

Integrated Circuits Testing: Passive Devices

Intro Video:

<https://youtu.be/l6tTD5Xmfc4>

Syllabus:

- Description of Course:

This course reviews test characterization methods for passive integrated photonics components, including fiber-to-chip coupling schemes, waveguides, spirals, Mach-Zehnder Interferometers, Y-splitters, ring resonators, and directional couplers. Waveguide characterization will focus on loss and dispersion measurements, and examine wavelength and polarization dependencies. Guest lectures will cover wafer-scale testing and Design for manufacturing (DfM).
- Outline:
 - Topic 1: Photonic testing – an overview
 - Topic 2: Coupling to an integrated photonic chip
 - Topic 3: Waveguide testing
 - Topic 4: Resonator characterization
 - Topic 5: Waveguide couplers and interferometers
 - Topic 6: Photonic integrated circuit testing
 - Topic 7: Design for test
- Prerequisites:

Basic knowledge of guided-wave optics
- Learning Outcomes

The students will learn about the methods and metrics used to characterize passive integrated photonic circuits. They will gain knowledge both of experimental measurement techniques and of the theory behind them, such that they are able together and interpret the results. They will practice analyzing real measurement data.
- Grading Policy

A mix of numerical and multiple-choice questions are asked after each lecture or block of lectures. Students have 2 attempts to validate the lecture (resp. block of lectures) by answering 60% of the questions correctly. Every single set of questions must be validated to pass the class.
- Contact Information:

The teaching staff can be reached at picpassive@mit.edu for logistical questions about the course.

Questions related to the course contents can be asked in the class forum.
- Duration:
 - 4 hours of video lectures
 - Suggested duration: 3 weeks, asynchronous
- Tuition:

\$99 per student

Meet your Professors:

This course is led by Prof. Juejun Hu and Prof. Jaime Cardenas.

- **Prof. Juejun Hu:**



Juejun (JJ) Hu is currently an Associate Professor at MIT's Department of Materials Science and Engineering. His research primarily focuses on integrated optics and photonics. Prof. Hu has authored and coauthored more than 100 refereed journal publications. He has been recognized with the SPIE Early Career Achievement Award, the Robert L. Coble Award from the American Ceramic Society, the Vittorio Gottardi Prize from the International Commission on Glass, the NSF CAREER award, and the DARPA Young Faculty Award, among others.

- **Prof. Jaime Cardenas:**

Jaime Cardenas is currently an Assistant Professor in the Institute of Optics at the University of Rochester. He has a secondary appointment at the Department of Physics and Astronomy. He earned his PhD in Optical Science and Engineering at the University of Alabama in Huntsville. He spent two years in industry at Digital Optics Corporation in Charlotte, North Carolina before joining Cornell University as a postdoc in the Lipson group, where he then became a research scientist. He joined the faculty of the Institute of Optics in 2016.