MTH 254H COURSE OUTLINE

1. Some Linear Algebra

1.1. Vectors in $\mathbb{R}^n$, Inner ('Dot') Product.

1.2. Subspaces.

1.3. Linear Transformations.

2. Functions, Limits, Continuity

2.1. Scalar and vector valued functions.

2.2. Open and closed sets in $\mathbb{R}^n$, Convergence of sequences.

2.3. Limits and continuity.

3. The Derivative

3.1. Partial derivatives and directional derivatives.

3.2. Differentiability.

3.3. Differentiation Rules.

3.4. The Gradient.

3.5. Curves.

3.6. Higher order partial derivatives.

3.7. Implicit and explicit solutions to systems of equations: Introduction to manifolds.

4. Extremum Problems

4.1. Compactness and the maximum value theorem.

4.2. Maximum and Minimum problems.

4.3. Quadratic forms and the second derivative test.

5. Solving Nonlinear Problems

5.1. The contraction mapping principle.

5.2. Inverse and Implicit Function theorems, Manifolds in $\mathbb{R}^n$.

6. Integration in $\mathbb{R}^n$

6.1. Multiple integrals.

6.2. Iterated integrals and Fubini's theorem.

6.3. Polar, Cylindrical and Spherical Coordinates.

6.4. **Change of variables theorem.**

7. Differential forms and integration on manifolds

7.1. **Differential forms.**

7.2. **Line integrals and Green's theorem.**

7.3. **Surface integrals and Flux.**

7.4. **Stokes' theorem.**

Tentative Schedule

Please note that the numbering here refers to the course outline above, not the chapters in the textbook.

date	sections/topics covered
January 12	1.1
14	1.1, 1.2
15	recitation
16	1.3
21	2.1, 2.2
22	recitation
23	2.2
26	2.3
28	2.3
29	recitation
30	3.1, 3.2
February 2	3.2
4	3.2
5	recitation
6	3.3
9	3.4, 3.5, cross product in $\mathbb{R}^3$
11	3.5
12	recitation
13	3.5, 3.6
16	3.7
18	3.7, 4.1
19	recitation
20	4.1
23	4.2
25	eigenvalues, quadratic forms
26	**Exam #1 in recitation covering 1.1 through 4.2**
27	4.3
March 2	5.1
4	5.1, 5.2
5	recitation
6	5.2
16	5.2
18	5.2, 6.1
19	recitation
20	6.1

date	sections/topics covered
March 23	6.2
25	6.2
26	recitation
27	6.3
30	6.4, determinant
April 1	7.1
2	recitation
3	7.1
6	7.1
8	7.2
9	recitation
10	7.2
13	7.2
15	7.2, 7.3
16	recitation
17	7.3
20	7.3
22	7.4
23	**Exam #2 in recitation covering 4.3 through 7.3**
24	7.4
27	7.4
29	7.4
30	recitation
May 1	7.4
Thursday, May 7	**Final Exam 10.00 a.m. to noon**