Calculus on Manifolds

1. Introduction to multivariable functions, differentiation, directional derivatives.
2. Implicit and Inverse function theorems.
3. Review of integration.
4. Partition of Unity (2 lectures)
5. Change of variables and applications. (Diffeomorphisms in n-dimensional space)
6. Explaining the determinant: Volume of a parallelopiped.
7. Manifolds in n-dimensional space.
8. Integrating on manifolds: Volume of a parallelopiped, integrating scalar functions.
9. Multilinear algebra and alternating tensors
10. The wedge product.
11. Tangent vectors and differential forms.
12. The differential operator
13. Grad, Curl, Div. Pullback of forms.
14. Integration of forms over parametrized manifolds.
15. Orientability.
16. Integration of forms over orientable manifolds.
17. Stokes' theorem
18. Classical versions.
19. Proofs of the above theorems (2 lectures)