CMPSC/MATH 451: Numerical Computation, Course Syllabus, Fall 2014.

Instructor: Alexei Novikov, Professor, Department of Mathematics. Contact: aun2@psu.edu, 233 McAllister Building. Course text: Lecture Notes are available to all students. These notes include complete sets of home works which are required for the course. For a more detailed text, I recommend the book: Guide to scientific computing, Second Edition, by Peter Turner, CRC Press, or more classical: Numerical Analysis by D.Kincaid and W.Cheney.

Webpage: http://www.math.psu.edu/~anovikov/math451/

Lecture Schedule: MWF 11:15am-12:05pm (Section 1), 12:20pm-1:10pm (Section 2), 110 Walker. Computer Labs: August 27 (Wednesday) in Willard 069, and Sept. 8, 15, 22, 29 (Mondays) in 134 Cedar, during lecture time. Office hours: Monday 4:45pm-6:15pm, Wednesday 2:20pm-3:35pm + appointments.

Course Content
1. Introduction and some background: Representation of numbers in different bases, Floating point representation, Loss of significance, Review of Taylor series.
3. Spline: Linear spline, Natural cubic spline.
7. Method of least squares (smoothing of data): Linear least square, Some quasilinear and nonlinear examples.

The course emphasizes on computational properties and algorithm implementation. Matlab will be used as the programming tool for the computer projects of the course. Learning to use Matlab will be an important part of the course. Students may take only one course for credit from CMPSC/MATH 451 and CMPSC/Math 455.

Prerequisites: Calculus (Math 230/231), and some basic programming knowledge (at least 3 credits). You would also need some linear algebra (Math 220) and some Differential equations (Math 250/251). Some knowledge on Matlab will make it easier.

Home works: Home works will be assigned regularly throughout the semester, likely every week. About half of the home work will be programming oriented, i.e., to use Matlab to solve problems. Students would be required to spend quite some time working with a computer. The programming part of the home works should be submitted by email. The worst two home work grades will be dropped. Following the general policy of the Math Department, late home works would NOT be accepted with any excuses.

Exams: There will be one in-class (theory-oriented) midterm exam I, and one take-home (programming oriented) midterm exam II. Exam I is tentatively set on Wednesday October 8, Exam II will be announced before the Thanksgiving break on Thursday November 20, and it will be due at 11:59pm on Wednesday December 3. At the end of the semester there will be a comprehensive final exam (1h50m).

Course Grades guideline: 40% homework + 15% exam I + 20% exam II + 25% final exam. Letter grades cut-offs: \( \geq 90\% \approx A, \geq 80\% \approx B, \geq 70\% \approx C, \geq 60\% \approx D \). These cut-offs may be lowered but not increased.

All Penn State policies regarding ethics and honorable behavior apply to this course. For information see: http://www.science.psu.edu/academic/Integrity/index.html

Students with disabilities. Penn State welcomes students with disabilities into the University’s educational programs. For information see: http://equity.psu.edu/ods