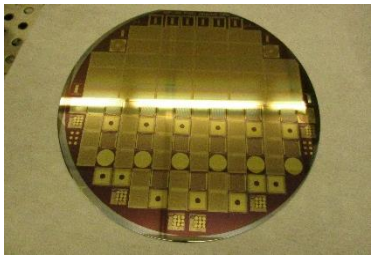
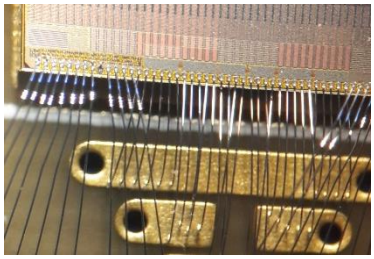


**ECE 621, Spring 2025**

**Advanced Solid-State Devices**



**Instructor**: Dr. Jennifer Ott, assistant professor
**Email**: ottjenni@hawaii.edu

**Course Time/Location**: MW 14:00-15:15pm, location to be confirmed

**Prerequisites**

Physical Electronics (EE 324), Theory and Design of IC Devices (EE 327) or equivalent; or Consent.

**Textbook (recommended)**

B.G. Streetman & S.K. Banerjee, *Solid State Electronic Devices*, 7th edition, Pearson, 2015
ISBN: 9780133356113 (e-book), 9780133356038 (hardcover)

**Course Description**

The course will cover structure and fabrication, operating principles, state-of-the-art and novel developments of various solid-state device types used in the detection of ionizing and non-ionizing radiation, photovoltaics, optoelectronics, stimulated light emission, and quantum circuits.

**Course Objectives**

Through this course, the students will develop a comprehensive understanding of the following aspects:

- How fundamentals in electronics and semiconductor physics manifest and are utilized in solid-state devices
- Typical micro- and nanofabrication techniques and how they are applied
- State-of-the-art technologies in different device types
- What parameters define and what factors limit the performance of devices
- What materials and functionalities are needed to enable state-of-the art technologies and future advances
- Identifying current topics and trends for various solid-state devices in the scientific community

**Course topics**

- Semiconductor detectors for charged particles, gamma rays and x-rays
- Photodiodes and photodetectors
- Readout electronics in sensing/detection
- Solar cells
- Light-emitting diodes
- Solid-state lasers
- Silicon photonics
- Graphene, carbon nanostructures and 2D materials in IC devices
- Devices and electronics in quantum circuits

***Please contact Dr. Ott for available Graduate Research Assistant opportunities!***