CSci 124/CSci 297 Discrete Structures II - 3 credits - Vora

Fall 2006 schedule: Tues., Thurs., 5:00-6:15 pm, Rome 459

Instructor: Poorvi Vora, Philips 706. Phone: 202-994-1864

Office Hours: Tues: 1:30-4:30 pm; Thurs: 10:30am-noon and 1-2:30pm unless cancelled in class.

TA: Ben Hosp. Email: bhosp@gwu.edu Office Hours: TBD

Course Website: http://www.seas.gwu.edu/~poorvi/Classes/CS124/

Purpose of course: To provide an introduction to some discrete structures and mathematics used in computer science, such as: linear algebra, discrete fourier transforms, algorithmic number theory. To illustrate these ideas using examples from cryptography and audio-video signal processing.

Course content: Complex numbers, linear algebra and matrices, discrete convolution and polynomial multiplication, discrete fourier transforms, algorithmic number theory.

Prerequisites: Introductory discrete math and single-variable calculus.

Text: None. Class notes will be provided.

Grading: 25% for homework, 25% each for two in-semester tests, 25% for best 10 of 12 quizzes. *There will be no make-up quizzes.* Grading will be absolute and not on a curve. All HWs will be submitted in Blackboard. **You will not be allowed the use of laptops, PDAs or calculators and similar devices during quizzes and in-semester tests**.

Undergraduate and graduate students will be graded separately. Graduate students will have extra assignments. *If you are an undergraduate and wish graduate credit for this class, contact your adviser. Graduate credit is NOT automatically obtained by undergraduates through registration for the graduate course.*

Policy on collaboration: All examinations, papers, and other graded work products and assignments are to be completed in conformance with The George Washington University Code of Academic Integrity. You may discuss HWs among yourselves, and work on them in groups. However, each student is expected to write his or her own HW out independently; you may not copy one another's assignments, even in part. You may not collaborate with others on the tests and quizzes. You are expected to cite all your sources in any written work that is not closed book: papers, books, web sites, discussions with others - faculty, friends, students. For example, if, in a group, one student has a major idea that leads to a solution to a HW problem, all other students in the group should cite this student.

Any violations will be treated as violations of the Code of Academic Integrity.

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss specific needs. Please contact the Disability Support Services office at 202.994.8250 in the Marvin Center, Suite 242, to establish eligibility and to coordinate reasonable accommodations. For additional information please refer to: http://gwired.gwu.edu/dss/.

Syllabus: This is a tentative syllabus. **There will be a quiz every Thursday** except on 19 October and 7 December, when you will have the two in-semester tests.

Week I 5 and 7 September: Complex Numbers: Algebra. Cartesian and Polar Representation.

Week II 12 and 14 September: Complex Numbers: Powers and roots. Matrices and Linear Algebra: Linear Equations. Gaussian Elimination.

Week III 19 and 21 September: Matrices and Linear Algebra: matrix operations, Cramer's rule, determinants, matrix inverses. Vector Spaces, bases, change of bases.

Week IV 26 and 28 September: Matrices and Linear Algebra: Norms, Eigenvalues and Eigenvectors. Convolution: Polynomial multiplication as discrete convolution.

Week V 3 and 5 October: Discrete Fourier Transform and convolution. DFT and vector spaces.

Week VI 10 and 12 October: FFT. Relationship between continuous and discrete-time Fourier analysis and DFT.

Week VII 17 October: Questions on material for test. 19 October: Test, material covered in Weeks I-VI.

Week VIII 24 October: Return Test. Discuss. 26 October: Catch up.

Week IX 31 October and 2 November: Algebra: Groups and Rings, definitions, order of an element, Z_{26}, Z_p. Examples from cryptography.

Week X 7 and 9 November: GCD. Euclidean algorithm with correctness proof.

Week XI 14 and 16 November: Computational Complexity of basic operations. Implementation: fast powers mod n. Lagrange's theorem. Cyclic groups and generators.

Week XII 21 and 23 November: Homomorphisms and isomorphisms. Chinese Remainder Theorem,

Week XIII 28 and 30 November: Isomorphism between Z_{pq} and $Z_p \times Z_q$ based on CRT, Euler Phi function. Algebraic structure of roots of unity.

Week XIV 5 December: Questions on test material. 7 December: Test. Material Covered in Weeks VII-XII.