



# Spacetime, Geometry and Gravitation (Progress in Mathematical Physics)

*Pankaj Sharan*

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## **Spacetime, Geometry and Gravitation (Progress in Mathematical Physics) Pankaj Sharan**

This is an introductory book on the general theory of relativity based partly on lectures given to students of M.Sc. Physics at my university. The book is divided into three parts. The first part is a preliminary course on general relativity with minimum preparation. The second part builds the mathematical background and the third part deals with topics where mathematics developed in the second part is needed. The first chapter gives a general background and introduction. This is followed by an introduction to curvature through Gauss' Theorema Egregium. This theorem expresses the curvature of a two-dimensional surface in terms of intrinsic quantities related to the infinitesimal distance function on the surface. The student is introduced to the metric tensor, Christoffel symbols and Riemann curvature tensor by elementary methods in the familiar and visualizable case of two dimensions. This early introduction to geometric quantities equips a student to learn simpler topics in general relativity like the Newtonian limit, red shift, the Schwarzschild solution, precession of the perihelion and bending of light in a gravitational field. Part II (chapters 5 to 10) is an introduction to Riemannian geometry as required by general relativity. This is done from the beginning, starting with vectors and tensors. I believe that students of physics grasp physical concepts better if they are not shaky about the mathematics involved.

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