Module Name **Mathematics in Theoretical Physics**						
Type of Module Advanced Module			**Module Code** AM-PhyMath			
Identification Number MN-CS-PhyMath	**Workload** 180h	**Credit Points** 6 CP	**Term** 1. – 3. Semester	**Offered Every** variable	**Start** both	**Duration** 1 Semester

1	**Course Types** a) Lecture b) Exercise	**Contact Time** 60 h 30 h	**Private Study** 45 h 45 h	**Planned Group Size** < 30 Students

2 Module Objectives and Skills to be Acquired

Courses to provide background knowledge in mathematics disciplines fundamental to gravity and/or quantum field theory.

3 Module Content

- **Differential Geometry (4+2hpw, 6CP):** geometric structure of differentiable manifolds, Riemannian geometry, concepts of differential topology, theory of fibre bundles
- **Topology (4+2hpw, 6CP):** topological spaces, homotopy theory, homology, characteristic classes, knot theory
- **Theory of Groups (4+2hpw, 6CP**): Lie groups and algebras, representation theory, classical Lie groups.
- **Functional Analysis (4+2hpw, 6CP):** mathematics of inifinite dimensional vector spaces, theory of functionals, infinite dimensional analysis, mathematics of Hilbert and Banach spaces.

4 Teaching Methods

Lectures and Exercises

5 Prerequisites (for the Module)

none

6 Type of Examination

Written or oral examination

7 Credits Awarded

The module is passed and credit points are awarded if the 180-minute final exam is passed or the 30-45-minute oral final exam is passed.

8 Compatibility with other Curricula

The course is part of the Master of Science Physics

9 Proportion of Final Grade

6/114

10 Module Coordinator

A. Altland

11	**Further Information**