

## PIC Sensors: About the Course

### Intro Video:

<https://youtu.be/GBaahiap0kc>

### Syllabus:

- Description of Course:

Have you wondered about how a PIC sensor works? This new course covers the basics of photonics chem-bio sensing components and techniques. This will provide learners with insights that will lay the foundation for them to envision their own PIC sensors. They will learn to make judicious decisions regarding wavelengths, materials platforms, light sources, spectrometers, and photodetector solutions based on their desired application. The course includes a diverse line-up of invited lectures with leading-edge PIC sensor experts from around the world, who review critical metrics for designing photonics sensing systems.
- Outline:
  - Topic 1: Introduction to PIC sensors
  - Topic 2: PIC sensing system overview
  - Topic 3: Sensing element design
  - Topic 4: Light source
  - Topic 5: Detector
  - Topic 6: Spectrometer
  - Topic 7: Integrated photonic biosensing
  - Topic 8: Markets, roadmap, and sensors PDK
- Prerequisites:

Basic knowledge of guided-wave optics
- Learning Outcomes:

The students will learn about the methods used in integrated photonic sensing with their respective figures of merit, such that they will be able to select a method for a particular application. They will gain knowledge of the working principles and key metrics of the different components involved in a PIC sensing system, to allow them to design their own PIC for sensing.
- 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:
  - Office Hours: Fridays 12-1 pm
  - The teaching staff can be reached at [picsensors@mit.edu](mailto:picsensors@mit.edu) for logistical questions about the course.
  - Questions related to the course content can be asked in the class forum.
- Duration:
  - 12 hours of video lectures
  - Suggested duration: 6 weeks, asynchronous
- Tuition:

\$99 per student

### Meet your Professors:

This course is led by Prof. Juejun Hu and Dr. Anu Agarwal, with 9 guest lecturers.

- **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.

- **Dr. Anu Agarwal:**

Dr. Anu Agarwal is currently a Principal Research Scientist at MIT's Department of Materials Science and Engineering and. She is developing integrated Si-CMOS compatible linear and non-linear materials for photonic devices, especially in the mid-IR regime, for hyperspectral imaging and chem-bio sensing. She has over 200 journal and refereed conference publications, 22 awarded patents and 4 pending patents. She also serves as the Leader of the AIM Academy Laboratory for Education and Application Prototypes (LEAP) at MIT.

- **Dr. Shrenik Deliwala:** Dr. Deliwala is a Senior Researcher at Analog Devices.

- **Dr. Sergio Nicoletti:** Dr. Deliwala is a Senior Researcher at CEA-Leti.

- **Prof. Delphine Marris-Morini:** Prof. Marris-Morini is an Assistant Professor at the Paris-Saclay University.

- **Dr. Christian Pfluegl:** Dr. Fluegl is the Vice-President of Engineering and co-founder of Pendar Technologies.

- **Dr. Jerry Meyer:** Dr. Meyer is a Senior Scientist at the Naval Research Laboratory.

- **Dr. Laurent Vivien:** Dr. Vivien is Director of Research at the Centre for Nanoscience and Nanotechnology (C2N).

- **Prof. Jifeng Liu:** Prof. Liu is an Associate Professor at Dartmouth College.

- **Prof. Benjamin Miller:** Prof. Miller is a Professor at the University of Rochester.

- **Dr. Kevin McComber:** Dr. McComber is the CEO and co-founder of Spark Photonics.

### Mission:

Creators/Sponsors

### Introduce Yourself:

Videos of JJ introducing Anu and Anu introducing JJ