Lecture Notes in Mathematics

An Introduction to Riemannian Geometry

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Preface

These lecture notes grew out of an M.Sc. course on differential geometry which I gave at the University of Leeds 1992. Their main purpose is to introduce the beautiful theory of Riemannian Geometry a still very active area of mathematical research. This is a subject with no lack of interesting examples. They are indeed the key to a good understanding of it and will therefore play a major role throughout this work. Of special interest are the classical Lie groups allowing concrete calculations of many of the abstract notions on the menu.

The study of Riemannian geometry is rather meaningless without some basic knowledge on Gaussian geometry that i.e. the geometry of curves and surfaces in 3-dimensional space. For this I recommend the excellent textbook: M. P. do Carmo, *Differential geometry of curves and surfaces*, Prentice Hall (1976).

These lecture notes are written for students with a good understanding of linear algebra, real analysis of several variables, the classical theory of ordinary differential equations and some topology. The most important results stated in the text are also proven there. Others are left to the reader as exercises, which follow at the end of each chapter. This format is aimed at students willing to put **hard work** into the course.

For further reading I recommend the interesting textbook: M. P. do Carmo, *Riemannian Geometry*, Birkhäuser (1992).

I am grateful to my many enthusiastic students who throughout the years have contributed to the text by finding numerous typing errors and giving many useful comments on the presentation.

Norra Nöbbelöv, 17 February 2016

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