Kartik Ramachandrula

Transcript of Advanced Coursework

Below are the listings and descriptions of my advanced course undertakings as a High School student.

▬ Mathematics

Marquette

- **MATH 4210**, *Complex Variables*, Spring 2024, Rebecca Sanders
  Undergraduate introduction to Complex Analysis. Complex numbers, analytic functions, differentiation, series expansion, line integrals, singularities and residues.
  Textbook: Brown and Churchill, *Complex Variables and Applications*.

- **MATH 4200**, *Intermediate Analysis*, Fall 2023, Rebecca Sanders
  Undergraduate introduction to Real Analysis. Limits and continuity, differentiability, Riemann integration. Topology of N-dimensional spaces.
  Textbook: Kenneth Ross, *Elementary Analysis: The Theory of Calculus*.

A **MATH 4121**, *Abstract Algebra II*, Spring 2024, Wim Ruitenburg
  Continuation of MATH 4120 with emphasis on groups, rings, fields and modules.
  Textbook: Judson, *Abstract Algebra: Theory and Applications*, chapters 16-23.

A **MATH 4120**, *Abstract Algebra I*, Fall 2023, Wim Ruitenburg
  Sets, mappings, operations on sets, relations and partitions. A postulational approach to algebraic systems including semigroups, groups, rings and fields. Homomorphisms of groups and rings, number systems, polynomial rings.
  Textbook: Judson, *Abstract Algebra: Theory and Applications*., chapters 1-6, 9-15

P **MATH 3977**, *Problem Solving: Putnam Competition*, Fall 2022, Wim Ruitenburg
  Studies mathematical problems, examine their solutions and formulate general problem solving methods and techniques. Prepares students for the Putnam Mathematical Competition.

A **MATH 2451**, *Differential Equations*, Fall 2022, Tyler Gillen
  Methods and techniques applicable to first order, nth order, and systems of first order differential equations. Eigenvalues, eigenvectors, the Wronskian, Laplace transforms, linearization and phase portraits.
  Textbook: James Brannan, *Differential Equations: An Introduction to Modern Methods and Applications*.

A **MATH 2350**, *Foundations of Mathematics*, Fall 2022, Rebecca Sanders
  Undergraduate proof-emphasized course in Discrete Mathematics. Introduction to set theory, logic, mathematical induction, graph theory, modular arithmetic, and higher mathematical thinking through proof and applications.
  Textbook: Ensley and Crawley, *Discrete Mathematics: Mathematical Reasoning and Proof with Puzzles, Patterns, and Games*.

Milwaukee School of Engineering

A+ **MTH 2340**, *Linear Algebra with Applications*, Summer 2022, Chunping Xie

Undergraduate introduction to Linear Algebra. Topics include systems of linear equations, matrix equations, linear transformations, invertibility, subspaces and bases, the determinant, eigenvectors, the inner product, orthogonality, projection, matrix factorizations, and selected applications.
Textbook: Lay, Lay, Macdonald; *Linear Algebra and Its Applications*.

University of Wisconsin Oshkosh

A+ **MATH 273**, *Calculus III*, Spring 2022, Heather Minton

Undergraduate introduction to Multivariable Calculus and Vector Analysis. Vectors in two and three dimensions, dot and cross products, lines, and planes. Vector functions and their differentiation and integration. Multivariate differential and integral calculus, partial derivatives and their applications, gradients, and multiple integrals. Line and surface integrals, fundamental theorem of line integrals, Green's theorem, and Stokes' theorem.
Textbook: James Stewart, *Calculus: Early Transcendentals*, chapters 12-17.

Brookfield Central High School

A+ **AP**, *Calculus BC*, Fall 2020, Ryan Rutz

5 Introductory calculus course equivalent to calculus I, II. Concepts, methods, and applications of differential and integral calculus, including topics such as parametric, polar, and vector functions, and series
Textbook: James Stewart, *Calculus: Early Transcendentals*, chapters 1-11.

A **AP**, *Statistics*, Spring 2023, TJ Reuteman

5 Introductory statistics course.
Textbook: Yates, Moore, Starnes; *The Practice of Statistics*.

Physics Courses

Marquette

A **PHYS 3100**, *Classical Mechanics*, Fall 2023, Bill Hirsch

Three-dimensional motion of a particle in both Cartesian and spherical coordinate systems. Newtonian dynamics, central forces. Lagrange's and Hamilton's formulations of analytical mechanics, angular momentum, Kepler's problem and the dynamics of a rigid body.
Textbook: Douglas Cline, *Variational Principles in Classical Mechanics*.

University of Wisconsin Milwaukee

A **PHYSICS 309**, *Modern Physics*, Spring 2023, Abbas Ourmazd

Elementary quantum physics, atomic and molecular physics, solid state and nuclear physics.
Textbook: Kenneth S. Krane, *Modern Physics*.

Brookfield Central High School

A+ **AP**, *Physics C: Mechanics, Electricity*, Fall 2022, John Wilkinson

5 Introductory calculus-based treatment of undergraduate mechanics and electricity with lab.

A+ **AP**, *Physics I*, Fall 2021, John Wilkinson

5 Introductory algebra-based treatment of undergraduate mechanics with lab.

Computer Science Courses

Marquette

A **COSC 3100**, *Algorithms*, Fall 2023, Sheikh Iqbal Ahamed

Types of algorithms such as divide-and-conquer, greedy, probabilistic, graph traversal, heuristic and parallel algorithms. Computational complexity including time and space complexity, and the P=NP problem.

Textbook: Tim Roughgarden, *Algorithms Illuminated: Omnibus Edition*.

A **COSC 2100**, *Data Structures*, Fall 2022, Niharika Jain

Introduction to algorithm analysis and complexity theory presented in the context of data structures and the algorithms used to manipulate them. Includes traditional abstract data types, such as lists, stacks, queues and trees; as well as concepts of indexing, hashing and time/space complexity.

Textbook: Dale, Joyce, Weems, *Object-Oriented Data Structures Using Java*.

Brookfield Central High School

A+
5   **AP**, *Computer Science A*, Fall 2022, Ryan Osterberg

Introductory course in programming and Java.

▬ Language Courses

University of Minnesota Twin Cities

A **LAT 3003**, *Intermediate Latin Prose*, Fall 2023, Daniel Tess

Building from a basic knowledge of Latin grammar and syntax, this course aims to develop students' fluency with Latin prose and to introduce some stylistic elements of hallmark authors of the Republican period. The primary author for the course is Cicero and/or Caesar. In addition to providing an opportunity to read sustained prose, these texts also introduce some fundamental principles of Roman rhetoric, the science of constructing language around the goal of persuasion.

Samskrita Bharati USA

- **SAMS 301, 302**, *Advanced Samskritam*, 2023-24, Vinitia Sharma, Sukirta Algarswamy

Reading and analyzing simple stanzas in verse, and learn to compose essays in Samskritam. Students will also learn the present continuous participles and euphonic consonant combinations in depth. In addition, students will use the necessary skills to read simple poetry.

▬ Other Courses

- **AP**, *English Language and Composition*, Spring 2024, Kathleen Evans

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A **AP**, *Biology*, Fall 2023, John Jablanowski

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A **AP**, *Chemistry*, Fall 2022, John Harder
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A **AP**, *Macroeconomics*, Spring 2022
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