**Math 549** **Geometric Structures** **Spring 1995**

# SUGGESTED READING

The topic of the course this spring will be the Hodge Theorem. In order to prove it, we'll need to develop some of the basic theory of elliptic partial differential equations on manifolds. There will be no textbook, but the following books will be on reserve in the Mathematics Research Library and will provide useful background reading.

1. W. Rudin, *Functional Analysis*, New York, McGraw-Hill, 1991. This is an excellent source of background information on Hilbert spaces, the Fourier transform, compact operators, and unbounded operators.

2. F. Warner, *Foundations of Differentiable Manifolds and Lie Groups*, Springer-Verlag, 1983. This is a general introduction to differential geometry. For our purposes, it is useful because it has a self-contained proof of the Hodge Theorem in Chapter 6. Be warned, however, that Warner's proof is quite unconventional in that the analytic results are reduced to the case of operators on a Euclidean torus, where the theory of Fourier series can be applied. This approach, although more elementary than the one we will use, is much less general and less in the spirit of modern geometric analysis.

3. R. O. Wells, *Differential Analysis on Complex Manifolds*, New York, Springer-Verlag, 1980. Although this is a book about complex manifolds, the treatment of the theory of elliptic operators on manifolds, in Chapter 4, is similar to the treatment I will present, and in addition fills in some of the details on pseudodifferential operators that we will skip over. You should be able to read Chapter 4 by itself, and ignore most of the references to complex manifold theory.

4. T. Aubin, *Nonlinear analysis on manifolds, Monge-Ampère equations*, New York, Springer-Verlag, 1982. This is an overview of some important applications of (nonlinear) partial differential equations on manifolds. Chapters 2 and 3 give a comprehensive overview of most of the important analytic techniques that are used in applications of PDE to differential geometry, with references to the literature for everything that is not proved in the text.