

MATHEMATICAL TOOLS

[Iñaki Garay, David Brizuela]

Differential geometry. Differential manifolds. Curves, tangent vectors and tangent space. Tensor algebra. Tensor calculus: covariant derivative, Lie derivative, geodesics.

Lie groups. Introduction to group theory. Lie groups. Lie algebras. Lie group representations.

Functional analysis. Introduction: normed linear spaces. Banach and Hilbert spaces. Operators and spectral theory. Distributions and Fourier transform.

Bibliography

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M. Nakahara, *Geometry, Topology and Physics*, CRC Press (2003).
R. M. Wald, *General Relativity*, University Of Chicago Press (1984).
R. d'Inverno, *Introducing Einstein's Relativity*, Oxford University Press (1992).
B. C. Hall, *Lie Groups, Lie Algebras, and Representations*, Springer-Verlag (2003).
W. Rossmann, *Lie Groups*, Oxford University Press (2002).
K. Erdmann, M. J. Wildon, *Introduction to Lie Algebras*, Springer-Verlag (2006).
N. Boccara, *Functional Analysis: An Introduction for Physicists*, Academic Press (1990).
Y. Eidelman, V. Milman, A. Tsoolomitis, *Functional Analysis: An Introduction*, American Mathematical Society (2000).
D. Farenick, *Fundamentals of Functional Analysis*, Springer (2016).
J. B. Conway, *A Course in Functional Analysis*, Springer (1990).
A. Bowers, N. J. Kalton, *An Introductory Course in Functional Analysis*, Springer (2014).
M. Reed, B. Simon, *Methods of Modern Mathematical Physics*, Academic Press (1980).
B. C. Hall, *Quantum theory for mathematicians*, Springer (2013).

Assessment by **written final exam**.