UC San Diego
JACOBS SCHOOL OF ENGINEERING
Electrical and Computer Engineering

NEW 2017-18 Courses

Undergraduate courses:

- ECE 188 (F/W/S): Programming for Data Analysis
  - Tu/Th: 5-6:20pm
  - A hands-on course designed to teach students Python and its usage in Data Science applications. Topics include:
    - Understand Python object-oriented and functional programming styles
    - Learn key scientific computing packages
    - Apply key Python data structures and algorithms effectively
    - Enhance productivity with Python development workflows
    - Develop deployable codes using modern package management and source control
  - Prerequisite: ECE 15

- ECE 188 (F/W): LabVIEW Programming: Design and Applications
  - M/W: 9:00am-11:50am. EBUI B538.
  - An interactive LabVIEW programming course designed to teach students how to design and develop LabVIEW applications. The course will prepare students for the NI Certified LabVIEW Associate Developer (CLAD) exam as well as provide hands-on engineering through team oriented LabVIEW projects!
  - Prerequisite: ECE 15

- ECE 188 (W/S): Software Systems

Graduate courses on Machine Learning and Data Science:

- ECE 289 (F): Special Topics in ECE. Probability and Statistics for Data Science
  - Probabilistic models, random variables, common distributions, expectations, Markov chains, random walks, law of large numbers, central limit theorem, maximum likelihood, inference, confidence intervals, hypothesis testing, linear regression.

- ECE 289 (F): Special Topics in ECE: Machine Learning in Social Networks
  - Tu/Th: 3:30pm-4:50pm. WLH 2207

- ECE 289 (W): Special Topics in ECE: Optimization and Acceleration of Deep Learning on Various Hardware Platforms

  - This course focuses on a holistic end-to-end methodology for optimizing the physical performance metrics of Deep Learning on hardware platforms, e.g., real-time performance, energy, memory, and power. The hardware platforms include CPU-CPU, CPU-GPU, and CPU-FPGA architectures. We start by discussing the hardware characteristics and the effect of the architecture on the DL performance. We will cover platform-specific algorithm and data transformation that contribute to significant improvement in deep learning performance.

- ECE 289 (S): Special Topics in ECE: Parallel Processing in Data Science.

Graduate courses on ISRC:

- ECE 276A (F): Sensing & Estimation in Robotics.
  - M/W: 6:30pm-7:50pm. CENTR 214.
  - This course covers the mathematical fundamentals of Bayesian filtering and their application to sensing and estimation in mobile robotics. Topics include maximum likelihood estimation (MLE), expectation maximization (EM), Gaussian and particle filters, simultaneous localization and mapping (SLAM), visual features and optical flow, and hidden Markov models (HMM).
  - Prerequisites: equivalent of ECE101, 153, 171, 174

- ECE 276B (W): Planning & Learning in Robotics.
  - This course covers optimal control and reinforcement learning fundamentals and their application to planning and decision making in mobile robotics. Topics include Markov decision processes (MDP), Pontryagin's Maximum Principle, linear quadratic regulation (LQR), deterministic planning (A^* and RRT^*), value and policy iteration, Q-learning, and policy gradient methods
  - Prerequisite: ECE276A

- ECE 276C (S): Advances in Robotics Manipulation.
  - Robot Manipulation involves the use of robot effectors (like arms, trunks, hands, etc.) to operate in real environments. It ranges from low-level control (such as how a robot should move its joints to move its gripper towards an object), to high-level decision making (such as whether the robot should make the move in the first place). Many useful algorithms that have been developed in the areas of control theory, artificial intelligence, and now machine learning are being used in unison to achieve tasks. This class is set up in a way to explore reinforcement learning as a means to solve challenging robot manipulation problems. Part 1 will cover topics pertinent to robot manipulation and will rapidly focus on examining new algorithms for achieving more complex robot motions and behaviors. Part 2 will involve a substantial project component involving developing a new machine learning algorithm to solve some open challenges in robot manipulation.
  - Prerequisite: ECE 276A

Graduate courses on Signal and Image Processing:

- ECE 207 (S): Computational Evolutionary Biology

- ECE 285 (F): Special Topic in SIP/ISRC: Video and Image Restoration
  - M/W: 11-12:20am. EBUI 2315.
  - Introduction to inverse problems in image/video restoration contexts: denoising, deblurring, super-resolution, tomography, compressed sensing. Fundamentals of linear/local filtering: maximum likelihood, spatial averaging, heat equation, low-pass and Wiener filtering. Basic of non-linear filtering: signal adaptation, maximum a posteriori, wavelets and sparsity, non-locality, patches. Towards advanced filtering: dictionary learning, convex and non-convex optimization, parameter selection.

- ECE 285 (F): Special Topic in SIP/ISRC: Fundamentals of Image and Video Compression
  - This course provides theoretical background to image and video compression. Topics cover basic coding tools such as entropy coding, transform and quantisation as well as advanced coding methods: motion estimation and compensation, error resilient coding and scalable coding. Also students will learn how these coding tools are related with the popular image and video compression like JPEG, JPEG2000, SPIHT and HEVC.

- ECE 285 (W): Special Topic in SIP/ISRC: Real-time Image and Video Compression
  - This course introduces image and video coding methods for real-time processing. Topics cover parallel image compression on GPU, integer transform and quantisation, fast motion estimation, fast prediction, multiplication-free arithmetic coding. Especially, students will learn practical GPU programming for parallel compression on the real GPU system.
  - Prerequisite: Matlab and C/C++ programming skill, ECE285(Fall quarter).

Graduate courses on Computer Engineering:

- ECE 268(W): Security of Hardware Embedded System
  - The course gives an overview of areas of security and protection of modern hardware, embedded systems, and IoTs. Covers essential cryptographic methodologies and blocks required for building a secure system. Topics include low overhead security, physical and side-channel attacks, physical security primitives, physical security and proofs of presence, hardware-based secure program execution, scalable implementation of secure functions, emerging technologies, and rising threats. Recommended preparation: Programming in a standard programming language. Undergraduate level knowledge of the IC design flow and digital designs.

Graduate courses on Mathematics for MS Comp Exam:

- ECE 278: Math Topics for MS Comp Exam
  - M/W: 8am-8:50am. YORK 2622