes are also applied within our own imec.academy training offer: a wide range of professional courses on nanoelectronics and digital technology that attract students from around the world.



Imec uses thin-film photodetectors to make infrared sensors sufficiently affordable for the consumer market.



In 2022, imec pioneered an UWB transmitter chip with data rates up to 1.66 Gb/s and mW power. An ideal match for AR/VR.

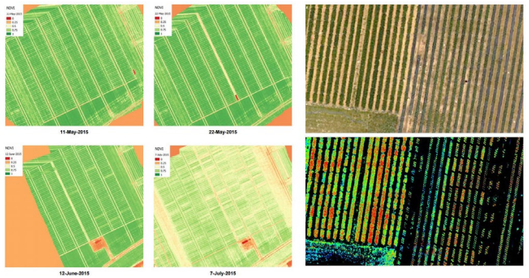


MEMS-based ultrasound transducers.

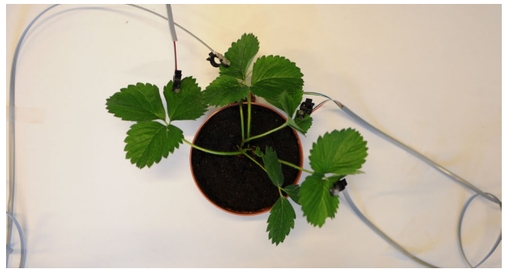
Infotainment

From radio and television to smartphones and VR, ... In our personal interaction with electronics, the trends have been increased mobility and more immersive user experiences. And that's not about to change. Virtual and augmented reality will be integrated in even more compact devices. And with technologies such as holography, the future of infotainment looks even more like science fiction.

Imec innovations will be at the heart of those new technologies. We're working on high-speed networks, high-resolution OLED displays, power-efficient sensor and eye-tracking technology, software for sensor fusion, advanced optical and acoustic systems enabling holography and haptic feedback, and much more.



Hyperspectral aerial images of strawberry test fields in Belgium – courtesy of VITO and pcfruit.



Researchers from IDLab have developed an open-source platform for plant sensing. It's compatible with a wide range of state-of-the-art analog and digital sensors.

Agrofood

Our climate is changing. Natural resources and farmlands are becoming scarcer. Meanwhile, the world's population keeps on growing: by 2050, more than 9 billion people will inhabit the earth. How can we give them access to plentiful and healthy food?

One of the answers is to tap into a resource that is, as yet, underused: data. Affordable sensor technologies allow farmers to continuously check the composition of water, soil and waste streams. Aided by artificial intelligence and robotics, they can then adjust their growth schedules and recover nutrients. Resulting in the production of more and better food on smaller surface areas.

Creating a sustainable food supply is one of the goals of the OnePlanet Research Center, of which imec is one of the founding partners. OnePlanet is an innovation center that will use the newest microchip and digital technologies to create a society in which everyone can live healthy lives and have access to sufficient and good food. Find out more on www.oneplanetresearch.nl.

WHAT WE OFFER

Boosting your research

At imec, we believe in the power of collaboration to push your company's technology forward. We give you access to our state-of-the-art infrastructure – including 12,000 m² of cleanroom capacity and labs. Collaboration agreements with imec come in different forms:

R&D platform with multiple partners

Some challenges are too big to tackle alone. The answer is precompetitive research that allows you to share expertise and research among partners – lowering risks and costs for everyone involved.

Bilateral research

Are you in need of specific expertise? Or do you want to use best-in-class infrastructure for private research? By working with a discreet and trusted partner such as imec, you can accelerate your project while securing your IP.

Government-funded research

To tackle industrial, scientific and societal challenges, imec is involved in numerous research projects that are co-funded by governments. We strongly contribute to Flemish and European R&D programs that include companies, research centers and universities.

Imec.icon

The imec.icon program is a formula for demand-driven, cooperative research on innovations that involve hardware, software or both. Over a period of typically two years, multi-disciplinary research teams develop digital solutions that find their way into the market.

NGRAVE's offline hardware wallet for safe use of cryptocurrencies. The company was supported by the imec.istart acceleration program. On top of this, imec acted as hardware and research partner for the development of this unique product.

For their implants, Cochlear collaborates with imec to enable further miniaturization of the devices, small-size manufacturing for clinical trials, and scaling up this manufacturing in a later phase.

De-risking and accelerating your nanotech and digital innovations

Creating an ASIC, microdevice or system requires exceptional infrastructure and knowhow. That's where a trusted partner such as imec comes in. Speeding up your development. De-risking the process. And supporting you all the way: from designing to prototyping, low-volume manufacturing, and mass manufacturing via easy access to mainstream foundries.

ASIC development

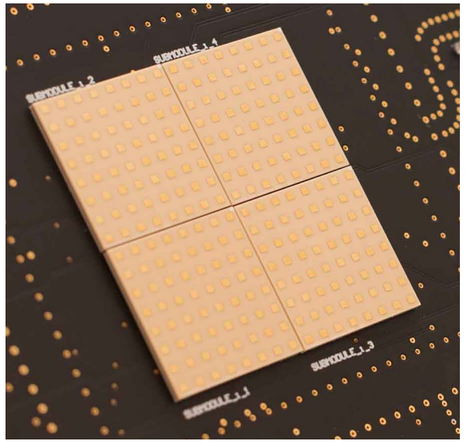
Team up with imec's division for ASIC solutions to develop your customized chip – from a few prototypes to high volumes. Read more: www.imeciclink.com.

Custom microdevice development

Take advantage of imec's infrastructure and expertise to develop and manufacture your customized MEMS and silicon microdevices. Read more and download our white paper: www.imec-int.com/microdevices.

System development technologies

Access advanced technology platforms – such as integrated photonics and nanoimprint lithography – and IP blocks for custom development of your system. Read more: www.imec-int.com/development.



Imec spin-off Pharrowtech launched the world's first IEEE 802.11ay-compliant CMOS RF chip for indoor and outdoor wireless use cases.

miDiagnostics, an imec spin-off, launched a COVID-19 PCR, based on imec's silicon chip technology and developed in close collaboration with Johns Hopkins University.

Supporting start-ups and entrepreneurs

Services and support for deep-tech start-ups

Imec is at the heart of an unparalleled ecosystem of companies, universities, start-ups and organizations from the world of nano- and digital technology. That's why it's the perfect place to bring your disruptive idea and develop it into a product. Read more at www.imec-int.com/deeptech.

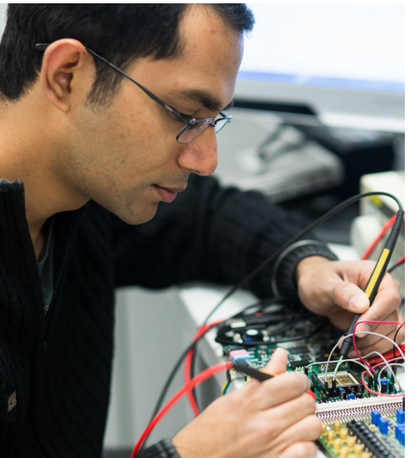
Imec.istart

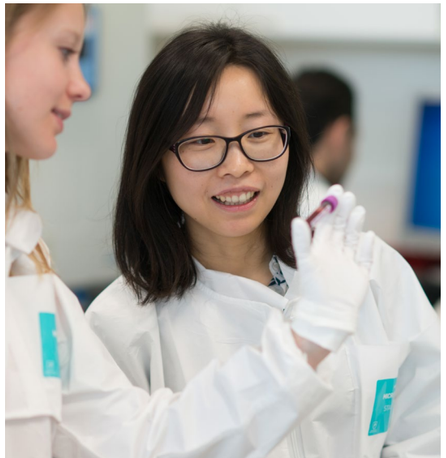
Through the imec.istart business incubation program, we provide tech entrepreneurs with specialized coaching, facilities and support – and a safe and stimulating environment to develop and grow their business.
Read more at www.imec-int.com/istart.

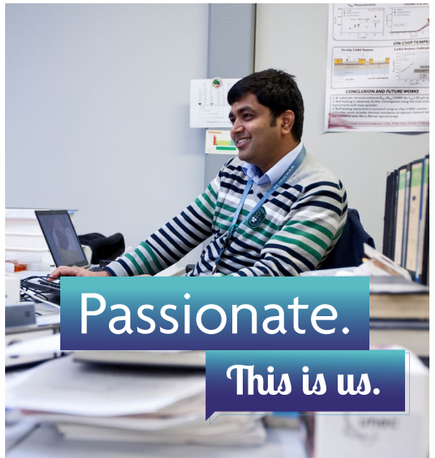
Imec.xpand

Imec.xpand is an independently managed value-add venture capital fund that enables to invest in projects in which imec's knowledge and infrastructure are differentiating factors. It includes access to imec's infrastructure, and support from corporate investors and venture capitalists.
Read more at www.imec-int.com/xpand.

ABOUT US







Technology starts with people

Hilde, Kim, Praveen and Umberto. At imec, colleagues come from every corner of the world. Over 5,000 passionate colleagues, from more than 90 nationalities, work at the headquarters in Leuven (Belgium) and various sites worldwide. We take on the challenges of tomorrow and the day after, together. This is us.

As one of the world's largest and most prominent R&D players in microchip technology and digital innovation, we work on technology that is 5 to 10 years ahead of what exists today. Technology that helps our partners to develop innovative applications that improve our lives. Technologies for a better health, safer mobility, sustainable energy and much more. This is how we help shape the future. Embracing a better life. In a high-tech environment and an ecosystem with local and international partners from the academic and business worlds.

But above all, imec consists of the passionate people who work here: researchers, engineers, operators, software developers, lawyers, sales professionals, and countless others. The Hildes, Kims, Praveens and Umbertos. Together, we are working to create tomorrow. This is us.

Academic excellence

Academia and industry both have their roles to play in innovation. Universities usually conduct long-term research – on limited budgets. Meanwhile, companies steer high investments towards short-term applications. Nevertheless, great things happen when these two worlds meet. And imec is one of the places where that happens.

At imec, more than 800 PhD students from over 40 countries get the chance to bring ideas from academic research to higher technology readiness levels. Conversely, we translate future technology needs from our partners in industry to research at universities.

All this is possible thanks to imec's partnerships with universities from all over the world. With several of them, we have a dual degree agreement: program students spend three years at a Belgian university, while researching at imec, and one year at a foreign university. After these four years, they get a degree from both universities.

Sustainability

Imec strives toward sustainable development to benefit both current and future generations. That's why we always think ahead regarding the choices we make in further developing the semiconductor industry in terms of its impact on people, the environment, and society. As an R&D hub, imec is ideally placed to inspire and involve the entire value chain in searching for sustainable and innovative technologies and solutions.

Imec did not choose its motto – *'embracing a better life'* – lightly. It reflects the organization's long-term vision to pursue a sustainable world through technology and innovation and perfectly aligns with its core values: connectedness, integrity, excellence, and passion.

For imec, sustainability is structured around five central pillars: research, development, and innovation as drivers for a sustainable society; care for the planet; care for our people; ethics and good governance; and a commitment to entering sustainable partnerships. These policy areas and their underlying priority themes are designed to mirror the United Nations' Sustainable Development Goals (SDGs).

Discover our **sustainability report**

And our **gender equality plan**

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