Engineers develop education kit to teach students practical skills in integrated photonics

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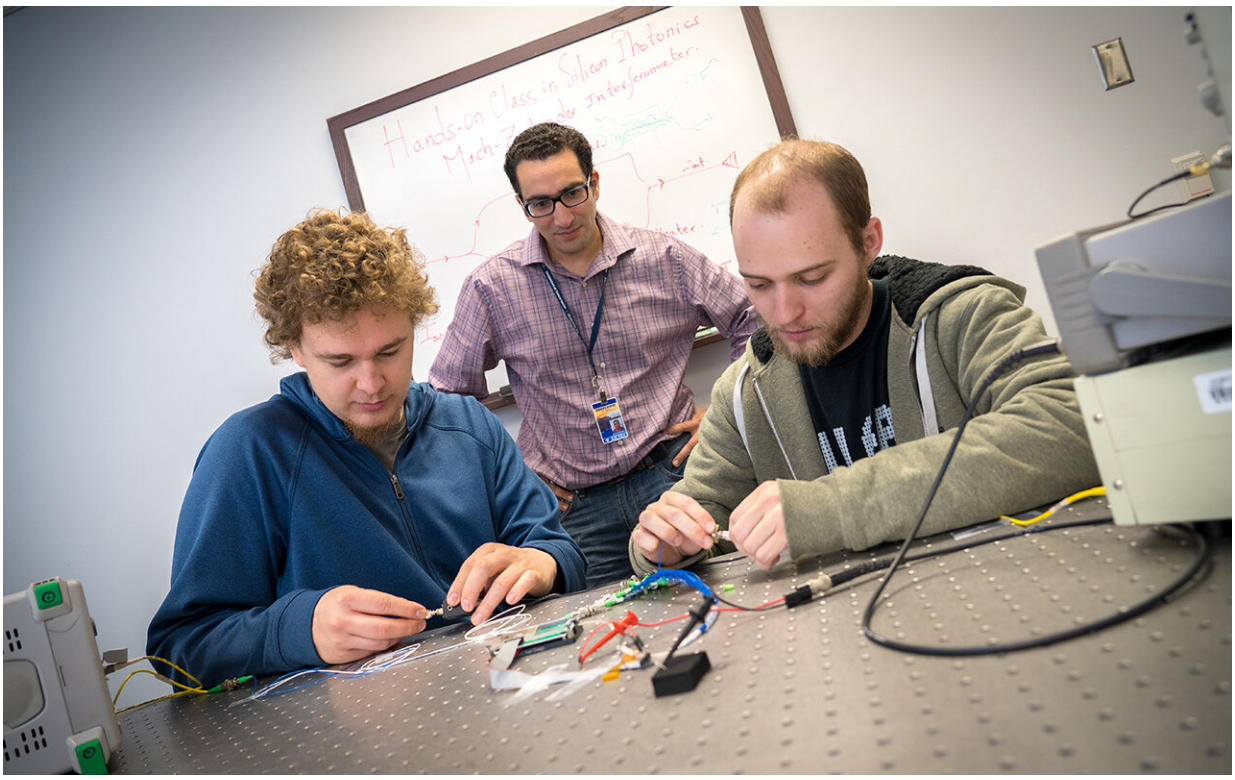


Abdelkrim El Amili (center) is leading a project at UC San Diego to develop an educational toolkit to teach students practical skills in integrated photonics. Credit: David Baillot/UC San Diego Jacobs School of Engineering

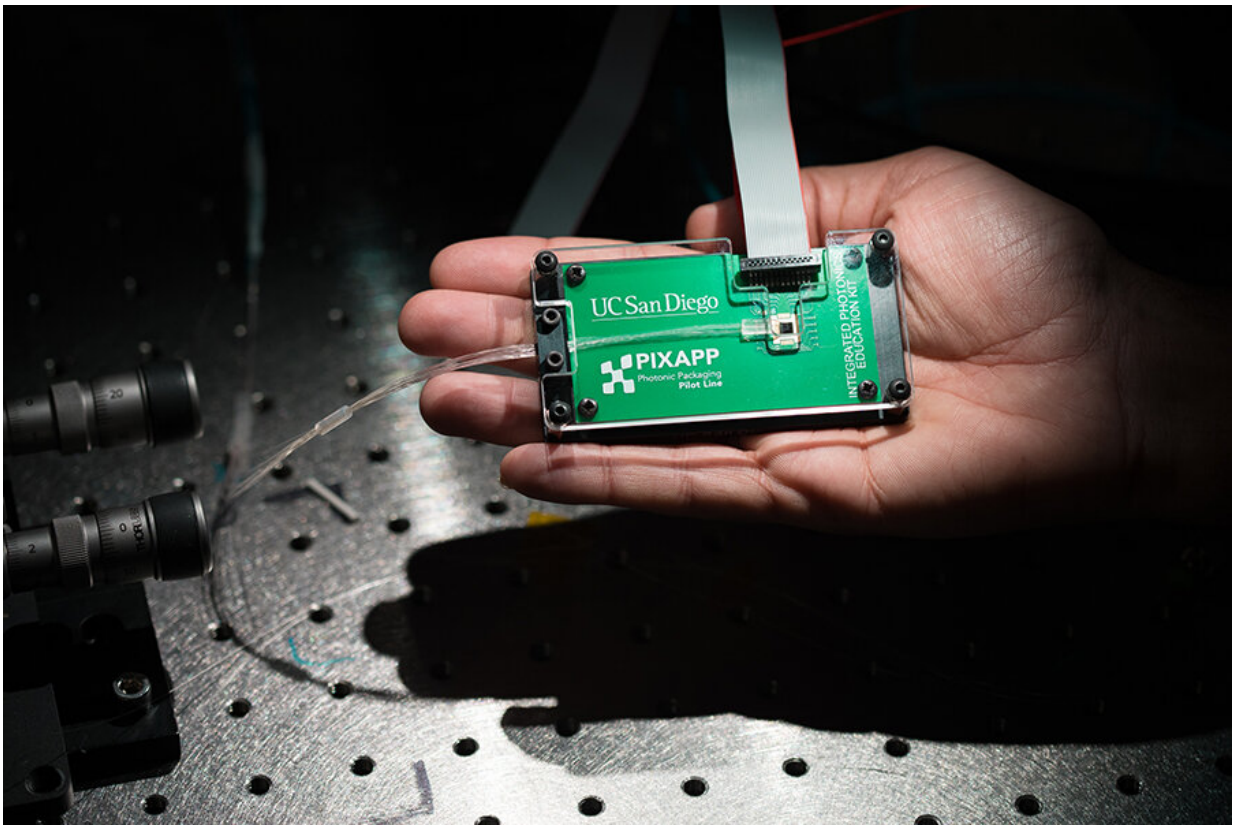
Engineers at the University of California San Diego, in collaboration

with Tyndall National Institute in Cork, Ireland, are developing an educational toolkit to bring integrated photonics into the college engineering and science curriculum.

The toolkit is designed to teach undergraduates practical skills in integrated photonics, including how to characterize and test photonics integrated circuits—skills that today are typically acquired at the Ph.D. level. The team envisions that teaching these skills earlier on will enable more graduates to enter the integrated photonics industry workforce and meet the growing demand for photonics technicians and engineers.

The project was conceived by Abdelkrim El Amili, a research scientist in the Department of Electrical and Computer Engineering at UC San Diego. His team includes Shaya Fainman, a professor of electrical and computer engineering at the UC San Diego Jacobs School of Engineering, and Jordan Davis, a Ph.D. student in Fainman's lab. The UC San Diego team is collaborating with researchers led by Professor Peter O'Brien at Tyndall's European Packaging Pilot Line PIXAPP.

The team is presenting a prototype of the toolkit at the 2019 Optical Fiber Communications Conference and Exhibition (OFC), Mar. 3 to 7 in San Diego.



Prototype of the Integrated Photonics Education Kit. Credit: David Baillot/UC San Diego Jacobs School of Engineering

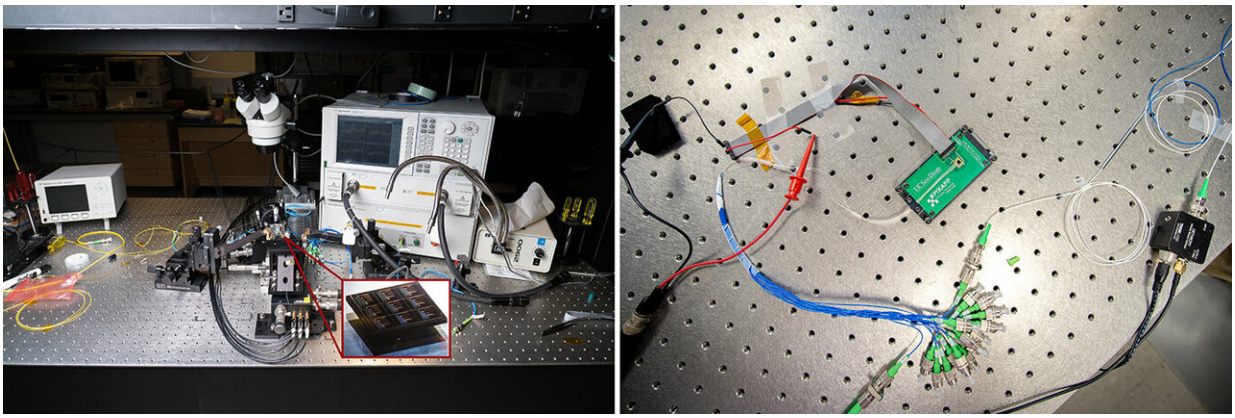
"This toolkit will bridge the gap between the growing demand in the silicon photonics job market and the supply of technicians and engineers who have practical skills in the field," said El Amili.

"As the market grows, there will not be enough graduates to fill all these opportunities because only Ph.D. graduates so far have the practical skills in integrated photonics. But learning integrated circuit design, device fabrication, packaging and testing should not be limited to Ph.D. students. Our hope is that by bringing hands-on integrated photonics training to undergraduate and masters students, this toolkit will equip them with the knowledge and skills to fill new job opportunities," he

said.

The toolkit, dubbed Integrated Photonics Education Kit (IPEK), is a packaged silicon photonic platform. Instructors can use it as part of an engineering laboratory course to teach students basic building blocks of photonics integrated circuits. By experimenting and tinkering with the plug and play kit, students can gain experience designing, assembling and testing photonics integrated circuits.

The current prototype includes 6 photonic components such as a waveguide, micro-ring resonator, short and long Bragg mirrors, filters, and a Mach-Zehnder interferometer. These are basic building blocks in educational, research, and industrial environments. The devices can be controlled using heaters. Additionally, many of these devices are electrically tunable to demonstrate various modes of operation to the user. They can be also combined together externally using fiber for more complex photonic functionality.



IPEK simplifies a conventional photonics experimental platform (left) into a portable, less costly setup (right). Credit: David Baillot/UC San Diego Jacobs School of Engineering

IPEK offers many of the functionalities of conventional photonics platforms for a fraction of the cost. It costs around $1,500 to build whereas the equipment for a conventional setup costs around $10,000 to $12,000. And while conventional platforms are bulky and require a separate lab space, IPEK is portable. The current prototype fits in a user's hand.

IPEK is also robust and easy to use, said El Amili. With the plug and play package tool, users no longer need to spend time aligning and stabilizing the optical fiber like they would with a conventional platform. "We gain time in performing the experiment," he said.

"The Tyndall Institute through the support of the PIXAPP Pilot Line is delighted to collaborate with UC San Diego on this unique educational program," said O'Brien. "Tyndall and PIXAPP recognize the need for a skilled workforce in integrated photonics across all skill levels. The IPEK toolkit is an excellent initiative dedicated to training the next generation of engineers and technicians."

The team is working to refine the prototype. El Amili, Davis and Fainman are preparing a laboratory curriculum at the UC San Diego Jacobs School of Engineering to implement the toolkit.

Provided by University of California - San Diego

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