3592H (Honors Mathematics I) Syllabus, Part I – Fall 2015

Rough Outline: Our goal is to complete the first 3 chapters of Hubbard and Hubbard's book, following their outline rather faithfully. This means that we'll cover an introduction to linear algebra, differential calculus in several variables, and a bit about manifolds at the end of the semester. The reading to complete in advance of class is listed in parentheses.

This syllabus (on three pages) covers the entire semester, but is very likely to change once the class is under way and we have a better idea about pacing. The readings listed will still be correct for the given topic.

I. Vectors, Matrices, and Derivatives

1.	W	Sept. 9	Outline of course, definition of vectors (Chapter 0, Section 1.1)
2.	F	Sept. 11	Matrices as linear transformations (Section 1.3 up to p. 64)
3.	M	Sept. 14	Basic operations on matrices, inverses (Section 1.2 and pp. 64-65)
4.	W	Sept. 16	Using matrices to understand the geometry of $\mathbb{R}^n$ (Section 1.4)
5.	F	Sept. 18	Limits (Section 1.5, pp 84–97)
6.	M	Sept. 21	Continuity (Section 1.5, pp. 97–102)
7.	W	Sept. 23	Existence of maxima, minima for continuous functions (Section 1.6, pp 106–111)
8.	F	Sept. 25	Mean value theorem, fundamental theorem of algebra (Section 1.6, pp. 112–119)
9.	M	Sept. 28	Derivatives (Section 1.7, pp. 120–126)
10.	W	Sept. 30	Jacobians and directional derivatives (Section 1.7, pp 126–137)
11.	F	Oct. 2	Computing derivatives (Section 1.8)
12.	M	Oct. 5	Criteria for differentiability (Section 1.9)
13.	W	Oct. 7	Review for Exam 1
	F	Oct. 9	IN CLASS MIDTERM I

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II. Solving Equations

14.	M	Oct. 12	Row reduction (Section 2.1)
15.	W	Oct. 14	Solving systems via row reduction (Section 2.2)
16.	F	Oct. 16	Solving systems via inverses (Section 2.3)
17.	M	Oct. 19	Orthonormal bases (Section 2.4)
18.	W	Oct. 21	Kernels, image, and rank-nullity theorem (Section 2.5, pp. 195–201)
19.	F	Oct. 23	Interpolation and partial fractions (Section 2.5, pp. 202–207)
20.	M	Oct. 26	Vector spaces (Section 2.6)
21.	W	Oct. 28	Eigenvalues and eigenvectors (Section 2.7)
22.	F	Oct. 30	Newton's method, Lipschitz condition (Section 2.8, pp. 232–239)
23.	M	Nov. 2	Computing with Netwon's method (Section 2.8, pp 239–251)
24.	W	Nov. 4	Strong form of Kantorovich's theorem (Section 2.9)
25.	F	Nov. 6	Inverse function theorem (Section 2.10, pp. 259–268)
26.	M	Nov. 9	Implicit function theorem (Section 2.10, pp. 268–276)
27.	W	Nov. 11	Review for Exam 2
	F	Nov. 13	IN CLASS MIDTERM II

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III. Calculus on Manifolds

28.	M	Nov. 16	Definition of a manifold (Section 3.1 pp. 284–292)
29.	W	Nov. 18	Ways of presenting a manifold (Section 3.1 pp. 292–303)
30.	F	Nov. 20	Tangent spaces (Section 3.2)
31.	M	Nov. 23	Taylor polynomials (Section 3.3)
32.	W	Nov. 25	Computing Taylor polynomials (Section 3.4)
	F	Nov. 27	NO CLASS – THANKSGIVING BREAK
33.	M	Nov. 30	Quadratic forms (Section 3.5)
34.	W	Dec. 2	Critical points (Section 3.6)
35.	F	Dec. 4	Critical points with constraints (Section 3.7, pp. 351–359)
36.	M	Dec. 7	Examples of Lagrange multipliers, proofs (Section 3.7, pp 359–365)
37.	W	Dec. 9	The spectral theorem for symmetric matrices (Section 3.7, pp 365–368)
38.	F	Dec. 11	Geometry of curves (Section 3.8, pp. 371–376)
39.	M	Dec. 14	Geometry of surfaces (Section 3.8, pp. 377–388)
40.	W	Dec. 16	Review for Final Exam
	Th	Dec. 17	FINAL EXAM