Non-commutative topology for beginners
This course is about relationships between topological and C*-algebraic concepts. It will be demonstrated that C*-algebras can be explored by methods inspired by topology.

We assume basic knowledge of general topology, but will introduce C*-algebras in the course.

We will start with the Gelfand-Naimark theorem which establishes the duality of the category of locally compact Hausdorff spaces and the category of commutative C*-algebras. Inspired by this theorem, one can think of non-commutative C*-algebras as a generalization of locally compact topological spaces.

After that we will give an introduction into topological K-theory and learn the Serre-Swan theorem, which will allow us to introduce a far reaching generalization of topological K-theory – K–theory for C*-algebras, one of the most important tools for investigating C*-algebras.

Eventually among the things we will study is the famous Brown-Douglas-Fillmore theory where two quite dissimilar fields of mathematics – operator theory and algebraic topology – interact in a deep, essential and unexpected manner.

Below a plan of the course is outlined. In parenthesis I have indicated some literature on these topics to those interested. It is by no means a requirement of the course to have these books. Lecture notes will be provided.

Plan of the course:
Gelfand-Naimark Theory
(literature: Murphy “C*-algebras and operator theory”)

From topological K-theory to K-theory for C*-algebras
(literature: Blackadar “K-theory” and Wegge-Olsen “K-theory for pedestrians”)

Non-commutative absolute retracts and absolute neighbourhood retracts
(literature: Blackadar “K-theory”)

Brown-Douglas-Fillmore Theory
(literature: Davidson “C*-algebras by example”)

Requirements:
We only assume prior knowledge of basic general topology and bounded operators of Hilbert Spaces.