

Silicon Photonics: Linear, Nonlinear, and Quantum Integrated Optical Devices and Circuits

Overview

Silicon photonics is the most significant development in integrated optoelectronics in the last 15 years. In 2015, a Manufacturing Institute was created in the USA with more than \$600 million in funding to further develop silicon photonics, and major companies like IBM, Intel, Oracle, Cisco and Keysight (HP) have started in-house teams developing silicon photonics products. However, the educational and student training aspects are only beginning, both in the USA and in other countries, with great potential and need for further development of a pipeline for trained researchers. The goal of this course is to teach students/researchers who have some knowledge of basic guided-wave optics and of CMOS electronics how to specify, design, fabricate, measure and characterize silicon photonic devices which can be used in modern communication systems, such as transceivers, switches, routers, etc. as well as in spectroscopic instrumentation, imaging systems, and other emerging applications. We will cover the basics of high-index contrast optical waveguides, directional couplers, fiber-waveguide interfaces, electro-optic modulators, photodetectors, amplifiers, and systems-level device modeling approaches. The course will include “design challenges” wherein a systems-level specification is provided, and we will attempt to design and simulate a device which can meet those requirements. The course will also discuss the growing potential for silicon photonics in emerging areas such as integrated nonlinear optoelectronics and quantum photonics.

Dates for the Course	19th March, 2017 to 1st April, 2017
Host Institute	IIT Madras
No. of Credits	2
Maximum No. of Participants	50
You Should Attend If...	<ul style="list-style-type: none">▪ You are an electronics engineer or research scientist interested to know about the developments in integrated optics within the last 15 years, especially concerning the initiation, maturation and industry adoption of “silicon photonics” as a major field within optics; also to appreciate the potential for silicon photonics to enable chip-scale nonlinear or quantum systems, which operate at room temperature, and can achieve transformative technological impact on emerging post-Moore’s Law technology trends.▪ You are a student interested in learning functional silicon photonics devices and circuits (linear, nonlinear and quantum optic); including fundamentals of optical waveguide theory, spectral- and temporal- domain modeling, dispersion and polarization characterization, input/output interfaces and electronic carrier effects.
Course Registration Fees	<p>The participation fees for taking the course is as follows: Student Participants: Rs.2000 Faculty Participants: Rs.5000 Government Research Organization Participants: Rs.5000 Industry Participants: Rs.10000</p> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p>Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai The demand draft is to be sent to the Course Coordinator at the address given below.</p>
Accommodation	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p>

Course Faculty



Prof. Shayan Mookherjea joined the UCSD faculty in July 2003. His current research focuses on photonic devices, and chip-scale nonlinear and quantum photonics. At MIT, his research contributed to early work on remotely-pumped architectures for optical distribution networks. At Caltech, he received the Charles Wilts thesis

prize, awarded for outstanding independent research in Electrical Engineering leading to a PhD. As assistant professor in the Electrical Engineering department at UCSD (2003-2008), he was appointed a Hellman Faculty Fellow (2004-2005) and has received the NSF CAREER award (2007-2012). He was awarded tenure in 2008, and was elected OSA Fellow in 2013.



Dr. Bijoy Krishna Das is a faculty in the Dept. of Electrical Engineering at the Indian Institute of Technology, Madras. He heads the integrated optoelectronics laboratory and is an active member of the Centre for NEMS and Nanophotonics (CNNP). His

current focus is to demonstrate advanced silicon photonics devices and circuits for optical interconnects and various sensing applications.

Course Coordinator

Name: Bijoy Krishna Das
Phone: +91 44 2257 4459
E-mail: bkdas@ee.iitm.ac.in

URL: <http://www.ee.iitm.ac.in/mems/iolab>