Advanced Algorithms Honors

Kehillah Jewish High School

Dr. Zachi Baharav

Room 213

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Our Four Commitments

1. Everyone counts.
2. Everyone has equal access to great learning.
3. Every person's unique talents are valued equally.
4. We take responsibility for ourselves, our learning, and our community.

Course Description

The course explores algorithms and methods used in data analysis, and their applications to real world data. Topics include numerical algorithms for calculating derivatives and matrix inversion with applications in simulation of physical systems, convex optimization methods with applications in Artificial Intelligence, string matching algorithms with applications to genomic data matching and natural languages, and Monte-Carlo techniques with applications to modeling queues.
The course is aimed at students who completed the Computer Science lane, culminating in AP-Computer Science-A, and have strong mathematical base. Students must demonstrate independent problem solving with code in previous courses. Any instructor-approved language may be used (For example, Python, Java, Matlab, C/C++).

The course concludes in a 3-weeks long project applying an algorithm to a real-world problem, and demonstrating the skills acquired in the course. These skills include researching a problem, formulating it in a clear and succinct manner amenable for solution, devising and implementing an algorithm, and communicating the results.

List of subjects covered

Gauss-Jordan algorithm for system of equations; Newton Raphson algorithms for roots of polynomials; Finite difference solution of heat equation; O(n); Depth/breath first: 8-queens, shortest distance, and solving a maze; Graph algorithms; Dynamic programming, Levenshtein distance; Hidden Markov processes.
We might spend more time on specific items from the list, following students interest.

Availability and contacting me

I am open on blocks 3,4,5 and 8, and plan to be available during these times in room 213. Feel free to drop-in, or if you want to secure a specific date/time, Schoology message or email would work well. I am here to help.

Contacting me: Other than in person, the best way to reach me is through email (or schoology) at zbaharav@kehillah.org . I read emails daily on school-days, and will respond within 24-hours.

Required Materials

Textbook

None of the below is required in terms of buying. I will supply the relevant chapters as needed.

[1] **Main course book:** "Grokking Algorithms", Aditya Y. Bhargava, 2016. ISBN 978-1617292231

[2] "Numerical recipes in C", W. Press et. Al, 1992. We will mostly use Chapter 2 (Solution of linear algebraic equations) and Chapter 9 (Root finding). ISBN 978-0521431088

[3] "Pearls of functional algorithm design", Richard Bird, 2010. We will mostly use chapters 18 and 19 dealing with Games-AI. ISBN 978-0521513388.

Bring to class each day

1. Computer, Laptop. You can use a school computer, BUT you will need to be consistent with your choice, as we will install the IDE on it.
2. Enthusiasm and willingness to engage in class

Grade Weighting

Formal assessments (tests and projects) – 50%
Homework – 45%
Class participation – 5%

Timeliness Policy

You are encouraged to come and talk with me with any special circumstances. Life happens. We will have a lot of homework in the course, and you are expected to follow along in a timely manner.

a. Assignments will be graded for quality and completeness. Late work will earn a maximum of 80%. Late assignments can be turned in up to 5 school days after the due date. After that no credit may be given.
b. Tests and quizzes must also be completed within the five school day window after an excused absence. After the five-day window passes, students are no longer allowed to make up the test or quiz. If students arrange extensions with their teachers, the five-day countdown begins after the agreed-upon due date.

We acknowledge the needs of students with disabilities and will provide accommodations in line with a student's Student Success Plan (SSP) at Kehillah. If you have any questions about your plan, please contact the Center for Learning Success and your teacher.

Class participation
During class, you are expected to take an active part in the process of exploring and practicing. You ALWAYS have the option of saying 'pass' when asked, and skip your turn, and it will not count against you in any way, shape or form. Be sure though that you are not skipping your turn too often. Your answer is not evaluated for correctness, but rather for its intention and involved thought process.

Formal assessments
Advance notice will be given for any formal assessment. Tests will be cumulative throughout the year.

Collaboration
You are welcome (and are encouraged!) to collaborate on homework, challenges, and class assignments, unless explicitly specified otherwise.
However, you are required to submit your own original work. In this regard, giving your work for someone else to copy is NOT ok. Describing and explaining your work to them is encouraged.

Class behavior guidelines
Students are expected to behave according to, and in a manner encouraging, our four commitments. I expect us all to be courteous and respectful to fellow community members. Specific items for my class:

1. Please neither FOOD nor DRINKS in the classroom (during class, or when you come on open-block times).
2. Taking pictures of class material is ok, but no other cell-phone usage.
3. Working on computers and mobile devices when directed is ok, but please no un-related web-activity.
4. Raising your hand and asking to leave class is ok, but please don't leave without being dismissed.

Grading Scale

93-100	A	73-76	C
90-92	A-	70-72	C-
87-89	B+	67-69	D+
83-86	B	63-66	D
80-82	B-	60-62	D-
77-79	C+	Below 60	F

Academic Integrity
Academic integrity is essential to every academic institution. Students are expected to honor this value by acting honestly in every aspect of their academic lives. Violating academic integrity is contrary to Kehillah's core values and will be grounds for disciplinary action. Kehillah students are expected to perform and produce their own

work. Substitution of another's work for one's own violates the school's expectation of academic integrity and impedes the intellectual growth of the student.

Academic Dishonesty Includes:

- Presenting as one's own an idea or statement taken in full or in part, or even paraphrased, from some other source – whether another person (such as a tutor or parent), a published work (including electronic and on-line publications), or another student's work.
- Using unauthorized notes or other aids in a test, or copying from or being influenced by another student's work (orally or visually) during a test, quiz, etc., or seeking unauthorized information about a test or quiz.
- Giving unauthorized aid to another student; allowing another student to copy or use one's test, paper, or homework; telling another student what was on a test that could be given to another student at a later time.
- Submitting papers or other work already produced for another course without the approval of both teachers.
- Obtaining help (from a parent, tutor, another teacher, or another student) on homework or take-home tests that exceeds the limits specified by the teacher assigning the work.

The Dean of Students will review the incident and determine the next steps which may include loss of credit for the assignment or test, an academic or disciplinary contract, suspension, and/or expulsion.

===== Next page is signing page =====

Please sign and upload to Schoology (e-sign OK, or a picture of the page):

"I have read and understand the Advanced Algorithm Honors Syllabus"

Student Signature:

Name (please print): _____

Signature:_____ Date_____

Parent / Guardian Signature:

Name (please print): _____

Signature:_____ Date_____

======== **End** =======