Nico A. Espinosa Dice

Courses taken in mathematics and computer science.

Mathematics Courses

MATH131: Mathematical Analysis I   In Progress
Taught by Heather Zinn-Brooks   *Fall 2020*
   "This course is a rigorous analysis of the real numbers, and an introduction to writing and communicating mathematics well. Topics include properties of the rational and the real number fields, the least upper bound property, induction, countable sets, metric spaces, limit points, compactness, connectedness, careful treatment of sequences and series, functions, differentiation and the mean value theorem, and an introduction to sequences of functions."

MATH113: Number Theory and Cryptography   In Progress
Taught by Stephan R. Garcia at Pomona College   *Fall 2020*
   "This course introduces basic elements of the elegant and beautiful theory of numbers, including prime factorization, congruences and modular arithmetic, Fermat's little theorem, Euler's phi function, and quadratic reciprocity, together with their powerful application to public key cryptosystems like RSA and Diffie-Hellman."

MATH189R: Mathematics of Big Data   A
Taught by Weiqing Gu   *Spring 2020*
Machine Learning: A Probabilistic Perspective by Kevin P. Murphy
   "In this course, we will start with big data challenges and examples. Then we will demonstrate how to use mathematical techniques to process big raw data including data indexing, visualization, structuring, representing, and reducing data dimension. We then present mathematical techniques for overcoming big data challenges especially focusing on the mathematics behind machine learning black boxes. Students will learn how to select an appropriate existing algorithm or a specific machine learning method, or integrate different algorithms for the big data problem at hand. We will use several examples including topic modeling and anomaly detection to demonstrate the key points involved, such as how to select an appropriate metric to distinguish between the normal and abnormal. We will end the course by demonstrating several examples of big data to decision using mathematical techniques."

MATH171: Abstract Algebra I   A-
Taught by Jessalyn Bolkema   *Spring 2020*
Abstract Algebra by David S. Dummit and Richard M. Foote

"Groups, rings, fields and additional topics. Topics in group theory include groups, subgroups, quotient groups, Lagrange's theorem, symmetry groups, and the isomorphism theorems. Topics in Ring theory include Euclidean domains, PIDs, UFDs, fields, polynomial rings, ideal theory, and the isomorphism theorems. In recent years, additional topics have included the Sylow theorems, group actions, modules, representations, and introductory category theory."

MATH189Z: COVID-19 (Data Analytics / Machine Learning) Pass*

Taught by Weiqing Gu   *Spring 2020*

"This is a special topics course responding to the Coronavirus pandemic. We will employ big data analytics and machine learning (ML) techniques to process, identify key data features, infer, predict, integrate, classify, and extract unique insights from the COVID-19 Open Research Dataset. Math189Z is a project-based online course using the materials selected from this dataset. Some of the project goals include helping the science community to understand data genetics, incubation, and symptoms or helping fill some gaps when scientists are pursuing knowledge around prevention, treatment and a vaccine. Additionally, another goal of this course is to become comfortable using GitHub as this tool is extremely prevalent in industry and academia when developing and deploying models. To that end, all code, reading summaries, and your final project will be hosted on GitHub."

*Denotes pass/no-credit grading system for the class.

MATH055: Discrete Mathematics   A-

Taught by Michael E. Orrison   *Fall 2019*

Mathematics: A Discrete Introduction by Edward R. Scheinerman

"Topics include combinatorics, number theory, and graph theory with an emphasis on creative problem solving and learning to read and write rigorous proofs. Possible applications include probability, analysis of algorithms, and cryptography."

MATH065: Differential Equations/Linear Algebra II   A-

Taught by Andrew J. Bernoff   *Fall 2019*

Linear Algebra: A Modern Introduction by David Poole

MATH060: Multivariable Calculus   A

Taught by Yesim Demiroglu   *Fall 2019*

MATH045: Introduction to Differential Equations   A

Taught by Victoria Noquez   *Spring 2019*

MATH035: Probability and Statistics   High Pass

Taught by Mohamed Omar   *Fall 2018*

OpenIntro Statistics by Christopher D. Barr, David M. Diez, and Mine Çetinkaya-Rundel

MATH030B: Calculus   Pass

Taught by Michael E. Orrison   *Fall 2018*

Calculus by Michael Spivak

Computer Science Courses

CSCI151: Artificial Intelligence In Progress

Taught by Jessica Wu *Fall 2020*

"This course presents a general introduction to the field of Artificial Intelligence. It examines the question: What does (will) it take for computers to perform human tasks? It presents a broad introduction to topics such as knowledge representation, search, learning and reasoning under uncertainty. For each topic, it examines real-world applications of core techniques to problems which may include game playing, text classification and visual pattern recognition."

CSCI140: Algorithms In Progress

Taught by George D. Montañez *Fall 2020*

"Algorithm design, analysis, and correctness. Design techniques including divide-and-conquer and dynamic programming. Analysis techniques including solutions to recurrence relations and amortization. Correctness techniques including invariants and inductive proofs. Applications including sorting and searching, graph theoretic problems such as shortest path and network flow, and topics selected from arithmetic circuits, parallel algorithms, computational geometry, and others. An introduction to computational complexity, NP-completeness, and approximation algorithms. Proficiency with programming is expected as some assignments require algorithm implementation."

CSCI081: Computability and Logic A

Taught by George D. Montañez *Spring 2020*

"An introduction to some of the mathematical foundations of computer science, particularly logic, automata and computability theory. Develops skill in constructing and writing proofs, and demonstrates the applications of the aforementioned areas to problems of practical significance."

CSCI070: Data Structures and Program Development A

Taught by Beth Trushkowsky *Spring 2020*

"Abstract data types including priority queues and dynamic dictionaries and efficient data structures for these data types, including heaps, self-balancing trees and hash tables. Analysis of data structures including worst-case, average-case and amortized analysis. Storage allocation and reclamation. Secondary storage considerations. Extensive practice building programs for a variety of applications."

CSCI060: Principles of Computer Science A

Taught by Katherine Breeden *Spring 2019*

"Introduction to principles of computer science: Information structures, functional programming, object-oriented programming, grammars, logic, logic programming, correctness, algorithms, complexity analysis, finite-state machines, basic processor architecture and theoretical limitations."

CSCI005: Introduction to Computer Science Pass

Taught by Julie Medero *Fall 2018*

Miscellaneous Courses

ECON136: Financial Markets and Modeling   A-

Taught by Gary Evans   *Spring 2020*

"Modern financial strategy seeks to reduce market risk through the use of complex instruments called derivatives. This course introduces students to the world of futures, options, and other derivatives. Topics to be covered include a survey of the markets and mathematical models of risk and volatility."

MATH199: Mathematics Colloquium   Pass*

Taught by Weiqing Gu   *Spring 2020*

*Denotes pass/no-credit grading system for the class.

MATH093: Putnam Seminar   Pass*

Taught by Andrew J. Bernoff and Nicholas Pippenger   *Fall 2018*

*Denotes pass/no-credit grading system for the class.