

## **PHY 313a: Physics of Information Processing**

### **Course Outline:**

#### **Module 1: Information, noise and statistical processes (5 weeks, 16 lectures)**

- Introduction to Shannon's information theory (1 week)
- Formal theory of noise; shot noise, Johnson noise, 1/f noise (2 weeks)
- Information theory in context of statistical mechanics and precision of general measurements (1 week)

#### **Module 2: Modes of information (5 weeks, 18 lectures)**

- Electromagnetic waves, waveguides, antennas, lasers, modulators, switches (2.5 weeks)
- Information with solid state devices: electronic materials, devices and systems with exotic states (2.5 weeks)

#### **Module 3: Introduction to quantum information (2 weeks, 6 lectures)**

- Basic elements of quantum technologies: C-NOT gates and non-cloning theorem (1-week)
- Practical realizations: cavity-QED, superconducting qubits (1 week)

Primary reference;

We will be following the book below very closely, all along the semester:

#### **“Physics of Information Technology” by Neil Gershenfeld**

There are several secondary references which will be mentioned as the course progresses, the most important of them being **Claude Shannon's 1948 paper titled: “A mathematical theory of communication” and is widely available online.**

**The book and the paper, along with the above contents should give a fair idea of what to expect from this course.**