Class notes for Math/CS 717 Fall 1999

These notes are probably as good as you are likely to produce yourself by copying from the blackboard. There is no guarantee that they are better than that. Still, having these notes available should give you the opportunity to listen in class (instead of trying to decipher my handwriting).

Course is entitled "Numerical Functional Analysis". Alternative title: "Abstract Numerical Analysis". Intent is to teach, without assumption of prior knowledge, those parts of (mostly linear) functional analysis (=: **f.a.**) which a Ph.D. candidate in numerical analysis (=: **n.a.**) needs in order to read present day numerical analysis papers. This means that much of the motivation for specific f.a. topics will come from n.a. considerations.

Advanced calculus and linear algebra are assumed (but extensively reviewed in the first few weeks). A working knowledge of basic numerical methods is essential as a source of motivation.

Books: (r:= no present meaning, E := Engin.Lib., M := Math.Lib.)

- C.W. Groetsch, Elements of applicable f.a., Dekker 1980 (rM)(QA320/G73)
- A. Wouk, A course of applied f.a., Wiley 1979

Books in a similar vein:

- L. Collatz, F.a. and Numerical Mathematics, Academic Press, 1966 (rE)(QA320/C5713/3)
- Kantorovich & Akilov, F.a. in normed spaces, Macmillan l964 (rM)(QA320/.K313)
- Krasnoselski, Rutitski et al., Approximation methods for the solution of operator equations, Russian 1968, German 1973, English:W.-Noordhoff 1973 (rM)(QA329/P7413/2)
- Peter Linz, Theoretical n.a.: an introduction to advanced techniques, Wiley 1979 (rE)(QA297/L55/1979)

More restricted topics of n.a. in f.a. setting:

- L. Rall, Computational solution of nonlinear operator equations, Wiley 1969 (rE)(QA218/R34)
- A. Anselone, Collectively compact operator approxim.theory, Prentice-Hall 1971 (rE)(QA431/A64)

Good f.a. reference for this course:

- A. Friedman, Foundations of Modern Analysis, Holt, 1970
  now available in Dover paperback, 1982
- Kolmogorov & Fomin, Functional analysis. (Vol.I: Metric and normed spaces; Vol.II: Measure, Lebesgue integral, Hilbert space.) Graylock 1957 (rE)(QA331/K733/2) Apparently republished by Dover as a paperback under the title "Introductory Real Analysis".
- W.W. Sawyer, A first book of Numerical Functional Analysis, Clarendon P., 1978 (rM)(QA320/S25)

Good f.a. reference for any occasion:

- W. Rudin, Functional Analysis, McGraw-Hill, 19??

Engineers might prefer

- Naylor & Sell, Linear Operator Theory in Engineering..., Holt Reinhard 197? (rE)