1. ECE 554: Computer Architecture

2. 3 credits: 2-75 minute lecture sessions/week

3. Sudeep Pasricha

4. Computer Architecture: A Quantitative Approach. Patterson, D. A. & Hennessy, J. L. 2017.

5. Course Information
    a. Fundamentals of computer design, multiprocessors and thread-level parallelism, storage systems, and interconnection networks and clusters
    b. Prerequisites: ECE 452 or CS 470
    c. Selected Elective: Electrical Engineering; Computer Engineering

6. Goals for the Course
    a. Course Learning Objectives
        i. Analyze the building blocks for advanced computing systems used in smartphones, tablets, laptops, servers, datacenters, and supercomputers.
        ii. Examine the trade-offs between performance, energy, reliability, cost, and security in diverse computing platforms and across a wide range of applications
        iii. Design and evaluate software algorithms for achieving desired trade-offs across a wide range of computing platforms
        iv. Design and evaluate hardware for achieving desired trade-offs across a wide range of computing platforms
        v. Analyze state-of-the-art research and design challenges for emerging and future computing platform
    b. Student Outcomes
        1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
        2. An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and welfare, as well as global, cultural, social, environmental, and economic factors
        3. An ability to communicate effectively with a range of audiences
        4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
        7. An ability acquire and apply new knowledge as needed, using appropriate learning strategies

7. Topics Covered
    Processors
    Main memory architecture
    Advanced cache optimizations

Contemporary main memory design
Beyond ILP: thread level parallelism
Data level parallelism (DLP): SIMD, vector machines, GPUs
Coherence mechanisms
Servers
Warehouse scale computing
Parallel programming
Multicore architectures